KHSLA-2025 NATIONAL CONFERENCE
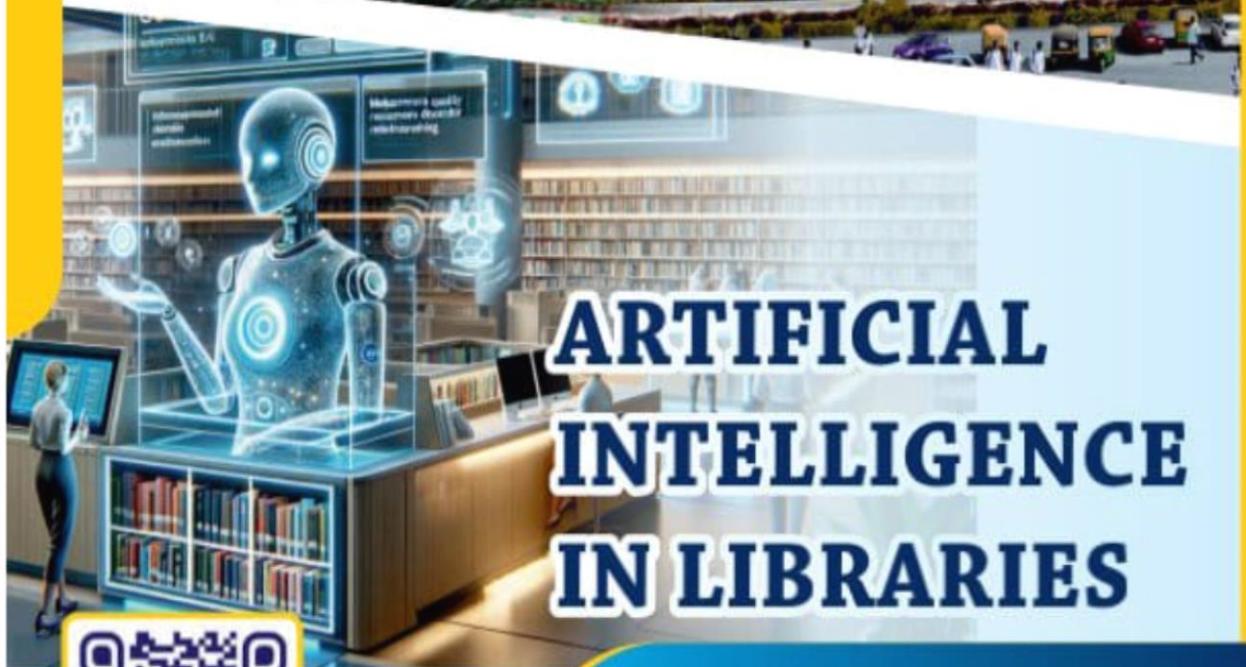
(KARNATAKA HEALTH SCIENCES LIBRARY

ASSOCIATION®)

Host: Rajarajeswari Medical College & Hospital, Bengaluru,

Karnataka.

Co-Host: Rajiv Gandhi University of Health Sciences, Karnataka, Bengaluru.

Date: 07th & 08 of February 2025.

Venue: Kadamba Hall, College Block, Rajarajeswari Medical College & Hospital,

Bengaluru-560 074, Karnataka.

THEME: ARTIFICIAL INTELLIGENCE IN LIBRARIES.

ELECTRONIC SOUVENIER

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ಥಾವರ್‌ಚಂದ್ ಗೆಹ್ಲೋಟ್
थावरचंद गेहलोत
THAAWARCHAND GEHLOT
Governor of Karnataka

No. GOV/KAR/MSG/50/2025

MESSAGE

I am glad to know that, **Karnataka Health Sciences library Association** *is conducting National Conference "KHSLA-2025" on the theme of "Artificial Intelligence in Libraries" hosted by Rajarajeswari Medical College & Hospital, Bengaluru and Rajiv Gandhi University of Health Sciences, Karnataka have proposed to bring out a e-Souvenir to commemorate the said occasion.*

I am happy to know that the Conference will witness 600 CMA Members, Representatives from Government, Corporates and Public Sector Undertakings.

I send my best wishes and warm greetings to the Organizers, participants and souvenir team and also for a grand success of the event.

30·1·25

(Thaawarchand Gehlot)

Raj Bhavan, Bengaluru - 560 001 (Karnataka) Ph. 080-22254102 - 108

RajaRajeswari Medical College & Hospital

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A Constituent Institution of Dr.M.G.R. Educational and Research Institute,

(Deemed to be University)

MHRD G.O No. F10/4/2018-u.3(A) Dt:14.02.2019

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27ᵗʰ January 2025

Message from the Founder Chancellor for the Library Conference

Greetings, It is my honor and privilege to welcome you to this year's KHSLA-2025, National Conference.

We are gathered here today to celebrate the power of libraries and the pivotal role they play in shaping the future of knowledge, culture, and society.

In a world that is rapidly changing, libraries continue to be an unwavering beacon of learning, information, and community connection. They are not just places of books; they are hubs for innovation, platforms for ideas, and sanctuaries for lifelong learning.

Let us use this gathering to inspire and challenge ourselves, to innovate, and to create new opportunities for the libraries of tomorrow. Together, we can shape a brighter future for knowledge and learning in every community.

Thank you for being here, and I look forward to the conversations, insights, and connections we will make throughout this event.

Enjoy the conference!

Dr. A C SHANMUGAM
Founder Chancellor
Dr. M.G.R. Educational & Research Institute, Chennai &
Rajarajeswari Group of Institutions, Bengaluru

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President's Message

Dear Esteemed Librarians, Scholars, and Distinguished Guests,

It is with great pleasure that I extend my warmest greetings to all of you gathered here today at the National Conference.

This event brings together passionate individuals who share in the profound belief that libraries are not just repositories of books, but vital spaces for learning, discovery, and community connection.

Libraries play an indispensable role in shaping an informed, thoughtful society. As we look to the future, we must continue to embrace innovation and the evolving needs of our communities while holding steadfast to the core values.

With best wishes for a successful and enriching conference.

Regards,

Dr. A C S Arun Kumar
President
Dr. M.G.R. Educational & Research Institute, Chennai &
Rajarajeswari Group of Institutions, Bengaluru.

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Executive Director's Message

Welcome and warm Greetings!

This conference serves as an opportunity for us to come together to share insights, explore new ideas, and collaborate on initiatives that will help libraries thrive in the 21st century. I encourage you all to engage, connect, and take full advantage of the wealth of knowledge and experience gathered in this room.

As we move forward, we must continue to adapt and embrace new technologies, methodologies, and partnerships that allow us to serve our communities even better. This conference presents a valuable opportunity for us to share ideas, learn from one another, and collaborate on ways to elevate the work we do for the people we serve.

I would like to take a moment to express my gratitude to all of you – the library professionals, educators, and supporters – who dedicate your time, energy, and expertise to making libraries a thriving, dynamic force in society. It is your passion and commitment that drives our collective mission forward.

Thank you for your commitment to the vital mission of libraries, and for all that you do to ensure that the doors of opportunity remain open for everyone.

Warm Regards,

Dr. Vijayanand
Executive Director,
Rajarajeswari Group of Institutions, Bengaluru.

Phone : +91-80-22870060
Fax: +91-80-22875798
dmekarnataka@yahoo.com

ವೈದ್ಯಕೀಯ ಶಿಕ್ಷಣ ನಿರ್ದೇಶನಾಲಯ

BMC&RI (Old Building), 1st Floor, Fort, K.R. Road, Bengaluru-560002.

MESSAGE

It gives me great joy to know that the Karnataka Health Sciences Library Association (KHSLA), in collaboration with Rajiv Gandhi University of Health Sciences, Karnataka, is organizing a National Conference on the 7th and 8th of February 2025 at Rajarajeshwari Medical College and Hospital, Bangalore.

The theme, "Artificial Intelligence in Libraries," is a forward-thinking choice, reflecting the exciting opportunities.AI offers to transform library services and enhance the support provided to healthcare professionals and researchers. Health science librarians play a vital role in bridging the gap between information and innovation, and this theme underscores their importance in today's evolving healthcare landscape.

Over the last 13 years, KHSLA has been a beacon of knowledge-sharing and professional development, consistently organizing events to empower librarians with new ideas and skills. In the current era, where research is the backbone of evidence-based clinical practice, health science libraries are critical in providing the tools and resources necessary to advance both education and healthcare outcomes.

I am confident this conference will serve as an exceptional platform for learning, collaboration, and innovation. My heartfelt congratulations to the organizers for their dedication and efforts in bringing this event to life. Best wishes to all the participants for a meaningful and successful conference.

Dr Sujatha Rathod B L
Director of Medical Education
Director
Bengaluru
Directorate Of Medical Education
Government Of Karnataka

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27th January 2025

Dean's Message for National Conference KHSLA-2025

At the Outset, I am extremely pleased to know that Karnataka Health Service Library Association (KHSLA) has chosen our Rajarajeswari Medical College & Hospital as host to conduct KHSLA-2025 National conference, with Rajiv Gandhi University Health Sciences, co-hosting the event under the Theme **'Artificial Intelligence in Libraries'**.

I wholeheartedly thank all the office bearers of KHSLA and welcome all the Library/ Information science and health science Professionals to this wonderful conference.

Exploring emerging library technologies is vital in today's world of break through innovations and cutting edge digital revolution.

I hope and believe that this National Conference would throw light as the critical and evolving need of developing new system of health sciences, Artificial Intelligence being one of them.

I am sure this conference provides an ideal platform for Inter disciplinary collaboration and exchange of fruitful ideas and concepts to highlight the application of **Artificial Intelligence (AI)** in libraries.

Yet again, I whole heartedly congratulate the organizers and welcome all the delegates and wish this event a grand success.

Dr. Sathyamurthy B
Chairperson, Organizing Secretary, KHSLA-2025
Dean & Professor, Department of Anatomy, RRMCH.
Rajarajeswari Medical College & Hospital, Bengaluru.

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BANGALORE UNIVERSITY

Jnanabharathi, Bengaluru - 560056

Prof. Dr. JAYAKARA S.M.
MDS., FDS., RCPS(Glasg), D.IMPLANT (France), FPFA
VICE CHANCELLOR

Message

I am happy to know that the Karnataka Health Sciences Library Association (Regd.) is conducting National Conference on " Artificial Intelligence in Libraries " at the RajaRajeswari Medical College and Hospital, Bengaluru.

I hope this Conference would to explore the intersection of Artificial Intelligence with Library Sciences and will serve as a platform for academics, researches and industry experts to deliberate on the transformative impact of Artificial Intelligence on Library services, information management and Knowledge Dissemination.

(Dr Jayakara S M)

Phone : 080-23213172 / 22961001   Email : vc@bub.ernet.in
Website: www.bangaloreuniversity.karnataka.gov.in

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27th January 2025

MESSAGE

Dear delegates, I am pleased and truly honored to know that our esteemed institution **RajaRajeswari Medical College & Hospital, is hosting KHSLA-2025 National Conference** on the Theme – **'Artificial Intelligence in Libraries'**.

On this occasion I am sure that papers and discussions during this conference, will throw light on the challenges faced by the health science libraries, today. I wish the recent advances in the field of science and technology will be efficiently inculcated within the ambit of health sciences library. I expect lot many luminaries and scholars will guide the young generations regarding the achievement of professional efficiency.

I congratulate the organizing committee of the conference for their mammoth task to organize and wish them success. I extend warm welcome to all the delegates to RajaRajeswari Medical College & Hospital and wish them the pleasant stay and experience on the campus.

May this conference inspired and energize us as we explore new technologies, understand needs, paradigms and perspectives.

Wishing a grand success to the organizing team.

Stay safe and have a great year ahead!

Warm Regards,

Dr. Praveen Kumar
Medical Superintendent & Professor, Dept. of ENT&HNS
Rajarajeswari Medical College & Hospital, Bengaluru- 560 074.

SRI CHAMUNDESHWARI MEDICAL COLLEGE HOSPITAL & RESEARCH INSTITUTE

Approved by National Medical Commission(NMC), New Delhi & Govt. of Karnataka Affiliated to Rajiv Gandhi University of Health Sciences, Bengaluru

SRI CHAMUNDESHWARI
MEDICAL COLLEGE HOSPITAL
& RESEARCH INSTITUTE
Dedicated to Life

Date: 28/01/2025

MESSAGE

Extremely happy to know that Rajarajeswari Medical College and Hospital, Bengaluru is organizing Karnataka Health Sciences Library association [KHSLA] National conference in association with Rajiv Gandhi University of Health sciences, Karnataka.

In the era of smart phones, smart TV, smart class etc upgrading to SMART LIBRARY especially with Artificial Intelligence [AI] is the need of the hour. Very less is understood about application of AI in libraries.

AI is defined as field of science concerned with building computers and machines that can reason, learn, and act in such a way that would normally require human intelligence or that involves data whose scale exceeds what humans can analyze. AI in libraries is expected to invade the traditional setup of the library, reshaping the whole system with machines, technology based services, resource, research and managing the digital content both for providers and users .

The challenges of library service in handling huge data, qualified staff recruitment, cataloguing, quick access to resources, and budget planning etc, maintaining records of books relating to available titles, text books, journals, which are being borrowed, tracking the user, returning of books, operational queries along with work stress can be addressed by AI and automation thus easing the challenges. Librarians maybe utilized for better work production.

I am sure the conference will help the librarians to be trained to teach the users how to use Artificial Intelligence to make the best use of the library system.

Best wishes for the organizing team.

Dr. Pravin G U
Principal
Sri Chamundeshwari Medical College Hospital & Research Institute.
Channapatna

Sponsored by: Sri Ranga Educational Trust, Bengaluru.

📍 **CAMPUS:** #29/1, Bengaluru - Mysuru National Highway NH-275, Channapatna Taluk, Ramanagara District - 562 160.

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Mr.Ravi D.Shivanikar
Mr.Damodhar
Mr.Rajkumar
Dr Swamy Nayaka

Date: 28/01/2025

MESSAGE FROM SECRETARY KHSLA

Welcome you all to the conference KHSLA-2025, hosted by **Rajarajeswari Medical College and Hospital, Bengaluru** on the topic "**Artificial intelligence in Libraries**". I am sure; you all will be have an engaging session, product presentation and user-interaction, in addition to networking with fellow professionals in the field. RRMCH has hosted this conference befittingly where faculty and students have taken keen interest both in academics and the organization of the conference.

I hope you will have an enjoyable learning experience

Dr. H S SIDDAMALLAIAH

President, KHSLA

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Tel. 0802-26717825, Mob.: 98456 55516 E-mail : secretarykhsla@gmail.com Web:http//khsla.weebly.com

Reg. No. 1111/1999-2000

KARNATAKA HEALTH SCIENCES LIBRARY ASSOCIATION ®

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Secretary:
Dr. Umesha

Joint Secretary:
Dr. Ramesh Naik
Dr.Shashikala H. M.

Treausurer:
Dr. Prakash

Executive Committee Members:
Dr.Keshava Muruthy
Dr.Mamatha Pramod Kumar
Dr.Mahendra V.Chikkmath
Mr.K.S.Panchaksharappa
Dr.Yacob Johnson
Dr. Kiran R.
Mr.Narayana R.E.
Mr.Ravi D.Shivanikar
Mr.Damodhar
Mr.Rajkumar
Dr Swamy Nayaka

Date: 28/01/2025

MESSAGE FROM SECRETARY KHSLA

At the outset, I welcome all the delegates, for taking out time and attending the conference. I do know the effort of Dr. Kiran R and Rajarajeswari medical college and Hospital in organizing the conference. The RRMCH has taken keen interest in all aspect including accommodation to majority of those attending the conference. The theme of the conference is opt and current. I hope all the Delegates will have a learning experience.

I wish safe stay and participation to all the delegates

Dr. UMESHA
Secretary, KHSLA

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27th January 2025

MESSAGE

Dear esteemed colleagues,

On behalf of the Organizing Committee and KHSLA office bearers and executive committee members, it is my pleasure to extend a heartfelt welcome each one of you to the **KHSLA-2025 National Conference** on the theme, **"ARTIFICIAL INTELLIGENCE IN LIBRARIES"**, scheduled to take place at RRMCH in the metropolitan city of Bengaluru, Karnataka, India. Your presence adds immense value and we are thrilled to have you join us for this gathering.

The KHSLA has worked very hard to ensure that every aspect of the conference enhances the experience, right from the choice of venue, selection of topics and the seamless organization of events. We are confident that you will find this conference both enlightening and enjoyable.

KHSLA-2025 National Conference brings academic opportunities to present and discuss on implementation '**Artificial Intelligence**" from the perspective of Libraries, Librarians, and Health Sciences Professionals, Also brings a very good opportunity for the corporate organizations to show-case their products. We acknowledge that their continuous support and encouragement will help us to make this conference a success.

Let us come together to make this conference a remarkable gathering of Librarians where knowledge blossoms, collaborations thrive and friendships endure.

Thank you for being a part of this programme. I look forward to welcoming and see you at KHSLA-2026.

Warm Regards,

27/1/2025

Dr. Kiran R.
Organizing Secretary, KHSLA-2025
Chief Librarian, Rajarajeswari Medical College & Hospital, Bengaluru- 560 074.

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Profile of KHSLA

Karnataka Medical Library Association (KMLA) was established in the year 1999. During 2011, it was renamed as Karnataka Health Sciences Library Association® (KHSLA) for the inclusion of all health science institutions affiliated to Rajiv Gandhi University of Health Sciences (RGUHS), Karnataka, Bengaluru and other Deemed-to-be-universities in Karnataka. The Karnataka Health Sciences Library Association® (KHSLA) has been conducting Annual & National conferences for the last 15 years, on various aspects, on-par with the development in health science librarianship, application of technology & in the field of health sciences information landscape.

The Notable session in the conference is **"Joint session between health science professionals & librarians"**, to understand the gap between Health Sciences Professionals & Librarians in providing information services.

Profile of Bengaluru

Bengaluru formerly called as Bangalore is the capital and largest city of the southern Indian state of Karnataka. The located at a height of over 900 metres(3,000 ft) above sea level. The city is known as India's "Garden City", due to its parks and greenery. This city distinct wet and dry seasons and moderate climate throughout the year, the dry season extends from December to February followed by the summer season from March to May. The monsoon brings most of the rainfall from June to September, followed by a post-monsoon in October and November.

The Bangalore Development Authority (BDA) was established in 1976, and is the nodal agency responsible for the planning and development of the city. The Bangalore Metropolitan Region Development Authority (BBMP) established in 1985, is responsible for planning of the metropolitan region. As the capital of the state of Karnataka, the city houses the state executive and legislative headquarters in the Vidhana Soudha, state ministries at Vikasa Soudha, and the residence of the Governor at Raj Bhavan.

The Karnataka High Court in Bengaluru is the highest judicial body in the state, and manages a series of sub-ordinate civil and criminal courts.

The Bengaluru City Police (BCP) is the primary law enforcement agency in the city and is head by a commissioner of police.

Bengaluru City Traffic Police (BCTP) is responsible for the traffic management in the city.

The Bengaluru city falls under four parliamentary constituencies- Bengaluru Rural, Bengaluru Central, Bengaluru North and Bengaluru South, and city elects 298 MLAs to the Karnataka Legislative Assembly.

Transportation is well connected from the city to all places by Air, Rail & Road

Bengaluru is a major educational hub and home to premium educational institutions in the country.

Cricket is the most popular sport in the city, the Mangalam Chinnaswamy Stadium, also known as the Karnataka State Cricket Association Stadium, is a cricket stadium in the Bengaluru city of the Indian state of Karnataka. The Sree Kanteerava Stadium is a multi-purpose venue which hosts football and athletics

In 1905, Bengaluru was among the first cities to have electric power. The city was powered by hydro power generated by the hydroelectric plant in Shivanasamudra. Electricity in the city is regulated through the Bangalore Electricity Supply Company (BESCOM).

Healthcare service is providing by govt. hospitals, education institutions, corporate hospitals and others.

Sanitation facilities are provided by the Bangalore Water Supply and Sewerage Board.
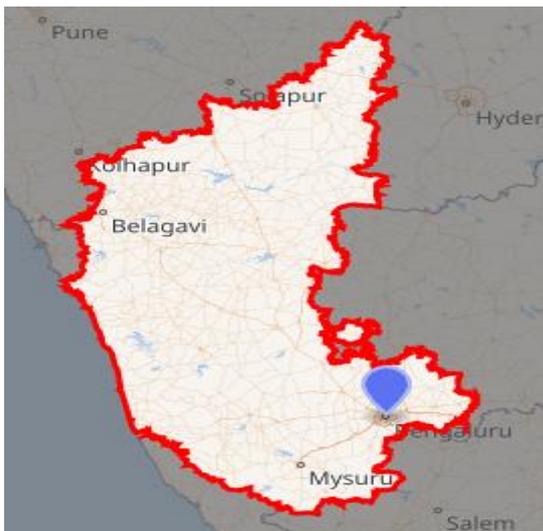
Profile of **Rajarajeswari Medical College & Hospital & Library**

RRMCH

The Moogambighai Charitable and Educational Trust was conceived in the year 1992 with a specific purpose and commitment to establishing institutions of academic excellence throughout Karnataka. Rajarajeswari Medical College & Hospital, Bengaluru, located in Mysore road, Kambipura, Karnataka, India, A Constituent Institution of Dr. M.G.R. Educational and Research Institute, Chennai, India (Deemed to be University).

Motto: Community development through excellent Health Care education, Service & Research Systems.

Library

The RRMCH Central Library was established in the year 2005 as a knowledge resources center, to support Under Graduate, Post Graduate including Super Specialty Education to all its students, faculty, clinicians and researchers. The library building, measuring an area of **45121.29 sq. ft,** has centralized Air condition, and the collection includes both printed and electronic resources like books, journals, multimedia learning materials in CD-ROM and tapes. It is networked on its campus wise network. The journals include both national and international journals. The services include user education, inter-library services and liaison with other health sciences institutions. The library is member of DELNET.

Library is managing by total 18 persons (6 Library Professionals, 12 other Staffs (Attenders, House Keeping & Security).

Library Professionals;		Other Supportive Staffs;
Dr. Kiran R.	Chief Librarian	Mrs. Sujatha N.
Mrs. Nagajyothi T. C.	Librarian	Mr. Lingaraju
Mr. Sathisha A. N.	Librarian	Mrs. Manjula S.
Mr. Paramesha S.	Asst. Librarian	Mrs. Manjula A.
Mr. Shreenivasa T. V.	Asst. Librarian	Mr. Nagarjuna D.
Mr. Nagendra Prasad V.	Asst. Librarian	Mrs. Tabasum Banu

WORKING HOURS:

Library Documents Areas

Monday to Friday – 9:00AM to 9:00PM
On Saturday   - 9:00AM to 4:30PM
On Sundays   - 9:00AM to 2:00PM & Holidays are closed.

Users Self Study Areas
Monday to Sunday 9:00AM to 12:00AM (Midnight) all 7 days in a week including Public & General Holidays.

The library have been automated by using "NewGenLib Helium 3.3 Version" Software with barcode and integrated with a theft detection system (RFID-HF System).

The ICT infrastructure of the Central library has 100 MBPS internet bandwidth and has 53 PCs connected on LAN. The library has Open Access shelf, circulation service on KIOSK, photocopy facilities, display of new arrival, question paper services and many more…

Co-Host

   Rajiv Gandhi University of Health Sciences, Karnataka (RGUHS) located in Bengaluru, India, is a public, affiliating university set up in 1996 by the Government of Karnataka, India, for the regulation and promotion of higher education in health sciences throughout the state of Karnataka. It is leading to a fragmented system with varying standards. Recognizing the need for a centralized body to ensure uniformity, quality, and progress in health science education and member of Association of Commonwealth Universities.

   RGUHS has named in honor of Rajiv Gandhi, the former Prime Minister of India, RGUHS was tasked with overseeing a wide range of health disciplines, including medicine, dentistry, nursing, pharmacy, and allied health sciences. This was a critical step in improving the quality of education and ensuring consistent academic and clinical training across affiliated institutions.

ORGANIZING COMMITTEE

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Founder Chancellor,
Dr. M.G.R.E&RI, Chennai & RRGI, Bengaluru.

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Managing Trustee,
Dr. M.G.R.E&RI, Chennai & RRGI, Bengaluru.

Dr. A.C.S. Arun Kumar
President,
Dr. M.G.R.E&RI, Chennai & RRGI, Bengaluru.

CHIEF GUESTS

Dr. Jayakara Shetty M
Vice-Chancellor,
Bangalore University, Bengaluru.

Dr. B L Sujatha Rathod
Director,
Director, Directorate of Medical Education, Karnataka.

CONFERENCE DIRECTOR
Dr. H S Siddamalliah
University Librarian,(RGUHS), Bangalore
 Principal Library and lnformaUon Officer (Rtd), NIMHANS, Bangalore
Visiting Professor, Mahasarakham University, Thailand (2014- 2016)

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Executive Director
Rajarajeswari Group of Institutions & Sri Ranga Education Trust, Bengaluru.

Dr. Naveen S
RGUHS Senate Member
Advisor, Rajarajeswari Medical College & Hospital, Bengaluru
Medical Director & Professor, Sri Chamundeswari Medical College Hospital & Research Institute, Channapatna.
 Senate Member, Rajiv Gandhi University of Health Sciences (RGUHS), Karnataka, Bengaluru.

Dr. Praveen Kumar
Medical Superintendent & Professor of ENT & HNS,
Rajarajeswari
Medical College & Hospital, Bengaluru.

Dr. A Nalini
Dean Library (All Campus), Professor, Electrical & Electronics Engineering,
Dr. M.G.R. Educational and Research Institute, Chennai.

ORGANIZING COMMITTEE

Dr. Satyamurthy B
Dean & Professor, Department of Anatomy
Rajarajeswari Medical College & Hospital, Bengaluru.

Sri C N Seetharam
Chief Executive Officer, Rajarajeswari Group of Institutions, Bengaluru.

Dr. Basavaraj Bhandare
Vice-Principal, Professor & Head, Department of Pharmacology,
Rajarajeswari Medical College & Hospital, Bengaluru.

Dr. Jamuna B L
Professor & Head, Department of Physiology,
Rajarajeswari Medical College & Hospital, Bengaluru

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Dr. Ramesh Naik G. S.
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KHSLA-2025 NATIONAL CONFERENCE

<u>Host</u>: Rajarajeswari Medical College & Hospital, Bengaluru.
<u>Co-Host</u>: Rajiv Gandhi University of Health Sciences, Karnataka.
Date: 07th / 08th February 2025
<u>Venue</u>: Kadamba Hall, Rajarajeswari Medical College & Hospital, Bengaluru.

PROGRAMME SCHEDULE	
Date: 06/02/2025 (Thursday)	
PRE-CONFERENCE WORKSHOP	
TOPIC	**TIME**
02:00PM to 04:00PM	Scientific writing and publishing in medical journals by **Dr. Geetika Sareen** Associate Director- Journals Jaypee Journals| Jaypee Brothers Medical Publishers
03:00PM to 03:15PM	**Coffee/ Tea Break**
Day Closed	

DAY-1 Date: 07/02/2025 (Friday)	
PROGRAMME	**TIME**
8:30AM to 10:00AM	Registration & Break Fast
10:00AM to 11:30AM	**INAUGURATION**
11:30AM to 11:45AM	Coffee/ Tea
11:45AM to 01:00PM	Technical Session – I Interactive Session **Doctors and Librarians**
01:00PM to 01:45PM	**LUNCH**
01:45PM to 02:30PM	Technical Session – II **Product Presentation**
02:30PM to 03:30PM	Technical Session – III **Papers Presentation**
03:30PM to 3:45PM	**Coffee/ Tea**
03:45PM to 05:00PM	Technical Session – IV **Papers Presentation**
05:00PM to 05:45PM	**General Body Meeting & Election**
06:00PM to 09:30PM	**Banquet/ Dinner** @ Rotary Hill View Resort Basavanapura, Ramanagara – 562 159.
Day Closed	

DAY-2 Date: 08/02/2025 (Saturday)	
PROGRAMME	TIME
08:00AM to 09:00AM	Break Fast
09:00AM to 09:45AM	Technical Session – V **Papers Presentation**
09:45AM to 10:30AM	Technical Session – VI **Product Presentation**
10:30AM to 10:45AM	Coffee/ Tea
10:45AM to 01:00AM	Technical Session – VII **Papers Presentation**
01:00PM to 02:00PM	**VALEDICTORY**
02:00PM Onwards	**Farewell Lunch**
Day Closed	

Topic – I Artificial Intelligence

Sr. No.	Name of the Authors	Title of the Article
1.	Mr. SreeKrishna M D Dr. Praveena Naik Mr. Yogesha B L. Mr. Ganesha & Ms. Hemalatha G N	Artificial intelligence in Libraries: revolutioning information access and service delivery.
2.	Mr. Babu J M	Transforming libraries with artificial intelligence: exploring applications, implementation, and innovations in access, sharing, efficiency, and security.
3.	Mr. Dasharath B Bandge	The impact of artificial intelligence on libraries: a transformation.
4.	Dr. Yacob Johnson	Artificial intelligence in libraries: present and beyond.
5.	Dr. Prasanna Kumar B M & Sachin Y	Innovative AI Tools for Systematic Reviews in Health Science Libraries: Opportunities and Challenges.
6.	Mrs. Lakshmamma & Dr. K G Jayarama Naik	Application of artificial intelligence in library and information centre: a study.
7.	Dr. Ramesh Naik Dr. Narasappa K C & Dr. Lokesha Naik	Implementation of Artificial Intelligence and Machine Learning in Library Operations and Services
8	Dr. Raju Gadad Mr. Kiran Malavade Mr. Ravi Shivanaikar[3]	Scientometric Analysis of Prosthetics and Orthotics Literature: A Study
9	Mr. Damodar U B & Dr. Chandrashekar D	The technologies emerging in health science libraries and its impact on library services: an overview.
10	Dr. Prasad N N Mr. Kumara swami R Marigoudar & Mr. Nagendra Kumar S	Purpose of use and attitude towards AI sources and services among NIMHANS users: a study.
11	Dr. G S Ramesh Naik & Dr. Sharanabasappa	The application of artificial intelligence (AI) in smart libraries: an overview.
12	Mr. Naveen K S & Dr. Vitthal T. Bagalkoti	AI tools in Medical and Dental education: perspectives from faculty and students at Subbaiah Institute Sciences, Shivamogga.
13.	Mr. Chandrappa Kamble & Mr. Jacob Isaac	Empowering library system with AI: Artificial intelligence for library services.
14	Dr. Prakash K M &	Application of artificial intelligence (AI) in different areas

	Mr. Nagesh H S	of the academic library
15	Dr.B. Raviivvenkat Dr.Jayaprakash S Dr.Keshavamurthy K C	IOT-Enabled Smart Library: An overview
16	Mr. Yogesha G. D	Artificial Intelligence Usage in Library Services
17	Mrs. Padma R Duggani	Artificial intelligence in learning: transforming educational knowledge.
18	Dr. Savitha	The Impact of Artificial Intelligence on Smart Libraries
19	V. S. Kattimani, Laxmee Kalyani Arpita.Mathad	AI Manages E-Resources in Libraries
20	Chetan M Matade	Artificial Intelligence in Libraries and Information Centers

Topic – II Smart Libraries

Sr. No.	Name of the Authors	Title of the Article
1.	Dr. Prakash K M & Lokesha G	Concept of smart library: a study.
2.	Mr. Yamanappa Siddappa Kori Mr. Rajashekara S N & Mr. Sridhara B R	Smart libraries in S.R. Patil medical college, Hospital and Research centre: concept and process, and library automation and OPAC.
3.	Dr. V Anasuya	Smart library users prefer smart services: technology used by health/ medical sciences smart libraries.
4.	Mrs. Suvarna N	Smart library for smart users and smart services.
5.	Mr. Narasimha Murthy A V	Transforming libraries: the rise of smart libraries in the digital age.

Topic– III General

Sr. No.	Name of the Authors	Title of the Article
1.	Mr. B. N. Yethiraju Mr. Eshwara Y Dr. P Dharani Kumar Dr. Hemantha Kumar	Discussion on Altmetrics – A Focusing on VIDWAN: A Case Study.
2.	Harshitha A R Hema S Samyam Gowda D M Ajay R Dr. A Abdul Rasheed & Dr. D Ashok	Automation of library operations: enhancing efficiency through advanced technologies.

Dr. Umesha
Secretary, KHSLA
KARNATAKA HEALTH SCIENCES LIBRARY ASSOCIATION ®
16th CONFERENCE

SECRETARY REPORT

The Karnataka Health Sciences Library Association popularly known as KHSLA registered under the Karnataka society's registration Act-1960 for the year 1999-2000, Started with few members from Karnataka Health Sciences library professionals affiliated to Rajiv Gandhi University of Health Sciences, Karnataka. With the continuous efforts from KHSLA member family/dignitaries. I am glad to state that we have nearly 527 Life members. And The registration of association and audited report is up-to-date

The Karnataka Health Sciences Library Association has decided to host Annual Conference every year in various places of Karnataka started in the year 2009 to 2020 hosted 12 annual and 03 National conferences across the state in health sciences institutions (Medical, Dental, Physiotherapy, Pharmacy, Ayush, Ayurveda, Nursing and allied sciences). The first annual conference hosted at J.J. Medical College & Hospital, Davanagere in the year 2009 subsequently hosted KIMS Bangalore, Mangalore, Kolar, Mysore, North Karnataka and other major cities and I am glad to inform that the 15th Conference (KHSLA-2024) hosted National conference in SIMS, Shivamogga and this 16th conference (KHSLA-2025) hosting in RRMCH, Bengaluru on February 07th & 08th, 2025.

KHSLA is a good platform and playing a pivotal role gathering the health sciences professionals every year in one place on this occasion to encourage and support education, research, sharing of information and collaboration.

I take this opportunity to thank the President, Past-Presidents, Office bearers and Executive Committee Members of KHSLA for their co-operation and encouragement. With the continuous support and involvement from KHSLA family/members last 15 conferences was held at various Health Sciences Institutions in Karnataka State.

I express my sincere gratitude to KHSLA-2025 Chief Patron Dr. A C Shanmugam sir, Executive Director Dr. S Vijanand sir, Dean Dr. B Sathyamurthy sir, Chief Executive Officer Sri. C N Seetharam sir, RGUHS Senate Member and Medical Director of Sri Chamundeswari Medical College Dr. S Naveen sir, Vice-Principal Basavaraj Bhandhare sir, Medical Superintendent Dr. Praveen kumar sir, all the Professor and heads of the department, organizing committee and various sub-committees Chairpersons and members, faculty members, non-teaching faculty, Dr.Kiran chief librarian RRMCH and Library Staff's.

I welcome all of you for this KHSLA-2025 National Conference, RRMCH, Bengaluru and I hope each one are benefitted and have a good learning experience from the deliberations and presentations during the conference.

Best Wishes for this conference grand success!

Sd-
Dr. Umesha
Secretary, KHSLA

PAPERS PRESENTATION

Artificial Intelligence in Libraries: Revolutionizing Information Access and Service Delivery

Mr.SreeKrishna M.D[1], Dr. Praveena Naik[2], Mr.Yogeesha B L[3], Mr.Ganesha[4] and Ms.Hemalatha G N[5]

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Abstract

The integration of artificial intelligence (AI) into libraries has revolutionized the ways in which these institutions manage information and deliver services. This research explores the impact of AI on library operations, focusing on how technologies such as AI-driven recommendation systems, virtual assistants, predictive analytics, digitization, and security measures enhance the user experience, streamline operations, and preserve cultural heritage. The paper also addresses the ethical challenges associated with AI, including data privacy, algorithmic transparency, and bias mitigation. Through an in-depth examination of current AI applications and their future potential, the study highlights the transformative power of AI in reshaping the library landscape. The findings point to AI's potential to further improve access, research support, and preservation efforts, emphasizing its role in ensuring libraries remain pivotal in the digital age.

Keywords Artificial Intelligence (AI), Libraries, Information Access, Service Delivery, Recommendation Systems, Virtual, Predictive Analytics, Digitization, OCR

Introduction

Libraries have historically been centres of knowledge, providing access to a wealth of information for education, research, and cultural preservation. However, with the onset of the digital age, libraries are under pressure to modernize and adapt to new technological

advancements. Artificial intelligence has emerged as a powerful tool that can enhance the management, organization, and accessibility of information. AI offers solutions to automate routine tasks, enhance user engagement through personalized recommendations, and optimize resource discovery. This paper aims to investigate the role of AI in transforming library functions, particularly focusing on AI's application in curation, information retrieval, digitization, and preservation, while also considering the ethical challenges of AI adoption.

Literature Review

Over the past decade, several studies have documented the benefits of AI in libraries. According to Smith and Jones (2019), AI applications in libraries are revolutionizing information retrieval and improving the efficiency of cataloguing. Research by Thompson et al. (2020) emphasizes AI's ability to offer personalized user experiences, particularly through recommendation systems and virtual assistants. AI-driven technologies such as natural language processing (NLP) and optical character recognition (OCR) have also been proven effective in digitizing and preserving fragile materials (Wang & Li, 2021). However, as highlighted by Lee (2022), the implementation of AI also raises critical ethical concerns, including data privacy, fairness, and algorithmic transparency, which must be carefully addressed to ensure equitable access and transparency.

Need of the Study

As libraries continue to evolve in the digital era, the adoption of AI technologies is essential to improve the efficiency of services, enhance the user experience, and preserve cultural heritage. Despite the growing implementation of AI in libraries, a comprehensive study that examines both the technological advancements and the ethical challenges remains lacking. This study aims to fill this gap by providing a holistic view of AI in libraries, assessing its impact on operational functions, user engagement, and preservation efforts, while also addressing the ethical considerations surrounding AI adoption.

Scope of the Study

This study focuses on the implementation of AI technologies in libraries, particularly in the areas of resource discovery, user engagement, digital archiving, and preservation of fragile materials. The research will also explore ethical concerns related to AI's role in libraries, including user privacy, algorithmic transparency, and fairness. The scope of the study is global, considering a wide range of libraries from academic to public institutions that have integrated AI technologies.

Methodology in the Study

This study employs a qualitative research methodology, combining a review of existing literature with case studies of libraries that have implemented AI technologies. A thematic analysis approach is used to categorize the various applications of AI in libraries, as well as the ethical challenges associated with its use. The research also includes expert interviews with librarians and AI technologists to gain insights into the real-world implications of AI adoption in library services.

1. The Role of AI in Libraries

AI is revolutionizing library services and operations, allowing libraries to provide smarter, faster, and more personalized services to users. The major applications of AI in libraries can be broadly classified into the following categories:

1.1. Curation and Recommendation Systems

AI-powered recommendation systems have reshaped the way users discover library resources. By analyzing user behavior, preferences, and borrowing histories, AI algorithms offer personalized suggestions that help users find books, articles, and other materials relevant to their needs. These systems utilize advanced machine learning techniques such as collaborative filtering, content-based filtering, and hybrid models to improve resource discovery.

1. **Personalization and User Engagement**: AI algorithms enhance personalization by tailoring suggestions to individual user profiles. This increases user engagement, as patrons are more likely to discover materials that align with their interests.

2. **Content-based and Collaborative Filtering**: Content-based filtering recommends resources based on their similarity to items a user has previously shown interest in, while collaborative filtering identifies patterns in user behavior to suggest materials that others with similar tastes have found useful. Combining both approaches leads to more accurate and diversified recommendations.

3. **Hybrid Systems**: Hybrid recommendation systems combine the strengths of content-based and collaborative filtering methods to provide users with better recommendations.

4. **User Feedback Integration**: AI systems constantly improve by incorporating user feedback, refining the recommendations based on satisfaction levels or changing preferences.

1.2. Information Retrieval

AI plays a crucial role in enhancing the accuracy and efficiency of information retrieval in library catalogs and databases. AI-based search engines and Natural Language Processing (NLP) algorithms allow for more accurate interpretation of user queries, leading to better search results.

1. **NLP and Search Accuracy**: NLP techniques enable AI to understand the context and semantics of user queries, improving search relevance and accuracy.

2. **Advanced Search Capabilities**: AI enhances the search experience by offering advanced filtering options and handling complex queries, allowing users to find the exact resources they need faster.

1.3. Digital Archives and Preservation

AI technologies assist in the preservation and digitization of fragile materials, ensuring that rare documents, manuscripts, and other cultural artifacts are safely archived and accessible to future generations.

1. **Digitization and Optical Character Recognition (OCR)**: AI-powered OCR technologies convert physical documents into machine-readable formats, making it easier to store and search text within scanned materials.

2. **Automated Indexing and Categorization**: AI systems can categorize and organize digital archives, making it easier to locate and retrieve materials based on specific criteria.

1.4. Chatbots and Virtual Assistants

Libraries have adopted AI-powered chatbots and virtual assistants to provide round-the-clock assistance to patrons. These virtual agents can answer queries, provide information, and guide users toward library resources, improving the overall user experience.

1. **24/7 Accessibility**: Virtual assistants offer continuous support, helping patrons find information or resources at any time, independent of library hours.

2. **Language Support**: Virtual assistants can be programmed to communicate in multiple languages, offering inclusivity for a diverse range of users.

3. **User Engagement**: AI chatbots enhance user engagement by providing interactive, real-time responses to queries, ensuring patrons can access information efficiently.

1.5. Predictive Analytics for Collection Management

AI-powered predictive analytics enables libraries to forecast future resource demands, optimize collection development, and manage inventories more effectively.

1. **Demand Forecasting**: AI analyses trends in resource usage and external factors to predict future demand, helping libraries make informed decisions about resource acquisition.

2. **Collection Optimization**: By analysing user behaviour and consumption patterns, AI helps libraries maintain up-to-date collections, ensuring that materials are relevant and accessible to users.

1.6. Security and Fraud Detection

AI enhances security measures within libraries, including fraud detection, access control, and monitoring of digital assets.

1. **Access Control and Surveillance**: AI technologies enable libraries to monitor physical and digital spaces, ensuring secure access to resources.

2. **Fraud Detection**: AI systems can identify unusual activity or potential threats, providing early warnings of security breaches or fraudulent activities.

2. AI-Powered Recommendation Systems in Libraries

AI recommendation systems are transforming the way users interact with library resources. These systems use data-driven algorithms to analyse user behaviour and preferences, offering personalized suggestions that enhance the user experience.

1. **Personalization and Engagement**: Personalized recommendations keep users engaged by offering tailored content based on their historical interactions with the library.

2. **Collaborative and Content-based Filtering**: By combining collaborative and content-based filtering techniques, AI systems provide diverse and relevant recommendations, ensuring that users have access to a wide array of resources that match their needs.

3. **Hybrid Systems and Improved Resource Discovery**: Hybrid recommendation systems that combine different AI approaches offer more precise and comprehensive recommendations.

3. The Role of Virtual Assistants in the Modern Library Ecosystem

Virtual assistants play a key role in modern library operations, offering personalized assistance, improving user engagement, and aiding in resource management.

1. **Personalized Assistance**: Virtual assistants help users navigate catalogs, find resources, and obtain relevant information based on individual preferences.

2. **24/7 Accessibility**: Virtual assistants break down the constraints of traditional library hours, offering patrons constant support.

3. **Resource Management and Discovery**: Virtual assistants automate tasks such as cataloging and indexing, ensuring efficient organization and retrieval of library materials.

4. AI's Role in Digitization and Preservation of Fragile Materials

AI has revolutionized the preservation of fragile library materials by offering advanced tools for digitization, restoration, and maintenance.

1. **Automated Image Enhancement**: AI-driven algorithms enhance the quality of digitized images, ensuring that fragile materials are preserved with the highest fidelity.

2. **Text Recognition and Transcription**: AI-powered OCR and text recognition systems make it possible to extract and transcribe text from old or damaged materials efficiently.

3. **3D Scanning and Reconstruction**: AI-based 3D scanning technologies preserve three-dimensional artefacts, offering a more accurate and detailed representation of fragile objects.

4. **Predictive Maintenance and Content Integrity**: AI can predict potential degradation of materials and help ensure their long-term preservation.

1.   Ethical Considerations in AI Integration

While AI offers transformative possibilities, its integration in libraries requires careful attention to ethical issues, such as data privacy, algorithmic transparency, and bias mitigation.

1. **User Privacy and Data Protection**: Libraries must prioritize user consent and ensure data security when collecting personal information for AI-powered services.

2. **Intellectual Freedom and Fairness**: AI systems should respect intellectual freedom by avoiding biases in recommendations and preserving equitable access to information.

3. **Algorithmic Transparency**: Libraries must ensure that AI systems are transparent, explaining how decisions are made and ensuring accountability in their deployment.

4. **Mitigating Bias and Ensuring Fairness**: Libraries must actively work to mitigate biases in AI algorithms and ensure that all users have fair access to resources.

6. Future Prospects of AI in Libraries

The future of libraries lies in the seamless integration of AI technologies, enhancing information discovery, research support, and resource management.

1. **Enhanced Information Discovery**: AI-driven cataloging and personalized recommendations will streamline the discovery process and improve user engagement.

2. **Streamlined Administrative Processes**: AI-powered automation will allow librarians to focus on more strategic tasks by reducing routine administrative burdens.

3. **Preservation of Cultural Heritage**: AI technologies will play a critical role in preserving cultural artifacts and ensuring the long-term accessibility of historical materials.

4. **Ethical and Inclusive AI**: The future of AI in libraries must ensure inclusivity, fairness, and ethical transparency in all AI-driven processes.

Conclusion:

Finally**,** in this study found that AI integration in libraries has significantly enhanced operational efficiency, personalized user experiences, and the preservation of cultural heritage. Libraries that have adopted AI technologies report improved resource discovery, better user engagement, and more effective collection management.

Libraries should prioritize ethical AI implementation, ensuring transparency in algorithmic processes and safeguarding user privacy. Additionally, librarians should be trained in AI technologies to better understand and manage these systems. Collaborative efforts between library professionals and AI developers are essential to create more inclusive, accessible, and ethical AI-driven library services.

The integration of AI in libraries is a transformative shift that enhances user experience, streamlines operations, and ensures the preservation of cultural heritage. By leveraging AI technologies such as recommendation systems, virtual assistants, predictive analytics, and digitization tools, libraries are better equipped to meet the evolving needs of users in the digital age. However, as libraries embrace these technologies, they must also be mindful of ethical concerns, including data privacy, algorithmic transparency, and fairness. With thoughtful implementation, AI has the potential to revolutionize libraries, making them more accessible, efficient, and inclusive for all users.

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Transforming Libraries with Artificial Intelligence: Exploring Applications, Implementation, and Innovations in Access, Sharing, Efficiency, and Security

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Abstract:

Artificial Intelligence (A.I.) is a Collection of Technologies that allows Computers to Perform Tasks That reflects human thoughts. The aim of this study is to explore how Artificial Intelligence (AI) can transform libraries by improving access and resource sharing, efficiency in daily task, and strong in data security, then the libraries become more informative, effective, and secure. The research involves an overview of AI applications in libraries and It analyze the implementation of AI Technologies such as Machine Learning Algorithms for Cataloguing, Classification and Improving on finding resources, and Security, Data Science for Analyze the user activity, improve decision making through Available data, Deep learning for Automated image and text Recognition, Natural Language Processing for translating data and Chatbots are personal assistance. AI can enhance search functions by providing accurate and relevant information based on user activity. It can also suggest what resources a user might be required According to their previous searches, offering recommendations on books, articles, or research documents. This personalization helps find information quickly and accurately. AI is also being used to automate cataloguing, classification and the organization of materials efficiently compared to traditional methods. Finally these technologies assist to improving access, efficiency, sharing, and security.

Keywords: Artificial Intelligence, Machine Learning Algorithms, traditional method Automation, Resource Sharing, Chat bots.

Introduction:

The AI is Collection of Technologies that can work based on the Human requirement. Artificial Intelligence (AI) is revolution in every sector and profession Library field is no exception. Utilizing AI tools in libraries makes user satisfaction and services more effective. Libraries have always been center of Knowledge and source of information ,but in today's fast-changing world, they face challenges in accessibility ,resource sharing ,work efficiency ,and data

Security .Enter into Artificial Intelligence (AI)---a technology reshaping industries by offering Accurate solution to difficult in problem. By Introducing AI into libraries, Institutions can transform how information is accessed, shared ,and organizing the data .. This transformation not only improves user experience but also creates opportunities for more inclusive and sustainable future for libraries worldwide.

Traditional library methods depends on manual processes like cataloguing, in-person to person assistance, and community based resource sharing, which are often time-consuming and restricted in reach. In, AI-Technologies provide instant search results, automate resource management, and it's Provide 24/7 virtual support, enhancing efficiency and accessibility. While traditional methods depend on basic security measures, AI introduces advanced cyber security and predictive analytics to protect data. Moreover, AI tools promote equity with features like text-to-speech and translation, ensuring libraries can handle huge range of Users. This transformation modernizes libraries, making them more dynamic and user-focused.

Review of Literature:

Hodonu-Wusu (2024) suggested that libraries must prioritize privacy, transparency, fairness, and inclusivity in their AI initiatives. They should regularly evaluate AI algorithms for bias and continuous effort should be made for user empowerment where AI can enhance personalized recommendations, virtual assistants, and data analytics to improve user experiences. Jayavadivel et al., (2024) The integration of AI into library systems marks a paradigm shift from the conventional methods of cataloguing and information retrieval to more dynamic, intelligent solutions that anticipate user needs and deliver personalized experiences

Lee, Y. A. (2024). AI chatbot evaluate its performance by exploring the important factors influencing users' chatbot evaluation and questions the chatbot was unable to provide answers. The study provides practical recommendations for institutions planning to implement AI chatbots, and also lays the foundation for future research on AI chatbot technology to improve library services.

Mahmud, M. R. (2024This paper aims to explore the role of artificial intelligence (AI) in automating library cataloguing and classification processes, exploring current applications, challenges and future possibilities. It aims to provide insights into how AI technologies are reshaping traditional library practices and their implications for the future of information organization and access.

Friedrich et al. (2020) ML algorithms can significantly improve search functionalities by predicting user needs based on their past interactions. By analyzing large datasets, AI tools can provide users with highly relevant results, effectively supporting research and resource discovery. In addition, NLP has enabled more advanced cataloguing and classification methods, enhancing access to resources by improving the accuracy and speed of catalogue systems

Marr, (2019) Artificial Intelligence (AI) has rapidly emerged as a transformative force across multiple industries, and its influence is increasingly being felt within the realm of library science. Traditionally viewed as quiet sanctuaries of knowledge, libraries are now at the forefront of technological innovation, using AI to redefine how information is accessed, managed, and disseminated. Prominent organizations like Google, IBM, Amazon, Netflix, and Expedia have increasingly integrated AI and ML technologies to enhance their products and services

Wu, J., Williams (2015)CiteSeerX is a digital library search engine that provides access to more than 5 million scholarly documents with nearly a million users and millions of hits per day. We present key AI technologies used in the following components: document classification and duplication, document and citation clustering, automatic metadata extraction and indexing, and author disambiguation

AI Technologies in Libraries:

AI technologies are play key role on Modernizing libraries, transforming them into smart, informative for innovation. These advanced tools enable libraries to meet the needs of modern users while improving their skills, knowledge in the digital world. Some of the AI applications in libraries include:

1. Machine Learning (ML):

AI is a parent of Machine learning, and It can improving Automatic cataloguing, classification and Resource Management. This technology can predict and suggest recommendations to users based on their past searches. Machine learning reduces human effort and time in providing services to users. With the help of ML, we can identify which resources are used the most in the library based on this we can make over the library more user friendly.

2. Natural Language Processing (NLP):

Natural Language Processing is one of the Technology in the AI, By using this technology Computers can Understand, Process and Gives output in the human understanding language. NLP can Recognise both Speech and text formats. Now a days everyone Knows Siri and Alexa this will convert speech to text and Google lens can convert text to text and speech through

search engines. In Libraries audio books can convert into text. No need to spent more time and effort for Storing and retrieving information about library resource such as books and Journals. NLP can translate text or documents to user friendly language helping to eliminate the language barriers.

3 Computer Vision:

With advanced technologies like scanning and image recognition tools,we can store large amounts of data and retrieve it easily. In libraries, manuscripts, artworks, and historical documents can be stored and preserved using these technologies.

4 Robotics:

Robotics can Assists physical tasks automatically like book sorting, shelving, and delivery, particularly in large amount library collections. This reduces manual mistakes, workload and improving efficiency in task.

5 Deep Learning:

Deep Learning is a one of the advanced Technique in Machine Learning, it can improve Daily Tasks in library more efficient and user friendly DL can analyse content and making categorization more accurate when compared to traditional method. By the help of DL we can generate content based on user instruction and need .

6 Reinforcement Learning:

One of the software in Machine Learning, while using Reinforcement algorithms a computer or a robot can learn how to make decision by user instruction in libraries. It perform different actions and Receives feedback from the user, Based on this the robot learns which one is better feedback from the user and tries to repeat those actions in the feature

7 Data Science:

In Libraries using Data Science to analyse large amounts of collection usage and most used content in the library based on user behaviour. Data Science can forecast and recognize the flow of content at present environment. It Can Also helps improve organizing the resources and make effective on user services.

8 AI-Powered Security Systems:

AI Can improve security on digital and physical collections by detecting unauthorized access, every step we can monitor on AI , and preventing cyber threats.

9 Accessibility Enhancements:

By using AI tools in library like text-to-speech, speech to text, It can also helps converts irrespective language to user friendly language based on this reduce the language barriers in the

library ,Users can access information without limitations. With these tools users can access , sharing data in effective manner.

10 Smart Libraries:

AI technologies are key factors of smart libraries, which combination of   IoT (Internet of Things), sensors, and creating automated environment are the key elements that attract readers to the library. Accessing information with accurate and Providing updates on availability of resources. User can get automatic notification for new events or arrivals With AI tools ,Libraries are improving information resources to assist new innovations and Learning, while also crating an advanced ecosystem. These changes in libraries are making them key sources of knowledge in a digital world."

Role of AI in Transforming Libraries:

1. Optimizing   User Experience

AI technologies are revolutionizing libraries. AI can provide recommendations based on user activity and search history, allowing libraries to create a more user-friendly environment. AI virtual assistants and chatbots offers 24/7 support, solving user queries and guiding them to resources effortlessly. Advanced voice and image recognition tools make it easier for users to access information in libraries..

2. Modernizing Library Functions.

Routine tasks in libraries such as cataloguing, classification, and indexing can be automated with AI, reducing the manual mistakes and workload on staff. Improving accuracy in library operations, Libraries to maintain resources more effectively, it can predict the needed documents for better organizing stock of the library. These innovations save time

3 Improving Accessibility

AI plays a crucial role in making libraries more effective by focussing on the needs of users. AI Tools such as text-to-speech, speech-to-text, and instant language translation reduce the barriers for individual user with visual, auditory challenges. By combination of these technologies, libraries can provide equal access to information for all users, making effective learning environment.

4 Enhancing Resource Sharing

With the help of AI-Technologies, libraries can make accessing facility effortless and wide range of information resource sharing through interlibrary loans and global networks. Machine Learning algorithms can quickly find resource requests with available information across

different institutions, collaboration and knowledge sharing. This interconnected will become maximizes resource utilization and creates a global knowledge ecosystem.

5   Strong in Data Security

As digitalization increases, so does need a strong data security, AI tools can instantly monitor library networks, focussing on the risk factors and preventing on the data theft by using advanced security methods. AI Keeps user data safe and secure.

6   Support on Research and Innovation

AI Assist Researcher by providing tools such as exploring data, structure recognition, analysing current methods of research. These features make the research process easier and effective when compared to traditional methods.AI can improve Sharing information by automating indexing and Retrieval of academic publication, making research more accessible and impactful.

7   Preserving Cultural Heritage

Basically the large collection of libraries have a cultural and historical documents and evidences, that requires careful maintenance .AI technologies can scan sensitive documents, repair damaged text and create fully documented digital collection. These tools help preserve cultural history and make it easy to access for future generations through smart search method.

8   Driving Data-Driven Decision Making

By using AI tools in Libraries collect and analyse the data based on user behaviour, staff service performance and current trends. Based on this Information Libraries can improve their Services, managing and procuring resources more effectively.

AI Implementation Challenges in Libraries:

Libraries are facing challenges on implementing AI. The initial investment is high because libraries need to Purchase Software, Hardware and need to update the infrastructure. Small Institutions or Libraries with Limited Budgets may hard Afford AI technologies. Another one challenge is Lack of technical experience. Library Staff need skills to use and Maintaining AI Software, if may not staff required training it takes money and time.

Data security and Privacy Libraries must and should data protection laws and prevent loss of Personal Information it can take expensive. Maintenance and software updates are becoming Expensive, As AI requires regular updates to perform effectively. User acceptance is also a one of the Challenge, as library users and staff may resist AI due to a lack of awareness about the technology.

Data quality is also a challenge because AI tools required organized and high quality data for storage and Maintenance. Additionally, Libraries must follow rules on copyright and intellectual assets, which can be complex.

Overcoming the Challenges

1. Collaborations: Partnering with tech companies, academic institutions, and government bodies can help share costs and expertise.

2. Grants and Funding: Securing funding from organizations supporting technological advancements in libraries.

3. Staff Training: Investing in professional development to build AI literacy among library staff.

4. Inclusive Policies: Designing AI systems that prioritize user privacy, address biases, and promote inclusivity.

5. Open-Source Tools: Exploring cost-effective, open-source AI tools tailored to library needs

Discussions:

AI makes library Day to Day activities by automatic like cataloguing and maintaining resources, improving efficiency. text –speech, speech –text and chat bots, virtual assistant enhance on user experiences .AI plays a crucial role on making digitalization of a documents and easy and accurate data accessing. While implementing AI faces challenges such as cost is high, lack of awareness on AI tools, Staff training, data privacy. Collaboration with tech companies, ongoing staffs training are key to overcome the challenges.

Conclusion:

The implementation of AI In Libraries transforms to improving accessing information, global resource sharing, strong in data security.AI Technologies are upgrading cataloguing ,search functions and also user interaction and managing library resources effectively .However challenges such as Lack of awareness on AI tools and high cost of procuring and organizing software can overcome collaboration and exploring open source AI Solution.

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The Impact of Artificial Intelligence on Libraries: A Transformation

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Abstract:

Digitization and artificial intelligence (AI) are fundamentally altering the ways in which we work, live, communicate, learn, and engage in leisure activities. Whether individuals recognize it or not, they are increasingly interacting with sophisticated technologies such as AI in their daily routines. As we progress further into the twenty-first century, numerous professions are being influenced by human creativity and innovation, which are enabling the extraction of value from emerging technologies. AI is poised to revolutionize the interactions between librarians and scholars with library resources. Traditionally, metadata has played a crucial role in aiding the discovery of materials. In the absence of metadata, the extensive resources of a library remain largely inaccessible to those seeking information. Humans function as both creators and consumers of tools. Libraries act as the central hub for preserving memory and fostering future knowledge development, both of which are vital for the effective application of AI. This article presents a literature review on the implementation of artificial intelligence (AI) in libraries and its effects on library operations.

*Keywords***:** Artificial Intelligence in libraries, AI in Application, Machine learning, deep learning, AI Chatbots, Smart Libraries and Emerging Technology.

Introduction

Artificial intelligence (AI) addresses a specific range of challenges that can be resolved using computers, software applications, or algorithms. With adequate time, resources, and creativity, a rational and intelligent individual should be capable of addressing the existing problems. One of the pioneering applications of AI in the field of librarianship is Optical Character Recognition (OCR). Individuals with visual impairments may find it difficult to access the entire library collection. In such cases, a human library assistant could read the texts aloud or convert them into braille or other supportive formats. In the mid-1970s, Ray Kurzweil developed computers that were proficient in OCR and text-to-speech technology, enabling these machines to vocalize written content. Kurzweil's innovations represent a significant advancement in technology that facilitates access and should be regarded as separate from both automation and the broader application of computers.

Artificial intelligence, commonly referred to as AI, has captivated the attention of researchers and visionaries for many years. It evokes images of science fiction and fantasy, but more significantly, it symbolizes advancement. Indeed, AI is intrinsically linked to the concept of progress. In conjunction with AI, machine learning has rapidly introduced innovative solutions for information professionals. While machine learning (ML) is recognized as a subset of AI, some experts contend that it constitutes a distinct discipline. The essence of machine learning lies in its capacity to learn from data and make decisions autonomously, without direct human intervention. An ML algorithm can identify and analyse patterns within data, aiming to forecast future decisions and outcomes based on that information. ML continuously evolves, incorporating new inputs into its decision-making framework, akin to human learning. The evolution of ML technologies presents numerous opportunities for librarians to employ these systems for the automated classification, labelling, and organization of information. Several of these opportunities will be examined in the chapters of this book, showcasing innovative methods to integrate machine learning and artificial intelligence into the practices of librarians. Just as Johannes Gutenberg's invention of the printing press transformed public access to information, artificial intelligence has similarly revolutionized the landscape. Today, search engines and algorithms serve as the modern equivalent of the printing press.

Librarians are distinctly equipped to address the challenges posed by artificial intelligence within their profession. Libraries have a long-standing history, having evolved alongside society for thousands of years, continuously modifying and enhancing their services to fulfil the informational requirements of their communities. In contemporary times, academic libraries have significantly broadened their digital resources, extending beyond mere access to electronic books and journal articles to also facilitate the discovery and utilization of software applications.

Background of Artificial Intelligence

Artificial Intelligence (AI) is not a recent development. It is often said that "it takes a long time to be an overnight success," and much of the foundational theory of AI was established by computer scientists like Alan Turing, Marvin Minsky, and John McCarthy over seventy years ago. The significant changes observed in the past decade pertain to access, speed, and availability. In the late 1950s, the concepts underlying machine learning were advanced by notable figures such as Arthur Samuel, who introduced the term "machine learning," and

Norbert Wiener, who is widely recognized as the father of cybernetics.In his 2011 essay titled 'Why Software is Eating the World,' Marc Andreessen articulates that "six decades into the computer revolution, four decades since the advent of the microprocessor, and two decades into the emergence of the modern Internet, all the necessary technology to revolutionize industries through software is now functional and can be delivered on a global scale," making it accessible and affordable for many.

Review of Literature

Over the past twenty years, artificial intelligence (AI) has significantly impacted the development of library services. AI is defined as "the capability of machines to perform tasks that would typically require human intelligence; it encompasses technologies utilized in library operations" (Jackson, 1985). The integration of artificial intelligence has become essential for enhancing organizational efficiency and productivity. The transformation brought about by AI technologies in various sectors, including libraries, is noteworthy in the twenty-first century. AI facilitates faster, more accurate, and more efficient workflows. The application of AI in library settings is still in its early stages (Cox et al., 2019; Hervieux and Wheatley, 2021). It holds substantial promise for improving access to information in fundamental ways, such as through advanced search capabilities, personalized recommendations, large-scale digital asset descriptions, transcription services, and automated translation. However, the incorporation of AI in libraries also raises several ethical dilemmas, with concerns that AI may ultimately supplant the roles of human librarians. This development could have significant implications for equity, diversity, and inclusion (EDI) within the profession.

Definitions of Artificial intelligence

Artificial intelligence as the development of machines to accomplish tasks and reproduce thought processes that are normally seen in humans; this simulation of intelligent behaviour is unique from other automation as it requires the computer to use human reasoning or thinking to perform tasks.

What is Artificial Intelligence?

The term "artificial intelligence is among those contemporary buzz words that have moved from the tech industry out into the everyday world, AI they are not a single technology, but rather a several collection so technologies with broad applicability in a variety of industries.

The Utilization of Artificial Intelligence (AI) Across Various Domains within the Library

- **Enhancing Resource Discovery and Accessibility:**

  AI-driven search engines possess the capability to comprehend intricate queries, resulting in more pertinent and customized outcomes. This advancement will alleviate user frustration and facilitate a smooth navigation experience through the extensive library collection.

- **Customized Recommendations:**

  AI algorithms can analyse user interactions to produce tailored recommendations, thereby introducing users to new and pertinent resources. This approach will broaden their intellectual perspectives and encourage deeper engagement with the library.

- **Task Automation and Workflow Optimization:**

  AI can take over repetitive tasks, allowing library personnel to concentrate on more impactful activities. This shift enables librarians to apply their expertise towards enriching the overall library experience.

- **Chatbots and Virtual Assistants:**

  AI-driven chatbots can deliver round-the-clock virtual reference services, providing immediate assistance to users. This ensures that patrons have access to support at any time and from any location.

- **Preservation and Archiving:**

  AI technology can evaluate images of library materials to detect signs of deterioration, facilitating timely interventions and preventive actions. This capability will help protect the library's invaluable collection. Example. Using AI to monitor temperature, humidity, and light levels of preserve rare manuscripts and books.

- **Ethical Considerations and Promoting Equitable Access:**

  The deployment of AI must be accompanied by a thorough examination of ethical issues, including data privacy, algorithmic bias, and equitable access. Libraries must ensure that

AI tools are utilized responsibly, avoiding discrimination or bias in resource recommendations and service delivery.

- **Security and Surveillance:**

AI can detect and prevent fraud and resource misuse by monitoring user behaviour for unexpected patterns. AI-powered surveillance systems improve library security by identifying and alerting users to potential hazards.

Conclusion

Artificial intelligence applications in libraries are transforming the way libraries operate, interact with patrons, and manage their collections. From enhancing user experience with personalized recommendations to streamlining internal operations with automation and predictive analytics, AI offers numerous benefits for modern libraries, helping them become more efficient, accessible, and user-friendly and AI also improving user experience and revolutionizing a more precise and well -organized library system and saves librarians important time spent on intellectually stimulating tasks, large volumes of data may be efficiently analysed by AI-driven users to retrieve information. Additionally, Artificial Intelligence play key role in customizing library services.

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Artificial Intelligence in Libraries: Present and Beyond

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Abstract

The integration of artificial intelligence in libraries could have a plethora of benefits to its clientele in terms of optimizing the library operational process of information seeking behaviour and retrieval. The revolution of artificial intelligence has its potential to impact information professionals, library operations, user services and library analytics. This paper aims to discover the applications of artificial intelligence in libraries and also to enlist the AI tools that can be adapted in the library for the favourable outcome of the systems and services. It discusses the library operations and services where integrating with artificial intelligence can streamline processes more efficiently and also addressing the pros and cons of adapting artificial intelligence in libraries. The paper would overview the successful case studies of AI implementation in libraries globally envisioning the futuristic scope of artificial intelligence in the library fraternity. By leveraging Artificial Intelligence, libraries can amplify its impact, expand its reach and enrich its services.

Keywords: Artificial Intelligence, AI in Libraries, AI Tools, Impact of AI

Introduction

According to UNESCO (2022), Artificial Intelligence is the machines that imitate some smartest features of human intelligence, such as perception, learning, reasoning, problem solving, language interaction and creations. In our daily routine, Artificial Intelligence revolutionizes the digital age with most of the computer systems and mobile phones being developed with AI features and is lesser known to people that they are intelligent machines. Some examples of Artificial Intelligence include speech recognition, natural language processing, self-driving, robotic and so forth. There are different types of Artificial Intelligence: *Reactive AI, Limited Memory AI, Theory of Mind AI* and *Self- Aware AI*. Reactives AI is capable of reacting to certain situations but doesn't possess any storing of memory, past experiences or the ability to learn from them. Example, Google Translate with Voice Recognition, Playing Chess games with computerised opponents having AI qualities

are the forms of Reactive AI. Limited Memory AI explores past experiences to make better decisions and predict the most possible future outcomes. The best example could be chatbot which suggests or predicts the nature of questions asked based on the former history of investigation. Theory of Mind AI is designed in such a way to understand human emotions, beliefs and intentions and react similarly to the retention of a human being. This AI is still in the development stage. Self-Aware AI is the AI that can recognise their consciousness and understand their surroundings. This AI category will be the game-changer of the future generation as it can be substituted in the place of human beings.

The prime areas where Artificial Intelligence technologies can revolutionize will be Healthcare and Education. In terms of health care, AI can analyse Advanced Diagnostics using medical images and data to detect diseases and conditions with greater speed and accuracy. AI powered robots can prescribe performing Complex surgeries with precision and accuracy reducing the possibility of human error and complications. AI powered systems can track health indicators and provide personalized care to seniors and thereby periodic monitoring of their health with a suite of AI enabled applications emphasizing real-time, enabling preventive care and timely care delivery.

With respect to revolutionizing education with AI, the future of the education industry can be overturned with the integration of AI technologies in the activities of academia. For instance, AI can personalize adaptive learning experience and adapt it to each student's needs thereby increasing academics engagement and retention. Interactive voice-enabled assistants such as Alexa, Siri, and Google can answer student queries automatically and support faster feedback loops between teachers and students. Interestingly, AI algorithms can analyze student work and provide instant grading and feedback, reducing the workload on teachers and providing more time for personalized instruction.

Artificial Intelligence in Popular Culture

Artificial Intelligence has come a long way since the term was first coined. Science enthusiasts from various industries have integrated the scientific invention of AI with their mundane works. One such industry that got widespread recognition and was widely impacted with AI was the Media Industry. Unlike any other industry, the role of media in projecting the novel innovative inventions in unique representations have grabbed the attention of the public and that way, it created an awareness of how the science world has reached and is reaching breaking the traditional bounds. Tamil movies like *Jeans (1998), Enthiran (2010), Enthiran 2 (2018) and Google Kuttappan (2022)* fascinated the filmmakers and audiences

alike and have brought light on how the implication of AI technologies and its integration in humanoids/machines can positively and negatively impact society. In the International Media context, from *Metropolis (1927) to Star Wars (1977)*, robots have been paving the way to the creation of artificial intelligence stories. In the sitcom *The Jetsons (1967),* the makers introduced the audience to the world's first AI character portrayed as a human-like domestic servant called Rosie.

Objectives

This paper aims to discover the applications of artificial intelligence in libraries and also to enlist the AI tools that can be adapted in the library for the favourable outcome of the systems and services. It discusses the library operations and services where integrating with artificial intelligence can streamline processes more efficiently and also addressing the pros and cons of adapting artificial intelligence in libraries. The paper would overview the successful case studies of AI implementation in libraries globally envisioning the futuristic scope of artificial intelligence in the library fraternity

Artificial Intelligence in Libraries: Pros and Cons

Libraries are constantly evolving and AI systems are helping to provide solutions to long standing issues. Libraries are more than just repositories for books; they serve as knowledge hubs for communities. From cataloguing to staffing, libraries face a range of challenges in meeting the needs of their patrons. The development of AI technologies has opened up new opportunities for libraries to revamp and innovate their services in alignment with modern day information seeking behaviour.

The advantages of AI Applications are that it can free up staff time for more specialised or interactive services to library patrons enabling a more efficient use of library space and resources. It can help to create personalized borrowing recommendations, improve reference services and offer a better user experience for library patrons and attempts to improve the accessibility of all library collections, regardless of language or format and make library systems more inclusive and accessible for differently abled patrons.

There are also some setbacks in implementing AI in libraries. Firstly, Access to AI technology poses a major challenge as not all libraries have access to financial and technical resources to implement and leverage AI technologies effectively. Secondly, Artificial Intelligence thrives on data and libraries, therefore, need to ensure data collected and managed with fairness, accuracy, inclusiveness and transparency. Appropriate training to library professionals is essential to understand, implement and operate AI systems effectively

and cope with newer advances. The advent of Artificial Intelligent can also lead to a shift in the skill sets required for the functioning of libraries and their changing roles.

Application of Artificial Intelligence in Library Services

Artificial Intelligence (AI) is revolutionising libraries and changing the way they serve their patrons. It represents a major shift in library services and offers many advantages over traditional methods with the characteristics of efficiency, precision and personalisation. It has the potential to improve and automate many library tasks such as cataloguing, stock taking and database searching. AI tools can provide more accurate and relevant search results, reducing the need for manual curation and saving time. Artificial Intelligence can help libraries to make recommendations to patrons based on their interests and reading patterns, improving the quality of service.

Effective use of AI in libraries requires careful planning and preparation. *Staff Training:* Staffing of AI deployment through training programs and workshops that teach them how to use the new systems. *Infrastructure:* Ensuring that the library has an up-to-date IT infrastructure with the necessary hardware and software to support AI systems. *Data Privacy:* Ensuring that data privacy regulations are followed and developing policies and procedures for the handling of personal data.

Artificial Intelligence Tools for Patron Services

Artificial Intelligence can improve the quality of patron services in libraries with the following adoption of various tools:

a. *Chatbots:* AI-powered chatbots can be used to provide real-time assistance to patrons, answering their questions and providing guidance.

b. *Virtual Assistants/Recommendation Systems:* AI-powered recommendation systems suggest books, articles and other materials to patrons based on their previous search borrowing history.

c. *Accessibility Tools:* AI can be used to create accessibility tools for differently abled patrons such as text-to-speech systems and voice recognition software.

d. *Augmented Reality:* AR can be used to create interactive and immersive experiences for patrons such as virtual book displays or tours of the library.

Future of Artificial Intelligence in Libraries

Artificial Intelligence tools offer many advantages for collection management in libraries and have the potential to transform the libraries of the future.

- AI Personal Assistants: Library Personal AI Assistants will provide instant support to library patrons and will support various modes of communication, including voice, chatbots and text messaging.
- Smart Libraries: AI- powered smart libraries will evolve to be more self-sufficient in managing and maintaining library resources, supporting the librarian's work, analytics and automation.
- Innovative Services: Artificial Intelligence will enable new library services to be developed and refined that will reduce the workload of librarians and improve the user experience, satisfaction and community engagement.

Success Case Studies of Artificial Intelligence Implementation in Libraries

Many libraries have started adopting Artificial Intelligence successfully. Some of the success stories of AI in serving to its clientele include:

Library of Congress

The organisation uses Artificial Intelligence to digitise its collections and improve the quality of user search experience. This resulted in high levels of user engagement and increased usage of library services.

Manchester City Library

The library uses Artificial Intelligence enabled Chatbots to provide real-time assistance to patrons that enables enhanced user satisfaction levels and a reduction in staff workload.

Princeton University Library

The university library implemented an AI system that predicts user demand for materials and highlights areas for collection development. This resulted in better resource management and improved patron information seeking behaviour.

Call for Action

Necessity of Integrating Artificial Intelligence in Future Library Services

There should be a universal global call for library and information professionals to mind and be prepared to disseminate various information services using AI in align with scope of the future. By embracing library services via AI, the library users can get hold of self-determined information retrieval, personalized recommendation of library resources and customising technologies as to the cater of different users. The discussion and policy-making on the transitive library services through artificial intelligence by Library and Information experts could redefine the shaping of present libraries and can resolve various issues concerning its

efficacy, inclusiveness and dynamicity of Artificial Intelligence overshadowing the future libraries.

Conclusion

Artificial Intelligence has the potential to enhance human capabilities, create value and solve complex problems. It is crucial to adopt a human-centered approach to AI development and deployment ensuring transparency, accountability and social responsibility. While there are potential risks and challenges, AI has the potential to drive positive change in a wide range of domains and shape a more prosperous and sustainable future.

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Innovative AI Tools for Systematic Reviews in Health Science Libraries: Opportunities and Challenges

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Abstract

Systematic reviews are crucial in synthesizing research evidence for informed decision-making in health sciences. The volume of biomedical literature has been increasing over the years, and this has necessitated the use of Artificial Intelligence (AI) tools to enhance the efficiency and accuracy of systematic reviews. This paper explores various AI-driven tools for literature screening, data extraction, citation management, and quality assessment. It emphasizes the advantages of increased scalability, facilitates more collaboration, and offers superior search capabilities. Yet, it raises concerns about technological hurdles, training requirements, data privacy issues, and some ethical dilemmas. The article investigates the involvement of health science libraries in AI implementation, the best practices for introducing AI tools in library services, and improvements in research support services by using AI technologies for promoting evidence-based practice.

Keywords: Systematic reviews, AI tools, Health science libraries, Evidence-based practice, Research support

Background

Systematic reviews are very vital in health sciences as they take existing research evidence and synthesize it to assist in clinical decisions, public health policies, and future research areas(Shaheen et al., 2023). Unlike conventional narrative reviews, systematic reviews observe a rigorous methodology that is always transparent to the reader, such that the result of the studies is reliable, reproducible, and free of bias(Linnenluecke et al., 2020). Systematic review usually encompasses several key stages, such as formulating a research question, comprehensive literature search, study selection based on predefined criteria, data extraction, quality assessment, and synthesis of findings(Kabir et al., 2023). Given the complexity and time-intensive nature of

systematic reviews, researchers often seek support from health science libraries, which serve as essential partners in facilitating the process(Snyder, 2019).

Health science libraries have been advocating for systematic reviews for a long time(Pawliuk et al., 2024). They have delivered a number of services ranging from the development of search strategies, access to comprehensive databases, reference management guidance, and the proper use of reporting guidelines(Page et al., 2021). Librarians mainly, especially health sciences librarians, contribute by leveraging their expertise in information retrieval and bibliographic management. The rising volume of biomedical literature makes it challenging for researchers and librarians. The publication of thousands of articles annually in health-related disciplines makes manual systematic reviews very time-consuming, making the need for efficient methods for handling and analyzing vast amounts of data very essential(Dash et al., 2019).

Emergence of AI in Research Support

Artificial Intelligence (AI) has revolutionized many fields to become a more transformative technology in today's world-whether it's healthcare, education, or any other field-related research. This technology has many potential applications and can be made use of with regard to accelerating and streamlining various stages in the systematic reviews process. Literature screening, data extraction, and sometimes even quality assessments can be conducted using AI-facilitated tools that harness machine learning and natural language processing. By reducing the time required for these tasks, AI tools improve not only the efficiency of systematic reviews but also the accuracy by eliminating human errors.

One of the important areas where AI has been proved to be helpful is in screening articles. Generally, researchers manually go through hundreds of abstracts and full-text articles to find those studies that include the inclusion criteria. AI tools trained on vast data can help them quickly identify the relevant studies against predefined criteria. This helps save a lot of time for the researcher. Furthermore, AI-based text mining and data extraction tools can be used to help in the identification of key data points from selected studies, thus accelerating the synthesis process.

There are challenges in applying AI in systematic reviews. Algorithmic transparency, data privacy, and the bias of AI-driven tools are just some of the issues that must be addressed to make AI-assisted systematic reviews reliable and reproducible. In addition, the successful integration of AI into health science libraries requires training librarians and researchers in its use as well as investing in the required technological infrastructure. Despite these challenges, the

advantages in terms of saving time, scale, and improving accuracy that can be accrued make AI a very viable solution for this problem, with the growing demands placed on systematic reviews in health sciences(Adewale et al., 2024).

Objectives of the study

- To seek creative AI tools, which can assist in various systematic review stages from literature screening through extraction and synthesis up to health science research.
- Evaluating efficiency and accuracy from the impact perspective of AI regarding streamlining systematic reviews and reducing effort and time put forth by both researchers and librarians.
- To identify opportunities for health science libraries in adopting AI technologies to enhance research support services and better assist researchers in conducting systematic reviews.
- To analyze the challenges associated with AI adoption, including technological barriers, ethical concerns, training needs, and potential biases in AI-driven tools.
- To provide recommendations for effective AI integration in health science libraries, focusing on best practices, capacity-building, and strategies for overcoming identified challenges.

Understanding Systematic Reviews

Definition and Purpose

A systematic review is a scientifically rigorous research methodology designed to systematically synthesize all available evidence on a specific research question in a transparent, reproducible, and unbiased way(Ahn & Kang, 2018). Unlike a narrative review that gives a general overview of the topic based on selected studies that are not put together with any predefined method, systematic reviews do this in a structured way that ensures the validity of the inferences drawn(Paré &Kitsiou, 2017).

Development of the Systematic Reviews
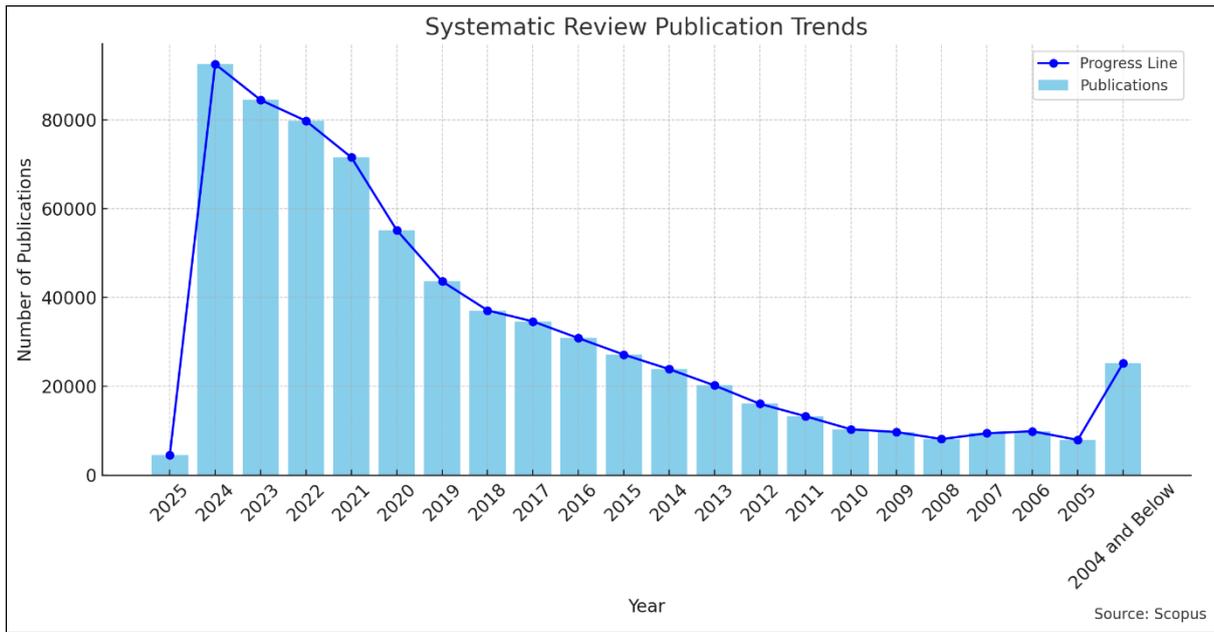
Figure 1: Systematic Review Publication Trends

1. Early History of Systematic Reviews

The first systematic review was published in 1889. In the early 20th century, systematic reviews were not common since the methodology was not yet widely recognized in academic research. Only a few systematic reviews were conducted during the following decades, mainly in specialized fields.

2. Slow Growth Until the 2000s

From 2004 and down, the overall number of systematic reviews was quite low, totaling 25,230 publications. It reflects a low growth because there was not much adoption of systematic review methodology in earlier years. The growth is steady from this period as evidence-based medicine and policy-making became increasingly important.

3. Rapid Increase Post-2010

A significant increase in the number of systematic reviews is observed starting in **2010**, with the publication count rising sharply year by year. The total number of publications in **2010** was **10,334**, and it continued to grow steadily:

- **2015:** The publication count reached **27,135**, reflecting a growing acceptance of systematic reviews as a standard research methodology.
- **2020:** The trend shows a major spike, with **55,127** publications, almost doubling within five years.

This surge can be linked to the increasing demand for high-quality synthesized evidence across multiple disciplines, especially in health sciences, where systematic reviews inform clinical guidelines and healthcare policies.

4. Peak in 2024

The highest number of systematic review publications was recorded in **2024**, with a staggering **92,508** publications. This peak likely corresponds to:

- The rise in global research activity, partly driven by the COVID-19 pandemic, which increased the need for rapid evidence synthesis.
- The availability of advanced tools and AI-driven platforms that facilitate the systematic review process, significantly reducing the time and effort required for conducting reviews.

Systematic Reviews vs. Narrative Reviews

Systematic Reviews:

- Follow a predefined protocol and a strict methodology.
- Aim to minimize bias by conducting a comprehensive and exhaustive search of the literature.
- Include explicit criteria for study selection, data extraction, and synthesis.
- Are highly regarded for their reliability in evidence-based healthcare and policy-making.

Narrative Reviews:

- Offer a broad overview of a topic but are less structured and prone to selection bias.
- Do not typically follow a strict methodology for literature search and study selection.
- Are more appropriate for summarizing existing knowledge on broad topics but less suitable for informing clinical guidelines and decision-making.

Key Steps in Conducting a Systematic Review

1. **Formulating a Research Question:** The review begins by clearly defining a focused research question, often framed using the PICO (Population, Intervention, Comparison, Outcome) model.

2. **Comprehensive Literature Search:**A systematic and exhaustive search of multiple databases (e.g., PubMed, Scopus, Web of Science) is conducted to identify all relevant studies, ensuring that no significant research is omitted.

3. **Screening Studies:**Identified studies are screened based on predefined inclusion and exclusion criteria. This involves reviewing titles, abstracts, and full texts to select studies that meet the criteria.

4. **Data Extraction:**Data from the selected studies are systematically extracted using standardized forms to ensure consistency. Extracted data typically include study characteristics, outcomes, and key findings.

5. Quality Assessment:The methodological quality of the included studies is assessed using standardized tools (e.g., Cochrane Risk of Bias Tool) to ensure that only high-quality evidence is synthesized.

6. Data Synthesis:The extracted data are synthesized, either narratively or quantitatively (meta-analysis), to draw overall conclusions and answer the research question.

Role of Health Science Libraries

Health science libraries play a significant role in the systematic review process as they provide access to resources, expertise, and infrastructure that the researcher needs in the course of the review process. Their participation greatly improves the quality and effectiveness of systematic reviews.

Traditional Support Offered by Health Science Libraries

Database and Resource Access: Health science libraries offer researchers easy access to databases, journals, and other resources for conducting comprehensive literature searches.

Search Strategy Training: Librarians help the researcher in the development of a good and intricate search strategy tailored to the database's unique structure and indexing system to ensure that the search is comprehensive and accurate.

Training and Workshops: Libraries usually host training sessions and workshops on systematic review methodologies, literature searching techniques, and reference management for the building of competencies of researchers.

Librarian's role in Systematic Reviews

1.Literature Searching: Information- retrieval librarian librarians make a contribution by performing or aiding literature searches; these searches ensure that the search strategy is comprehensive and well documented, facilitating the reproducibility of results.

2. Ref Management: In systematic reviews, effective reference management is crucial. librarians guide researchers on the use of reference management tools, such as EndNote, Zotero, to manage their citations and simplify the review process.

3.Maintenance of Methodological Rigor: Librarians contribute to maintaining the methodological rigor of systematic reviews by advising on best practices for documentation, adherence to reporting guidelines (e.g., PRISMA), and proper citation management.

4.Co-authorship in Writing Protocols: In many cases, librarians co-author systematic review protocols and papers, especially in sections related to search strategies and methodologies, to ensure accuracy and completeness.

Health science libraries have become an integral part of the systematic review process through their specialized services and trained professionals. With the adoption of emerging technologies such as AI-driven tools, they can further enhance their role in making systematic reviews more efficient and accessible to the research community.

3. Overview of AI Tools for Systematic Reviews

3.1 Categories of AI Tools

AI tools have transformed the systematic review process by automating various stages, including literature screening, citation management, data extraction, and quality assessment. These tools improve efficiency, reduce manual workload, and help manage the vast volume of scientific literature more effectively.

3.1.1 Literature Screening Tools

Literature screening is the most time-consuming and critical step in systematic reviews, which is essentially identifying the relevant studies from a huge list of search results. AI-driven literature screening tools make use of machine learning algorithms to assist researchers in the study selection process by predicting the relevance of articles based on predefined criteria. These tools help save time that would otherwise be spent on manual screening and focus the researcher's attention on high-priority articles.

Examples of AI-driven Literature Screening Tools:

- Covidence: Online tool streamlining the screening process. It accelerates title/abstract and full-text screening.

- DistillerSR: This is a widely used AI-based tool for screening and data extraction among researchers and librarians.

- Rayyan: Free, web-based tool. Machine learning will assist in systematic review screening. Collaboration features are very powerful.

- ASReview: Open-source tool. It utilizes active learning to prioritize relevant studies during the screening process.

- EPPI-Reviewer: A flexible tool supporting AI-assisted systematic reviews, offering advanced screening and data analysis features.

- JBI Sumari: A comprehensive tool developed by the Joanna Briggs Institute for systematic review management, including screening.

- PICO Portal: It is also designed to assist in evidence synthesis by using AI to streamline the study screening and data extraction process.

- CADIMA: This tool is an open-access tool that offers AI-supported systematic review management and literature screening.

- The Litsuggest: This is a machine learning tool that automatically provides suggestions for relevant studies in systematic reviews.

3.1.2 Automated Citation and Reference Management

Efficient citation and reference management are integral parts of systematic reviews. AI-driven tools in this category automate citation management tasks, ensuring accurate referencing and reduplication of sources.

•Examples of AI-powered Citation and Reference Management Tools:

- EndNote: A widely used reference management tool with AI capabilities for automatic citation formatting and duplicate detection.

- Zotero with AI-powered add-ons: The Zotero not only supports automated citation management but also integration of a bibliographic database, and all this is made possible due to the presence of AI-powered add-ons.

3.1.3 Data Extraction and Text Mining Tools

Data extraction is one of the essential steps in synthesizing evidence from included studies, and AI, therefore, can be used for automating data extraction through various NLP algorithms and for text mining.

•Examples of AI-powered Data Extraction and Text Mining Tools:

- RobotReviewer: An AI-driven tool that automates data extraction and risk of bias assessment, supporting faster evidence synthesis.

- Abstrackr: A free, web-based tool that uses machine learning to assist in screening and data extraction by predicting study relevance.

3.1.4 Quality Assessment Tools

Quality assessment of included studies is required to make sure that only high-quality evidence contributes to the synthesis. AI tools in this category help with bias detection and quality evaluation of studies, usually through semi-automated methods.

• Examples of AI-powered Quality Assessment Tools:

Tools embedded in platforms like RobotReviewer and DistillerSR can help in semi-automated quality assessment and risk of bias analysis.

3.2 Key Features and Functions of AI Tools for Systematic Reviews

AI-driven Search Strategy Refinement

AI tools help in refining the search strategy by providing relevant keywords, synonyms, and subject headings based on previous searches and user input. This way, the search is comprehensive, and all relevant studies are retrieved.

Machine Learning Models for Study Inclusion/Exclusion

Active learning-based machine learning models are widely used for prioritizing and predicting study inclusion or exclusion. These models learn from user feedback during the screening process and improve accuracy over time, significantly reducing the manual workload.

Natural Language Processing (NLP) for Data Extraction

NLP algorithms allow AI-powered tools to make sense of and extract structured data from unstructured text found in research articles. This, in turn, allows for the automated extraction of such key information as study characteristics, outcomes, and results, thereby accelerating and increasing the reliability of synthesis.

This overview categorizes AI tools on the basis of their functions, thus underlining the transformative power of AI for systematic reviews. Such tools streamline the process while

offering new opportunities for more accurate, efficient, and scalable synthesis of evidence within health science libraries.

4. Opportunities of AI in Systematic Reviews

4.1 Efficiency and Time Savings

One of the biggest opportunities offered by AI to systematic reviews lies in the efficient enhancement of how reviews are prepared, reducing their preparation time significantly. Traditional systematic reviews take several months or even years in the process as literature screening and data extraction or synthesis require quite an effort on the part of researchers. In such a way, AI automates repetitive steps that help them concentrate on more essential analytical aspects.

•**Faster selection of studies for review and extraction of data**: Screening tools driven by AI can rapidly scan and classify thousands of articles, prioritizing those that fit the inclusion criteria. Moreover, AI-driven tools for data extraction, such as RobotReviewer and Abstrackr, automatically extract key information from studies, which reduces the time needed to perform this step, thereby shortening the overall systematic review timeline and making it feasible to conduct more frequent updates of evidence.

4.2 Improved Accuracy and Consistency

Systematic reviews are highly susceptible to human errors, mainly during the literature screening and data extraction phases. Errors in systematic reviews may arise from factors such as fatigue, subjective bias, and inconsistency in judgment and observation among reviewers.

• **Reduces Human Mistakes in Screening and Extraction:** AI tools address the issues of this nature because it applies a consistent set of criteria during review. In contrast, human reviewers will easily fall victim to fatigue. Machine learning models will keep on getting better since more data is introduced during training; this will yield improved accuracy of finding the right study for extraction purposes.

4.3 Scalability

Scientific literature is now being produced exponentially, and thus the handling of large datasets in systematic reviews is becoming a challenge. The use of AI provides a scalable solution to this problem and enables researchers to handle and analyze large amounts of data that otherwise would be impossible to handle manually.

•**Handling Large Datasets:** With AI tools, researchers can efficiently screen and process large datasets without a corresponding increase in workload. Tools like Rayyan and EPPI-Reviewer are specifically designed to support large-scale systematic reviews by leveraging AI for rapid

screening and prioritization. This scalability enables researchers to conduct comprehensive reviews across multiple disciplines and databases.

4.4 Enhanced Collaboration

Research teams and librarians often join forces in conducting systematic reviews. AI assistants like these tools enhance collaboration by streamlining the workflow to allow real-time sharing of progress and results.

•**AI Tools That Support Collaborative Work:** Many AI-driven systematic review platforms, such as Covidence and DistillerSR, are cloud-based and support multi-user environments. Team members can thus work remotely, track each other's progress, and maintain version control. This greatly improves efficiency and coordination, particularly for large, multi-institutional review teams.

4.5 Advanced Search Capabilities

Systematic reviews are crucial in developing a comprehensive and effective search strategy. AI tools assist in creating complex search strategies with the identification of relevant keywords, synonyms, and subject headings that may be overlooked by researchers.

• **AI-facilitated Development of Sophisticated Search Strategies**: The AI-assisted search refinement tool analyzes initial results and modifies it in order to make it sensitive yet specific. Therefore, the relevant studies are searched with minimal number of irrelevant ones. Also, there are some AI tools that do a semi-automatic search across a database, and the time it would take otherwise for the overall retrieval of literature.

5. Challenges of Using AI Tools in Health Science Libraries

5.1 Technological Barriers

Technological barriers are one of the main challenges in adopting AI tools for systematic reviews in health science libraries. AI tools are often associated with significant financial and infrastructural requirements, which make them challenging to implement in resource-constrained environments.

•**Expensive AI Tools and Software:** Many advanced AI tools like Covidence, DistillerSR, and EPPI-Reviewer come with expensive subscriptions and licensing fees. Such costs are quite challenging for smaller libraries or institutions with tight budgets to accommodate such technologies on a large scale.

•**Strong IT Infrastructure:** AI tools require robust IT infrastructure, which comprises superfast internet connectivity, high-end computers, and secure cloud storage. In some developing

countries or communities, necessary infrastructure may not be available to allow the integration and working of AI-powered platforms efficiently.

5.2 Training and Skill Gaps

For AI tools to be successfully implemented in systematic reviews, a skilled workforce should be used with these technologies. However, many librarians and researchers may not possess the level of technical experience that can be used to fully exploit AI tools.

•**Health science librarians have a key role in facilitating systematic reviews**. The effective use of AI-driven tools, however, calls for further education in topics like machine learning, data management, and complex search strategy design. In the absence of adequate training, librarians are less likely to use these tools and, therefore, cannot reap the full benefits they offer.

Need for Ongoing Professional Development: As AI tools continue to evolve, there is a need for ongoing training and professional development programs to keep librarians updated on the latest advancements. Institutions must invest in regular workshops, online courses, and certification programs to bridge the skill gap.

5.3 Data Privacy and Security Concerns

Health sciences systematic reviews usually involve handling sensitive and confidential data, especially when dealing with patient records, clinical trials, and unpublished studies. The use of AI tools raises concerns about data privacy and security.

•**Handling Sensitive Health Research Data**: Most AI tools operate on cloud-based platforms, which introduces risks of data breaches and unauthorized access. Sensitive health data must be protected, and libraries must ensure that they have strong data privacy policies in place and use tools that are compliant with data protection regulations, such as the General Data Protection Regulation (GDPR).

•**Trust in Cloud-Based AI Solutions**: Cloud-based AI tools may store data on servers located in different jurisdictions, raising legal and compliance concerns. Libraries need to assess the data handling practices of AI tool providers to ensure that data privacy is maintained.

5.4 Algorithm Bias and Limitations

AI tools are only as good as the algorithms powering them. Algorithms can be biased, or even incomplete or unrepresentative datasets could be used to train them. This leads to skewed results affecting the quality of systematic reviews.

•**Biases in the Algorithms of Machine Learning**: Both AI and ML utilize a series of algorithms in which there can be biases with regard to the foundational data. For example, when studies from developed countries have mostly been considered for training an AI tool, then it may leave

out findings from low- and middle-income regions, which skews or partially in incomplete systematic reviews.

•**Limitations in Analyzing Complex Contexts**: A good AI application may have immense capacity to hold large data for processing and repetitive automatic tasks but possibly lack human judgment to reach nuanced decisions at times. AI might wrongly disqualify pertinent studies based on the subtleness of contextual pertinence and not according to a human analyst.

6. Best Practices for AI Adoption in Health Science Libraries

6.1 Building Technical Capacity

The successful adoption of AI tools in health science libraries is contingent upon building the necessary technical capacity among library staff. Librarians must develop a solid understanding of AI technologies, their capabilities, and their limitations to effectively support researchers in conducting systematic reviews.

Recommendations for Training Programs:

- Organize specialized workshops on AI-driven systematic review tools focusing on key functionalities such as literature screening, data extraction, and quality assessment.
- Introduce widely adopted AI tools, such as Covidence, DistillerSR, and Rayyan, that allow hands-on training in librarianship.
- Collaborate with external experts in order to offer advanced training in areas such as machine learning, natural language processing, and data privacy.
- Online certifications should be encouraged for librarians on AI-related subjects, such as data science and information retrieval.
- Provide internal knowledge-sharing platforms so that more experienced staff can mentor others while sharing best practices in using AI tools.

6.2 Collaboration with Researchers and IT Teams

Collaboration between librarians, researchers, and IT teams is essential to ensure the seamless integration of AI tools into the library's workflow. Effective collaboration helps in identifying user needs, customizing AI solutions, and maintaining robust technical infrastructure.

- **Ensuring Successful Integration of AI Tools:**

1. **Involve researchers and librarians** in the selection and customization of AI tools to ensure that they meet the specific requirements of systematic reviews.

2. **Work closely with IT teams** to establish the necessary infrastructure, including secure cloud storage, high-speed internet, and reliable computing systems.

3. **Create interdisciplinary task forces** comprising librarians, researchers, and IT professionals to oversee the implementation and monitoring of AI tools.

4. **Foster a feedback loop** where researchers can provide input on their experience with AI tools, enabling continuous improvement.

5. **Develop collaborative protocols** for AI-assisted systematic reviews, ensuring that all stakeholders are clear about their roles and responsibilities.

6.3 Evaluating and Selecting AI Tools

Given the wide range of AI tools available for systematic reviews, selecting the right tool based on the library's needs and resources is critical. A well-defined evaluation process helps in choosing tools that offer maximum value.

- **Criteria for Selecting Appropriate Tools Based on Library Needs:**

Functionality and Features: Ensure that the tool supports key functions such as literature screening, data extraction, quality assessment, and citation management.

Ease of Use: The tool should have an intuitive interface and minimal learning curve to enable quick adoption by librarians and researchers.

Integration Capabilities: Check whether the tool integrates seamlessly with existing library databases, reference management systems, and research workflows.

Scalability: Select tools that can handle large datasets and support multi-user collaboration for large-scale systematic reviews.

Cost-Effectiveness: Evaluate the cost of licensing, maintenance, and training, and assess whether the tool provides a good return on investment.

Data Security and Privacy Compliance: Ensure that the tool complies with data protection regulations (e.g., GDPR) and has robust data security measures.

Vendor Support and Updates: Choose tools from vendors with a track record of providing regular updates, user support, and technical assistance.

Conclusion

AI tools have paved the way towards a new beginning for systematic reviews of health sciences - an unparalleled effort to improve its efficiency, precision, and volume. By systematically automating and eliminating redundant routine tasks such as literature screening and data extraction of quality assessment tasks, AI tool has significantly managed to reduce more time

and manual effort for preparing systematic reviews against the growing demand of scientific literacy. Moreover, AI-based tools have brought advanced search capabilities, improved consistency by minimizing human error, and facilitated better collaboration among researchers and librarians. These advances highlight the potential of AI to transform systematic reviews.

As health science libraries continue to evolve, their role in research support is expanding beyond traditional services. With the adoption of AI tools, libraries are becoming key facilitators of advanced research processes, helping researchers conduct more robust and timely systematic reviews. Librarians, as information experts, will play an increasingly critical role in guiding researchers on the effective and ethical use of AI tools. This role shifting reflects the direction toward capacity-building within libraries themselves-technical capacity in terms of skills, the updating of necessary infrastructures, and development of best practices for carrying out AI-assisted research.

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Application of Artificial Intelligence in Library and Information centre: A study

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Abstract

Artificial intelligence (AI) has brought about new prospects for increasing research in all the fields. The Library & Information science is not behind. Artificial intelligence (AI) is one of the emerging trends and applications of computing in libraries. The presence of Artificial intelligence (AI) technologies in all spheres of work has made the future promising. The application of AI has contributed immensely to the provision and use of library information resources and service. This article aims to explain the concept of the Artificial intelligence (AI) tools and use of AI in the libraries. This study has covered the various AI tools & Applications in libraries of AI tools is also explained in this paper. This paper is useful to researchers, LIS students, and LIS professionals, etc. Artificial intelligence (AI) is revolutionizing library services and enhancing user experience, creating a new technology era of efficiency, accessibility, and innovation.. The AI' is most notable contribution to libraries in the automation of routine tasks, cataloguing and organizing; librarians can now rely on AI algorithms to streamline.

Keywords: Artificial Intelligence (AI), Machine learning, Library services, Expert system, Robotics, ChatGPT

Introduction

Libraries are considered as serviceoriented organizations and academicknowledge hub of the higher educational institutions that have evolved in the era of information technology. Over the past decade, the integration of emerging technologies such as the Internet of Things (IoT), Artificial intelligence (AI), Big data, Cloud computing, RFID technology, and Virtual reality has transformed libraries into intelligent spaces. This technological revolution has enhanced the physical space, information resource organization, service modes, and management methods in libraries. Smart libraries aim to provide better, more effective services, create an engaging environment for knowledge connection, and develop diverse areas for information exchange. Examples of smart library applications include 24/7 self-

borrowing and returning systems, mobile phone self-renewal systems, intelligent inventory/positioning systems, intelligent seat reservation systems, and 3D navigation systems.Artificial intelligence (AI) is a set of technologies that enable computers to perform a variety of advanced functions, including the ability to see, understand and translate spoken and written language,analyse data, make recommendations, and more.

The ever increasing expectations of library patrons/users have forced librarians to seek new and innovative technologies to maintain the user experiences of their libraries.The most recent innovations driven by digital technology encourages a new paradigm for education and research. These new technologies have transformed perspectives on education and the learning process.Libraries have been revolutionised by artificial intelligence (AI), which provides powerful tools that streamline operations, enhance the user experience, and optimize resource utilisation.Intelligence is the ability to think and learn facts and skills and also apply them when necessary. The prospect of developing computers or machines that perceive, learn, reason, and behavelike human beings has fascinated many people. Humans are born with an innate ability to perceive, reason/think and act, which develops and improves over time as a result of so many factors. Intelligence in humans is measured by the Intelligence Quotient (IQ) obtained through series of aptitude test focusing on different aspects of intellectual functioning. Similarly, developing intelligent computers that perceive, think and behave like humans is the crux of Artificial Intelligence. Intelligence in computers or machines depicts their ability to accomplish specific task in the presence of variability and monitor its environment and appropriately adjust its actions based on what it has sensed as prerequisites for intelligence. Intelligences in machines is an anthropomorphism in that intelligence is defined by the criterion that the actions would appear intelligent if a person were to do it (McGraw-Hill Encyclopedia of Science and Technology, 2007). According to Ex Libris (2019), intelligence in machines not only gives such devices the ability to learn but they are also configured to improve with use to perform functions better without being explicitly programmed because they are built to recognize and imbibe patterns efficiently on much higher scales than humans.

Concepts of Artificial Intelligence (AI)

The term artificial Intelligencewas first used in 1950s. Since then, scientists have been working to develop systems capable of performing tasks that required cognitive skills and

operating with some degree of autonomy. In recent years, however, something has changed. Whereas AI used to be the domain of scientists, enthusiasts and science-fiction lovers, the technology now speaks to the imagination of a wider audience. In other words, AI appears to have taken off, with irrevocable effects for society.

The sound of the term artificial intelligence often conjures images of robots or computers that talk. Artificial intelligence is an aspect of computer science that focuses on how computers learn (Machine Learning), interpret information, vision: character recognition, picture analysis, 3D perception, and modelling of the function of the eye; furthermore, it encapsulates speech recognition, speech production, understanding and use of natural language (Natural Language Processing), and Expert System which continues to gain more attention. Furthermore, artificial intelligence is the programming and development of computers to perform human required-intelligence task, such as speech recognition, decision-making, visual insight, language translation, talking and emotional feelings (Irizarry-Nones, Palepu& Wallace, 2017).According to Heath (2018), the artificial intelligence is the technology that enables machines be to have the abilities to plan, learn, reason, solve problems, move, and be creative to some extent.

All search engines for text, images and videos increase user expectations for presenting and manipulating information.Recent davances in language and platform development for example VRML, Java, OpenGL, and the provision of affordable high quality graphic workstations have also made visualization of information perspective in the field of research. Although artificial intelligence is a young discipline, it makes society beyond imagination
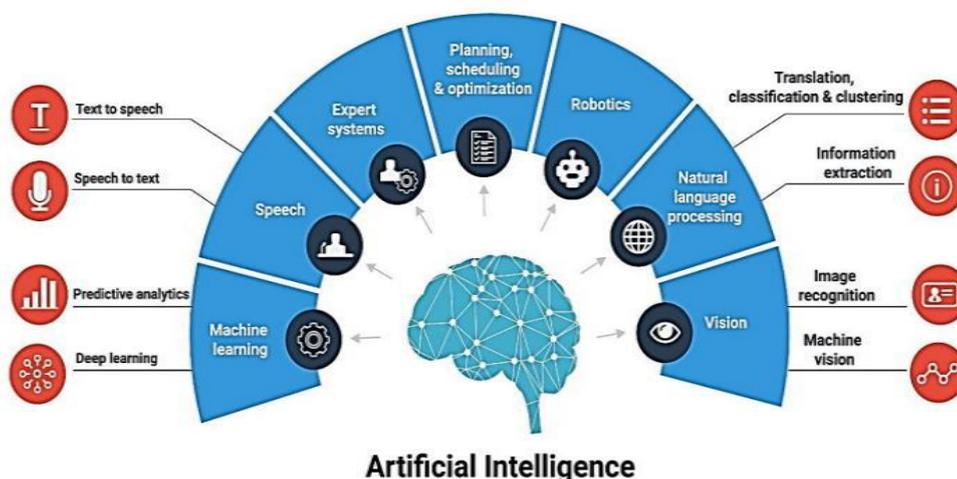

Artificial Intelligence

Figure 1 Pictorial diagram of AI Components

Artificial Intelligence (AI) Definition and Scope

Artificial intelligence is a field of science concerned with building computers and machines that can reason, learn, and act in such a way that would normally require human intelligence or that involves data whose scale exceeds what humans can analyze. AI is a broad field that encompasses many different disciplines, including computer science, data analytics and statistics, hardware and software engineering, linguistics, neuroscience, and even philosophy and psychology. On an operational level for business use, AI is a set of technologies that are based primarily on machine learning and deep learning, used for data analytics, predictions and forecasting, object categorization, natural language processing, recommendations, intelligent data retrieval, and more.

Artificial intelligence (A) has gone through periods of stagnation known as "AI winters" and is divided into two types: general AI, which aims to match human intelligence, and narrow AI, which is limited to specific domains **(House of Lords Select Committee on Artificial Intelligence, 2018).**AI is a broad concept encompassing the ability of computers to make rational decisions based on data and other observations. Machine learning and natural language processing are specific areas of AI development currently receiving significant attention. (House of Lords Select Committee on Artificial Intelligence, 2018)LeCun2, *et al.* define artificial intelligence (AI) as the ability of machines to perform tasks that typically require human intelligence, including visual perception, speech recognition, decision-making, and language translation, while Russell &Norvig (2010, p. 2) describe AI as a branch of computer science that aims to create intelligent machines capable of performing tasks requiring human-like cognitive abilities such as perception, reasoning, learning, decision-making, and natural language processing.

Objective of the Study

- ❖ To know the concept of Artificial Intelligence (AI)
- ❖ To aware of AI tools used in libraries
- ❖ Using AI tools in research.
- ❖ To identity features and use of AI tools.

 Literature Review

Poluru, 2024) found that widespread application within libraries with examples including expert systems for reference assistant, robots designed to assist with tasks like book sorting, and the integration of virtual reality for immersive learning experiences/ **(Chandrashekara & Mulimani, 2024)** examined that the main advancements, advantages, difficulties, and prospective effects of AI on LIS services, emphasizing how it might be used to improve information access and library operations for a range of user groups. **(Mali, 2023)** emphasized that the value of openness and responsibility in the use of Chat GPT and the necessity of continual assessment and development. **(Oseji&etal., 2021)** outlined the applications of AI, including subject indexing, collection development, technical services, reference services, and descriptive cataloguing. **(Ajakaye, 2021)** discussed about some of the elements of artificial intelligence (AI), the services that libraries can use it for, the advantages of using it, and the difficulties libraries have when implementing AI in their operations. **(Barki, 2022)** discussed the issues of implementing artificial intelligence (AI) in libraries, as well as robots, digital reality, and AI in libraries. **(Omame & Alex-Nmecha, 2020)** included virtual reality for immersive learning, robots that read books and shelves, and expert systems for reference, among other things. **(Vijay Kumar& Sheshadri, 2019)** discussed include speech recognition, image processing, natural language processing, robotics, expert systems, artificial neural networks, fuzzy logic, and others.

Importance of AI in Library & Information Centre

- ➢ Enhanced user experience through personalised services and recommendations.
- ➢ Improved efficiency by automating routine tasks like cataloguing and data management.
- ➢ Data analysis for informed decision-making and collection development.
- ➢ AI-powered content creation and curation for better discoverability and accessibility.
- ➢ Predictive analytics to anticipate user needs and trends.
- ➢ Text and data mining for research trend analysis and evidence-based decision-making.
- ➢ Accessibility for users with disabilities through AIpowered tools.
- ➢ Digital preservation automation for long-term resource accessibility.

> ➢ Collaboration and knowledge sharing through AIpowered chatbots and recommendation systems.

Application of Artificial Intelligence (AI)in Library &Information Centers

1. Elevating Resource Discovery and Access: Search engines with AI capabilities can comprehend complicated searches, producing more customized and relevant results. This will guarantee a smooth navigation of the extensive library contents and remove frustration.

2. Personalised Recommendations: Through the analysis of user behaviour, AI algorithms may provide tailored suggestions that introduce users to fresh and relevant content. Their perspectives will broaden as a result, and their interaction with the library will deepen.

3. Automating Tasks and Optimizing Workflows:AI may automate monotonous jobs, allowing library employees to concentrate on higher-value work. This gives librarians the freedom to commit their skills to improving the library experience.

4. **AI-powered chatbots and Virtual Reference Services:** Chatbots driven by AI have the ability to give customers round-the-clock virtual reference services and prompt support. This guarantees that customers may get help whenever and wherever they need it.

5. **Preservation and Conservation:** AI is able to analyze photos of library items to spot damage early on and take preventative action. By doing this, the library's priceless collection will be protected.

6. **Ethical Considerations and Ensuring Equitable Access:** The ethical ramifications of AI deployment, including data privacy, algorithmic bias, and equal access, must be carefully taken into account. Libraries need to make sure AI technologies are used ethically and do not favor or discriminate in the recommendations of resources

AI tools used in libraries for Research

1. Research Rabbit

2. Perplexity

3. Scite

4. ChatGPT

5. Consensus

6. EndNote

7. Semantic scholar

8. Elicit

9. QuillBot

Conclusion:

Artificial intelligence is considered important in the field of education in today's era. Artificial intelligence is used in libraries through various tools. This paper discussed the features and usages of various tools. All tools are used by librarians to help their readers with research. This paper also found features of AI tools like tool for citation-based mapping, free access papers, transparency reference checks, create bibliographies, quick-locate papers, search and determine terms, grammar checks, plagiarism detectors, etc.

The application of Artificial Intelligence is a developing technology in the field of librarianship. Artificial Intelligence has promising potential for ease and improved provision, processing, use, as well as security of information materials in the library. Researchers in LIS should collaborate with experts in AI to solve teaching and research problems related to the application of AI in libraries. This will open up opportunities in librarianship and the provision of information resources and services to library patrons will be effective and efficient. Despite artificial intelligence being applied in various aspects ofthe library, most of its applications are still in the theoretical stage, which is more or less limited and cannot be really implemented. This is due to the fact that library AI hardware equipment and research investment is insufficient, big data collection and data mining are facing difficulties, library artificial intelligence talent teams are in short supply, and artificial intelligence thinking in the library business is lacking, especially in the Global South countries like Nigeria. Librarians should not be scared of these intelligent systems taking over their jobs, but should be ready to improve their knowledge to be able toengage these systems and improve their productivity.

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Implementation of Artificial Intelligence and Machine Learning in Library Operations and Services

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Abstract:

*Artificial Intelligence (AI) and Machine Learning (ML) have transformed library operations and services, enhancing efficiency, accessibility, and user engagement. This paper explores the implementation of AI and ML in libraries, focusing on their applications in **automated cataloging, intelligent search and retrieval, chatbot-based assistance, predictive analytics, and personalized recommendations**. The role of AI in improving library management systems, digital resource discovery, and user experience is also discussed.*

*Additionally, the paper highlights the historical contributions of **George Boole**, whose Boolean logic laid the foundation for modern computing, and **Alan Turing**, whose Turing Machine revolutionized theoretical computer science and AI. The impact of AI-driven tools such as **ChatGPT, Google Translate, and recommendation algorithms** on library services is examined.*

*While AI presents numerous benefits, challenges such as **data privacy, ethical concerns, and the digital divide** must be addressed to ensure responsible implementation. This study concludes with insights into the future of AI and ML in **Library and Information Science (LIS)**, emphasizing their potential to create smarter, more adaptive library environments.*

Keywords: Artificial Intelligence, BMCRI Library, Postgraduate Students, Library Automation, AI in Libraries

Introduction:

The rapid advancement of Artificial Intelligence (AI) and Machine Learning (ML) has revolutionized various industries, including library and information science. Libraries, as knowledge hubs, have traditionally relied on human expertise for cataloging, classification, and reference services. However, with the increasing volume of digital information and

evolving user needs, AI and ML have emerged as transformative technologies that enhance library operations and services.

AI-powered tools enable libraries to automate routine tasks such as cataloging, metadata generation, and indexing, reducing manual workload and improving efficiency. Machine learning algorithms can analyze user behavior and preferences, facilitating personalized recommendations and improving information retrieval systems. Additionally, AI-driven chatbots and virtual assistants enhance user engagement by providing real-time assistance and answering queries efficiently.

The implementation of AI and ML in library services also extends to predictive analytics, resource management, and automated content curation. These technologies help libraries anticipate user demands, optimize resource allocation, and enhance decision-making processes. As a result, libraries can provide more dynamic, responsive, and user-centric services in an increasingly digital environment.

This paper explores the application of AI and ML in various aspects of library operations, including collection management, reference services, user engagement, and digital preservation. It highlights the benefits, challenges, and future potential of integrating AI-driven solutions in modern libraries.

The rapid advancement of Artificial Intelligence (AI) technologies has significantly transformed various sectors, including library and information services. Libraries, as information hubs, have increasingly integrated AI to improve user experience, enhance information retrieval, and automate routine processes. AI applications, such as chatbots, automated resource recommendations, and intelligent search systems, have the potential to revolutionize traditional library services, making them more efficient and personalized (Jain & Singh, 2022; Gupta & Patel, 2023).

In academic libraries, especially in medical institutions, AI tools can help postgraduate students navigate large volumes of academic resources, streamline the research process, and provide tailored recommendations (Sharma &Rathi, 2021). The BMCRI (Bangalore Medical College and Research Institute) Library has embraced AI technologies to support its postgraduate students in their academic endeavors. However, the impact of these technologies on students' research efficiency and satisfaction remains underexplored.

This study aims to assess the implementation of AI in BMCRI Library, focusing on its usage patterns, challenges, and overall effectiveness from the perspective of postgraduate students.

By evaluating these aspects, the research intends to provide valuable insights into how AI can be optimized to better meet the academic needs of students in medical institutions.

Artificial Intelligence

Artificial Intelligence (AI) refers to the **theory and development of computer systems** capable of performing tasks that traditionally required human intelligence. These tasks include **speech recognition, decision-making, pattern identification, and language processing**. AI is an umbrella term that encompasses various advanced technologies such as **Machine Learning (ML), Deep Learning, and Natural Language Processing (NLP)**. AI plays a crucial role in transforming multiple industries, including **libraries, healthcare, finance, transportation, and entertainment**. It enhances efficiency, automates repetitive tasks, and provides intelligent insights through data-driven decision-making.

Key Focus Areas of AI

1. **Algorithms** – AI systems rely on complex algorithms to process data, identify patterns, and make informed predictions.

2. **Machine Learning Models** – ML enables computers to learn from data and improve their performance over time without explicit programming.

3. **ChatGPT** – A powerful AI-based chatbot that utilizes NLP to generate human-like responses, assisting users in research, customer support, and content creation.

4. **Google Translate** – AI-driven language translation tool that uses NLP and deep learning to provide accurate multilingual translations.

5. **Netflix** – Uses AI algorithms to analyze user preferences and provide personalized content recommendations.

6. **Tesla** – Implements AI-powered self-driving technology, enhancing autonomous vehicle navigation and decision-making.

These advancements demonstrate how AI is shaping modern technologies, making processes smarter, faster, and more user-friendly. In the context of **library operations and services**, AI enhances **cataloging, resource discovery, virtual assistance, and user engagement**, transforming the way information is accessed and utilized.

Review of Literature:

Artificial Intelligence (AI) has increasingly become an essential component in modern libraries, revolutionizing traditional services and enhancing user experience. Numerous studies have explored AI's potential to streamline library operations, automate routine tasks, and provide personalized services (Jain & Singh, 2022; Gupta & Patel, 2023). In academic libraries, AI is transforming information retrieval, improving the accessibility of resources, and supporting research efforts by postgraduate students.

AI-based systems, such as intelligent search engines and resource recommendation tools, have been widely adopted in libraries to optimize information access. According to Gupta and Patel (2023), AI enhances search accuracy by understanding user queries in a more context-sensitive manner. Similarly, Jain and Singh (2022) highlighted the role of AI-powered chatbots in libraries, which assist users by providing 24/7 support for answering frequently asked questions, thereby improving overall service efficiency.

The implementation of AI in academic libraries also contributes significantly to the research process. Studies by Sharma and Rathi (2021) show that AI-driven personalized resource recommendations help postgraduate students quickly find relevant literature, saving time and effort. This is especially beneficial in medical libraries, where the volume of literature can be overwhelming. Research by Kumar and Soni (2020) suggests that AI-based tools can significantly reduce the time spent by students in searching for relevant academic materials, enhancing research productivity.

Despite the numerous advantages, the adoption of AI in libraries also presents challenges. Sharma (2021) discussed the need for continuous training for library staff and users to ensure the effective use of AI technologies. Moreover, some studies have pointed out the technical challenges and limitations of AI systems, such as system failures and the need for regular updates (Rani, 2020). Furthermore, user resistance due to unfamiliarity or perceived complexity of AI tools remains a barrier in many libraries (Singh & Kumar, 2019).

Overall, while AI shows great promise in improving library services, its successful implementation requires overcoming challenges related to training, user adoption, and system reliability.

Methodology

This study employs a mixed-methods approach, combining both qualitative and quantitative techniques to assess the implementation of Artificial Intelligence (AI) in the BMCRI Library from the perspective of postgraduate students. The methodology is designed to gather

comprehensive data on the usage patterns, impact, challenges, and satisfaction levels of AI tools, as well as to explore the demographic characteristics of the respondents.

3.1. Research Design:

A descriptive research design was adopted to provide an overview of postgraduate students' awareness, usage, and perceptions of AI services in the BMCRI Library. The study focuses on evaluating AI's effectiveness in improving research efficiency, understanding user satisfaction, and identifying challenges faced by students.

3.2. Population and Sample:

The target population for this study consists of postgraduate students enrolled in various medical courses at BMCRI, Bangalore. A stratified random sampling technique was used to select participants, ensuring a representative sample from different courses (MD, MS, and other specializations). The sample size was determined to be 100 students, selected to balance gender and course distribution.

3.3. Data Collection:

- **Survey Questionnaire:** A structured survey was designed to collect both qualitative and quantitative data. The questionnaire comprised both closed and open-ended questions. The closed-ended questions were designed to assess awareness, usage frequency, perceived effectiveness, and satisfaction with AI tools. The open-ended questions allowed students to express their opinions on the challenges they face and provide suggestions for improvement.

  The questionnaire was divided into the following sections:

  - **Demographic Information:** Gender, age, course of study.
  - **Awareness of AI Tools:** Questions assessing students' familiarity with AI tools used in the library.
  - **Usage Patterns:** Frequency and type of AI tools used.
  - **Impact on Research Efficiency:** Students' perceptions of how AI has influenced their research processes.

- o **Challenges and Satisfaction:** Issues faced by students in using AI tools and their overall satisfaction with the services.
- **Interviews:** In addition to the survey, semi-structured interviews were conducted with a smaller subset of 10 participants to gain deeper insights into their experiences with AI tools in the library. These interviews focused on understanding students' perceptions, challenges, and suggestions for further improvement.

Data Analysis:

- **Quantitative Analysis:** The responses to closed-ended questions were analyzed using descriptive statistics, including frequencies, percentages, and mean scores. This analysis was performed using SPSS (Statistical Package for the Social Sciences) software to identify trends and patterns in students' usage and satisfaction levels with AI tools.
- **Qualitative Analysis:** The responses to open-ended questions and interview transcripts were analyzed using thematic analysis. Themes related to the benefits, challenges, and suggestions for AI tool improvements were identified. This analysis was conducted manually, with the data being coded and grouped into relevant categories.

Validity and Reliability:

To ensure the validity and reliability of the research instruments, a pilot study was conducted with a small sample of 10 postgraduate students. Based on the feedback from the pilot, the questionnaire was refined to address any ambiguities. Furthermore, to enhance reliability, the study used multiple data sources (surveys and interviews) and triangulated the results to corroborate findings.

Ethical Considerations:

The study adhered to ethical guidelines by obtaining informed consent from all participants, ensuring that they were aware of the study's purpose, procedures, and their right to confidentiality. Personal details of participants were kept anonymous, and the data collected was used solely for academic purposes.

This mixed-methods approach allows for a comprehensive understanding of AI implementation in BMCRI Library, capturing both the quantitative impact and qualitative experiences of postgraduate students.

Objectives:

1. To Evaluate the Awareness and Perception of Postgraduate Students Regarding AI Applications in BMCRI Library
2. To Analyze the Impact of AI-Driven Library Services on the Research Efficiency of Postgraduate Students
3. To Investigate the Usage Patterns of AI-Based Library Resources Among Postgraduate Students
4. To Explore the Challenges Faced by Postgraduate Students in Using AI-Enabled Library Services
5. To Assess the Overall Satisfaction of Postgraduate Students with AI-Integrated Library Services

Demographic Information

Table 1: This table captures basic demographic details of the respondents (postgraduate students in BMCRI Library).

Demographic Category	Frequency	Percentage (%)
Gender		
Male	45	45%
Female	55	55%
Age Group		
21-25 years	60	60%
26-30 years	35	35%
31+ years	5	5%
Course of Study		
MD (Doctor of Medicine)	50	50%
MS (Master of Surgery)	40	40%
Other (Specializations)	10	10%

The demographic analysis of the respondents reveals a fairly balanced distribution of gender, with 55% of the postgraduate students being female and 45% male. This gender diversity is

important in understanding how AI tools may cater to varied needs across different student groups.

The age group distribution indicates that a majority (60%) of the students are in the 21-25 years range, which reflects the typical age of postgraduate medical students. This age group is likely more tech-savvy and open to adopting new technologies like AI in library services.

Regarding the course of study, 50% of the students are pursuing MD, followed by 40% enrolled in MS, and 10% in other specializations. This specialization diversity is key in assessing whether AI tools are meeting the specific needs of students across different disciplines.

These demographic insights suggest that the AI services in BMCRI Library should be tailored to the needs of a younger, tech-aware population involved in medical and surgical studies.

Table 2: The Awareness and Perception of Postgraduate Students Regarding AI Applications in BMCRI Library

Awareness of AI Tools	Frequency	Percentage (%)
Aware of AI-based search tools	85	85%
Aware of chatbots for FAQs	65	65%
Aware of personalized resource suggestions	60	60%
Not aware of any AI tools	15	15%

A majority (85%) of postgraduate students are aware of AI-based search tools in the library.65% are aware of chatbots, which indicates that the implementation of AI tools for support functions is recognized but not as widely understood as search tools.A smaller portion (60%) is familiar with personalized resource suggestions, indicating potential for greater awareness campaigns or training on these features.

Table **3: The Impact of AI-Driven Library Services on the Research Efficiency of Postgraduate Students**

Effect of AI on Research Efficiency	Frequency	Percentage (%)
Significantly improved efficiency	40	40%
Moderately improved efficiency	45	45%
No impact on efficiency	10	10%
Decreased research efficiency	5	5%

- 85% of students feel that AI tools have either significantly (40%) or moderately (45%) improved their research efficiency.

- Only 5% reported a decrease in research efficiency, suggesting that AI integration has had a generally positive effect on research outcomes for most postgraduate students

Table **4: The Usage Patterns of AI-Based Library Resources Among Postgraduate Students**

Frequency of AI Tool Use	Frequency	Percentage (%)
Daily use	20	20%
Weekly use	45	45%
Monthly use	25	25%
Rarely or Never use	10	10%

Frequency

■ Daily use ■ Weekly use ■ Monthly use ■ Rarely or Never use
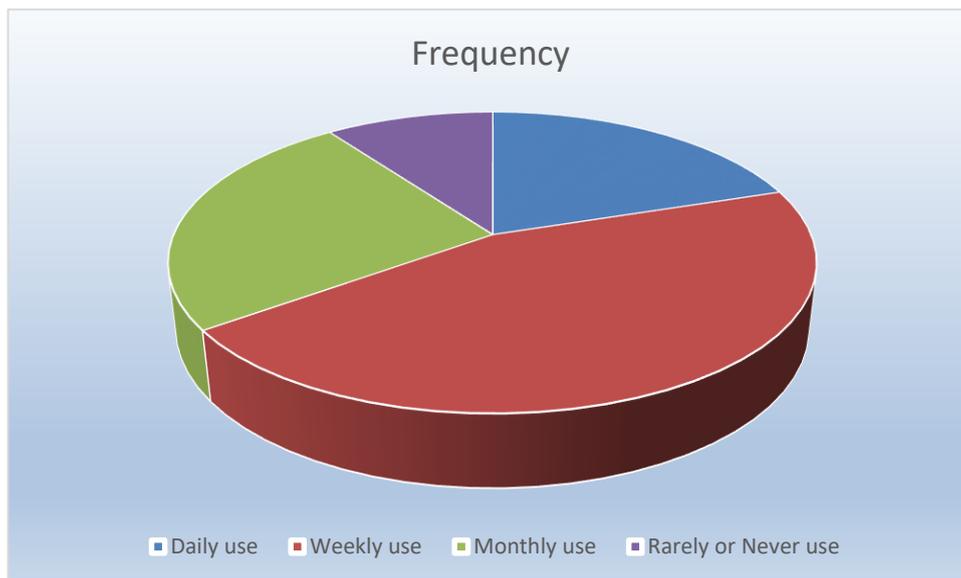
- A majority (65%) of postgraduate students use AI tools at least weekly, indicating regular interaction with AI resources.
- A small group (10%) does not use AI tools, which could indicate a lack of familiarity, interest, or access to these services.

Table **5: The Challenges Faced by Postgraduate Students in Using AI-Enabled Library Services**

Challenges Faced in Using AI Tools	Frequency	Percentage (%)
Difficulty in understanding AI functionalities	30	30%
Lack of training or guidance	40	40%
Technical issues or errors	15	15%
No significant challenges	15	15%

- 40% of students report a lack of training or guidance as a major challenge, indicating a need for more educational support regarding the use of AI tools.
- 30% face difficulty understanding AI functionalities, which highlights the need for user-friendly interfaces and better explanation of AI features.
- Only 15% experienced technical issues, suggesting that the technical infrastructure for AI tools is generally stable.

Table **6: The Overall Satisfaction of Postgraduate Students with AI-Integrated Library Services**

Satisfaction Level with AI Library Services	Frequency	Percentage (%)
Very satisfied	30	30%
Satisfied	50	50%
Neutral	15	15%
Dissatisfied	5	5%
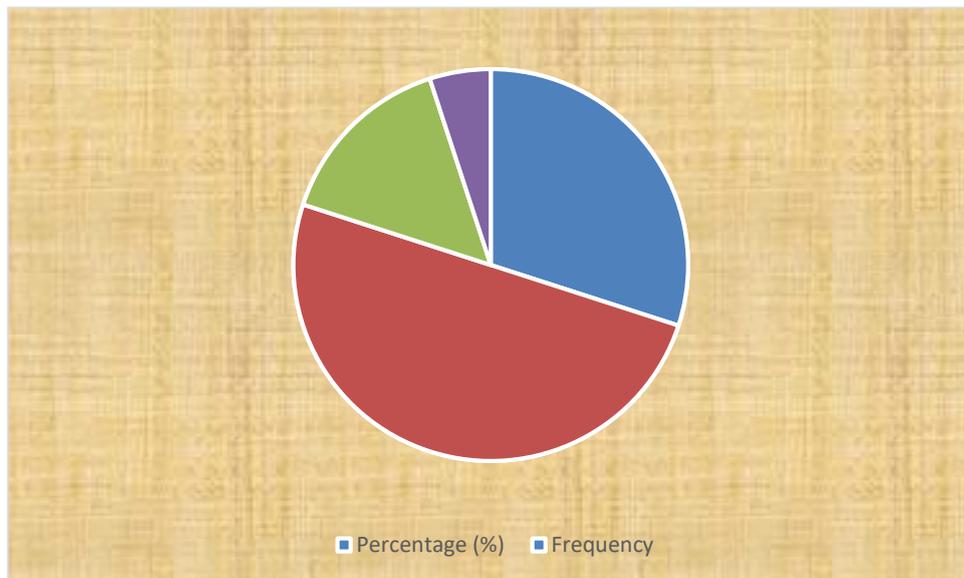
- A large proportion (80%) of postgraduate students are satisfied (30% very satisfied, 50% satisfied) with AI-integrated library services.
- Only 5% reported dissatisfaction, which suggests that, overall, the library's AI services are well-received.

9. Findings:

1. **Awareness of AI Tools:** The study found that 85% of postgraduate students at BMCRI Library are aware of AI-based search tools, with 65% aware of chatbots and

60% of personalized resource recommendations. However, there is still a segment (15%) that is not familiar with these technologies, indicating that awareness campaigns or training might be needed.

2. **Impact on Research Efficiency:** AI tools have positively impacted research efficiency for 85% of students, with 40% reporting significant improvements and 45% noting moderate improvements. Only 5% found a decrease in efficiency, highlighting the overall positive contribution of AI to academic work.

3. **Usage Patterns:** Most students (65%) use AI-powered tools at least weekly, with 20% using them daily. This suggests that AI services are integral to the students' academic routines, although 10% rarely or never use them, indicating potential barriers or lack of engagement.

4. **Challenges in AI Usage:** The primary challenge reported by students is a lack of training or guidance (40%), followed by difficulty in understanding AI functionalities (30%). This suggests that further user education and support are necessary to enhance the effectiveness of AI tools in the library.

5. **Satisfaction with AI Services:** Overall, 80% of students are satisfied with AI services, with 30% very satisfied and 50% satisfied. Only 5% expressed dissatisfaction, indicating that while AI services are well-received, there is room for improvement in areas like user experience and tool accessibility.

These findings underscore the need for continuous training and refinement of AI services to ensure broader and more effective usage among postgraduate students.

Suggestions:

1. **Enhance Awareness and Training:** While a majority of students are aware of AI tools, 15% are not. To bridge this gap, the library should organize awareness programs, workshops, and training sessions to ensure all students are familiar with the AI services available. Offering demonstrations on how to use AI tools effectively could improve engagement and adoption.

2. **Improve User Interface and Usability:** A significant portion of students (30%) faced difficulties in understanding AI functionalities. To address this, the library should consider simplifying the user interface and providing clear, step-by-step instructions on how to use the AI tools. Creating user-friendly guides or short video tutorials could help demystify the AI tools and make them more accessible.

3. **Provide Ongoing Support and Guidance:** Given that 40% of students cited a lack of training as a challenge, establishing a dedicated support team or chatbot for AI-related queries could enhance user experience. Regular training sessions could also ensure students feel confident using AI tools in their academic research.

4. **Expand AI Capabilities:** While AI tools have had a positive impact on research efficiency, some students may not be using them regularly. Expanding AI offerings, such as incorporating more advanced features like AI-driven citation recommendations or integrating AI with other academic databases, could further enhance the value of these services. Personalized, discipline-specific resources could also make the tools more relevant to postgraduate students.

5. **Address Technical Issues:** Although only a small percentage (15%) faced technical issues, ensuring that AI tools are consistently reliable and free from bugs is essential. Regular maintenance and upgrades will ensure seamless access to AI tools and prevent dissatisfaction among students.

6. **Evaluate Feedback Continuously:** Regularly collecting feedback from students through surveys or focus groups can help identify areas for improvement in AI services. This feedback loop will ensure that the library can adapt to the changing needs of its users and continuously refine its AI tools.

By implementing these suggestions, BMCRI Library can further enhance its AI services, fostering greater adoption and improving the overall research experience for postgraduate students.

Conclusion:

The implementation of Artificial Intelligence in the BMCRI Library has shown significant promise in enhancing the research efficiency and academic experience of postgraduate students. The majority of students are aware of and satisfied with the AI tools available, with a notable impact on improving research workflows. AI-based search tools and chatbots have become integral to students' academic routines, suggesting that these technologies have met their intended goals in streamlining information retrieval and providing academic support. However, the study also highlights several areas for improvement, such as the need for increased training, clearer user interfaces, and more targeted awareness campaigns to ensure that all students are fully equipped to take advantage of these resources. Challenges such as a

lack of understanding of AI functionalities and insufficient guidance need to be addressed to optimize the overall user experience.

In conclusion, while the integration of AI has proven beneficial, continuous support, training, and refinement of AI tools are essential to maximize their effectiveness and ensure that all postgraduate students at BMCRI Library can leverage these technologies for academic success.

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Scientometric Analysis of Prosthetics and Orthotics Literature: A Study

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Abstract:

The present study deals with Prosthetics and Orthotics Literature that appeared in the Scopus Database from 1962 to 2024. A totalof 946 documents are taken into consideration which have received 13654 citations. Scientometric analysis indicates that the highest number of papers were published in the year 2013 hence it will be considered as the peak period of publication and the highest number of citations were observed in the year 2011 with 2051 where 69 papers were published. The year 1985 has received the highest rate of citation per paper with 93.00. Prosthetics and Orthotics International channel of Communication has been considered as top-rated Channels of Communication where authors have published the highest papers with 367 papers. Authorship pattern reveals that the collaboration trend has been followed by the authors in publishing Prosthetics and Orthotics literature where the highest number of papers are multi-authored papers.

Keywords: -Scientometric Analysis, Prosthetics, Orthotics literature, Publication Productivity, Authorship Pattern.

Introduction:

Prosthetics and Orthotics are two distinct fields in medical care that involve the design, fitting, and management of devices to aid individuals with physical disabilities, injuries, or conditions. Prosthetics refers to the design and creation of artificial limbs (prostheses) for individuals who have lost a body part, such as an arm or leg, due to trauma, disease, or congenital conditions. Orthotics involves designing and fitting orthotic devices (orthoses) that are worn to support, align, or correct deformities in the musculoskeletal system, or to relieve pain and improve function.Both fields are crucial in enhancing the quality of life for individuals with physical impairments or injuries, helping them regain independence and improve functionality.Prosthetics

and orthotics are vital in improving the lives of individuals who suffer from physical impairments due to injury, illness, or congenital conditions. These fields play a key role in rehabilitation, enhancing mobility, and supporting independence.

Need for the Study:

The study of Prosthetics and Orthotics literature is critical for the advancement of the field, the development of better technologies, and the improvement of patient care.The field of prosthetics and orthotics is constantly evolving with new materials, technologies, and techniques. Studying the literature helps professionals stay up-to-date with the latest research, trends, and innovations, ensuring they can provide the best care.Research literature helps practitioners gain deeper insights into the effectiveness of various prosthetic and orthotic devices, allowing them to make evidence-based decisions in patient care.Reading current literature enables clinicians to adopt evidence-based practices that have been proven to enhance the functionality, comfort, and longevity of prosthetic and orthotic devices. This leads to better patient outcomes in terms of mobility, pain reduction, and overall quality of life. Literature often discusses case studies and patient feedback, allowing clinicians to better understand how devices are used in real-world settings. This helps them tailor treatments more effectively to the individual needs of patients, enhancing their rehabilitation process. Literature on emerging technologies like bionic limbs, 3D-printed prostheses, and smart orthotics can inspire innovation and improve the function of devices. Understanding these technologies' potential can drive further development in the field.

Methodology:

The present study follows the normal count procedure. The authors extracted the data from the Scopus database by providing appropriate keywords and complete bibliographic information on prosthetics and orthotics literature. The data were further scrutinized with the help of MS Excel spreadsheets. Proper tables and Charts were used to represent the data systematically and to achieve the set objectives under the framework of Scientometric analysis.

Scope and Limitation of the Study:

The present study emphasizes the Prosthetics and Orthotics literature that has been extracted from the Scopus database. The set of data has been analyzed under the framework of Scientometric analysis hence this study is restricted to the data which is been extracted from the Scopus database.

Objectives of the Study:

The present study highlights Scientometric analysis of Prosthetics and Orthotics literature appeared in the Scopus Database with following objectives: -

1. To analyze the Year-wise Distribution of Prosthetics & Orthotics Literature;

2. To distinguish Year-wise Distribution of Citations in Prosthetics and Orthotics Literature;

3. To know the Authorship Pattern in Prosthetics and Orthotics Literature;

4. To understand the Different Channels of Communication used in the Distribution of Prosthetics and Orthotics Literature;

5. To differentiate Different Types of Data Published in Prosthetics and Orthotics Literature and

6. To examine Language-wise Distribution of Orthotics & Prosthetics Literature

Data Analysis and Interpretation:

Table 1: Year-wise Distribution of Prosthetics & Orthotics Literature

No.	Year	Number of Papers	% Of Papers	Cumulative Papers	Cumulative %
1	1962	1	0.11	1	0.11
2	1963	1	0.11	2	0.21
3	1965	3	0.32	5	0.53
4	1967	4	0.42	9	0.95
5	1968	1	0.11	10	1.06
6	1969	2	0.21	12	1.27
7	1970	1	0.11	13	1.37
8	1971	2	0.21	15	1.59
9	1973	5	0.53	20	2.11
0	1974	10	1.06	30	3.17
1	1975	6	0.63	36	3.81
2	1976	6	0.63	42	4.44
3	1977	4	0.42	46	4.86

4	1978	8	0.85	54	5.71
5	1979	4	0.42	58	6.13
6	1980	1	0.11	59	6.24
7	1981	5	0.53	64	6.77
8	1982	2	0.21	66	6.98
9	1983	3	0.32	69	7.29
20	1984	4	0.42	73	7.72
21	1985	3	0.32	76	8.03
22	1986	1	0.11	77	8.14
23	1987	2	0.21	79	8.35
24	1988	4	0.42	83	8.77
25	1989	12	1.27	95	10.04
26	1990	8	0.85	103	10.89
27	1991	13	1.37	116	12.26
28	1992	6	0.63	122	12.90
29	1993	31	3.28	153	16.17
30	1994	28	2.96	181	19.13
31	1995	22	2.33	203	21.46
32	1996	8	0.85	211	22.30
33	1997	7	0.74	218	23.04
34	1998	8	0.85	226	23.89
35	1999	9	0.95	235	24.84
36	2000	9	0.95	244	25.79
37	2001	10	1.06	254	26.85
38	2002	9	0.95	263	27.80
39	2003	3	0.32	266	28.12
40	2004	13	1.37	279	29.49
41	2005	12	1.27	291	30.76
42	2006	16	1.69	307	32.45
43	2007	6	0.63	313	33.09
44	2008	10	1.06	323	34.14
45	2009	21	2.22	344	36.36

	Year	No. of Papers	%	Cumulative	Cumulative %
46	2010	19	2.01	363	38.37
47	2011	69	7.29	432	45.67
48	2012	66	6.98	498	52.64
49	2013	78	8.25	576	60.89
50	2014	47	4.97	623	65.86
51	2015	27	2.85	650	68.71
52	2016	14	1.48	664	70.19
53	2017	19	2.01	683	72.20
54	2018	22	2.33	705	74.52
55	2019	33	3.49	738	78.01
56	2020	29	3.07	767	81.08
57	2021	43	4.55	810	85.62
58	2022	37	3.91	847	89.53
59	2023	46	4.86	893	94.40
60	2024	53	5.60	946	100.00
61	**Total**	**946**	**100.00**		
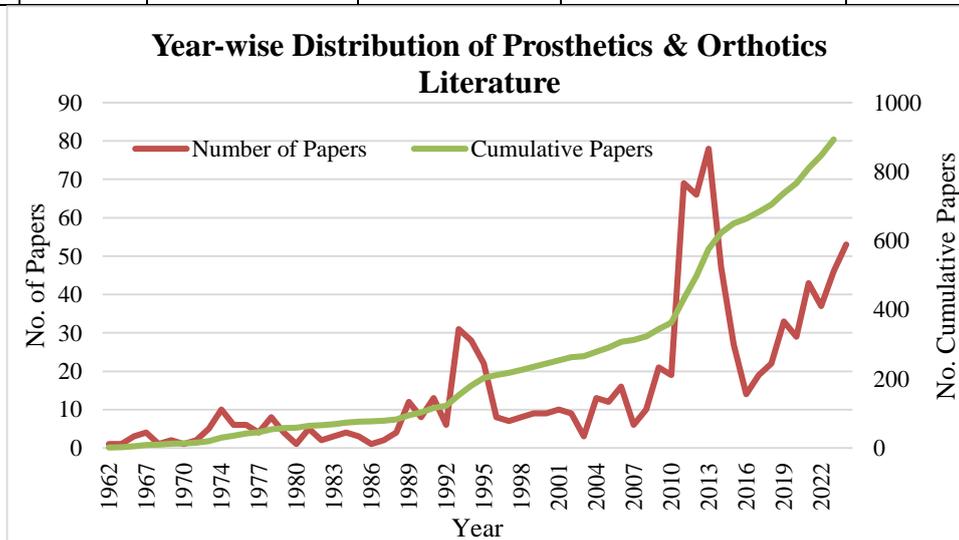
Figure 1: Year-wise Distribution of Prosthetics & Orthotics Literature

The table no. 1 presents the year-wise distribution of prosthetics and orthotics literature from 1962 to 2024, showing the number of papers published each year, the percentage of the total, and the cumulative number of papers with corresponding cumulative percentages.The number of papers published per year remained relatively low, with the highest being 10 papers in 1974. The cumulative percentage of papers gradually increased but was still below 6% by 1979.The number

of papers started to grow more noticeably in the 1980s, especially with a peak of 12 papers in 1989. The most significant increase occurred in the 1990s, particularly in 1993, with 31 papers published, raising the cumulative percentage to 16.17%.The growth continued into the 2000s, with some years like 2004, 2005, and 2006 showing 12 to 16 papers. The cumulative percentage crossed the 30% mark by 2005.The 2010s saw substantial growth in publications. 2011 marked a dramatic increase, with 69 papers published, bringing the cumulative percentage to 45.67%. The number of papers remained high, with 2013 reaching 78 papers and a cumulative total of 576 papers.The number of publications remained robust, with notable years like 2023 and 2024, which saw 46 and 53 papers, respectively. By 2024, the cumulative total reached 946 papers, covering 100% of the literature for this period.This distribution illustrates a clear upward trend in the volume of research in prosthetics and orthotics, especially in the last two decades, reflecting growing academic and practical interest in the field.

Table 2: Year-wise Distribution of Citations in Prosthetics and Orthotics Literature

Year-wise Distribution of Citations in Prosthetics and Orthotics Literature							
S. No.	Year	Total Citations	Number of Papers	%	Cumulative Citations	Cumulative %	Citation/ Paper
1	1962	0	1	0.00	0	0.00	0.00
2	1963	1	1	0.01	1	0.01	1.00
3	1965	0	3	0.00	1	0.01	0.00
4	1967	5	4	0.04	6	0.04	1.25
5	1968	0	1	0.00	6	0.04	0.00
6	1969	0	2	0.00	6	0.04	0.00
7	1970	1	1	0.01	7	0.05	1.00
8	1971	0	2	0.00	7	0.05	0.00
9	1973	30	5	0.22	37	0.27	6.00
10	1974	5	10	0.04	42	0.31	0.50
11	1975	24	6	0.18	66	0.48	4.00
12	1976	288	6	2.11	354	2.59	48.00
13	1977	16	4	0.12	370	2.71	4.00
14	1978	25	8	0.18	395	2.89	3.13
15	1979	21	4	0.15	416	3.05	5.25
16	1980	0	1	0.00	416	3.05	0.00

17	1981	30	5	0.22	446	3.27	6.00
18	1982	1	2	0.01	447	3.27	0.50
19	1983	0	3	0.00	447	3.27	0.00
20	1984	12	4	0.09	459	3.36	3.00
21	1985	279	3	2.04	738	5.41	93.00
22	1986	3	1	0.02	741	5.43	3.00
23	1987	14	2	0.10	755	5.53	7.00
24	1988	18	4	0.13	773	5.66	4.50
25	1989	77	12	0.56	850	6.23	6.42
26	1990	105	8	0.77	955	6.99	13.13
27	1991	160	13	1.17	1115	8.17	12.31
28	1992	47	6	0.34	1162	8.51	7.83
29	1993	340	31	2.49	1502	11.00	10.97
30	1994	257	28	1.88	1759	12.88	9.18
31	1995	301	22	2.20	2060	15.09	13.68
32	1996	53	8	0.39	2113	15.48	6.63
33	1997	39	7	0.29	2152	15.76	5.57
34	1998	226	8	1.66	2378	17.42	28.25
35	1999	44	9	0.32	2422	17.74	4.89
36	2000	28	9	0.21	2450	17.94	3.11
37	2001	155	10	1.14	2605	19.08	15.50
38	2002	150	9	1.10	2755	20.18	16.67
39	2003	243	3	1.78	2998	21.96	81.00
40	2004	205	13	1.50	3203	23.46	15.77
41	2005	139	12	1.02	3342	24.48	11.58
42	2006	116	16	0.85	3458	25.33	7.25
43	2007	16	6	0.12	3474	25.44	2.67
44	2008	168	10	1.23	3642	26.67	16.80
45	2009	250	21	1.83	3892	28.50	11.90
46	2010	371	19	2.72	4263	31.22	19.53
47	2011	2051	69	15.02	6314	46.24	29.72
48	2012	1309	66	9.59	7623	55.83	19.83

| 49 | 2013 | 1270 | 78 | 9.30 | 8893 | 65.13 | 16.28 |
50	2014	763	47	5.59	9656	70.72	16.23
51	2015	1317	27	9.65	10973	80.36	48.78
52	2016	1241	14	9.09	12214	89.45	88.64
53	2017	159	19	1.16	12373	90.62	8.37
54	2018	396	22	2.90	12769	93.52	18.00
55	2019	249	33	1.82	13018	95.34	7.55
56	2020	264	29	1.93	13282	97.28	9.10
57	2021	156	43	1.14	13438	98.42	3.63
58	2022	133	37	0.97	13571	99.39	3.59
59	2023	61	46	0.45	13632	99.84	1.33
60	2024	22	53	0.16	13654	100.00	0.42
61	**Total**	**13654**	**946**	**100.00**			**14.43**
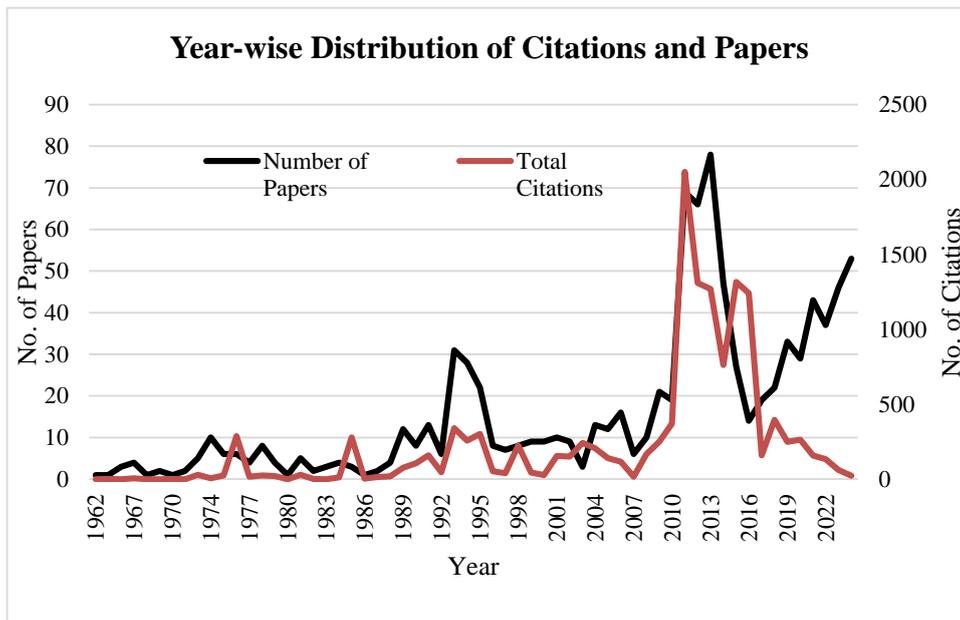
Figure 2: Year-wise Distribution of Citations in Prosthetics and Orthotics Literature

Table No. 2 provides a year-wise distribution of citations in prosthetics and orthotics literature. It outlines the total citations, the number of papers published, the percentage of total citations each year, cumulative citations, cumulative percentage, and the average citations per paper for each year. Over the years, citations have accumulated from zero in the early years (1962) to 13,654 by 2024.The year 2011 stands out with over 2,000 citations, comprising 15.02% of the total citations up to that point. Similarly, 2015, 2016, and 2024 showed a higher volume of citations

compared to earlier years.The 1990s (especially 1993, 1994, and 1995) and the early 2000s had a significant number of citations per paper.The citation rate varied greatly, with years like 2016 (88.64 citations/paper) and 2011 (29.72 citations/paper) showing a high average, while later years like 2023 (1.33 citations/paper) and 2024 (0.42 citations/paper) had lower citation averages.This data helps to analyze the trends in prosthetics and orthotics research, showing a strong increase in citations, particularly in the 2000s and 2010s.

Table 3: Authorship Pattern in Prosthetics and Orthotics Literature

Sl. No.	Year	Authorship Pattern in Prosthetics and Orthotics Literature										More than 10 Authors	Not Specified	MAP	Total
		1 *	2*	3*	4*	5*	6*	7*	8*	9*	10*				
1	1962			1								0		1	1
2	1963	1										0		0	1
3	1965	2										0		0	2
4	1967	2	2									0		2	4
5	1968	1										0		0	1
6	1969	1										0		0	1
7	1970	1										0		0	1
8	1971	1	1									0		1	2
9	1973	4										0		0	4
10	1974	7	2		1							0		3	10
11	1975	3	1	1								0		2	5
12	1976	3	1									0		1	4
13	1977	2	2									0		2	4
14	1978	3	3	1						1		0		5	8
15	1979	2		2								0		2	4
16	1980											0		0	0
17	1981	4	1									0		1	5
18	1982	1	1									0		1	2
19	1983	2	1									0		1	3
20	1984	3		1								0		1	4

No	Year											Sum		Total1	Total2
21	1985	1	1			1						0		2	3
22	1986	1										0		0	1
23	1987	2										0		0	2
24	1988	2	1	1								0		2	4
25	1989	5	2			2	2					0		6	11
26	1990	1	2	2	1							0		5	6
27	1991	6	1	2	1	2						1		7	13
28	1992	2	2		1	1						0		4	6
29	1993	12	5	7	2		3	1	1			0		19	31
30	1994	10	10	4	3							0		17	27
31	1995	6	7	4	1	1	1	1	1			0		16	22
32	1996	5		1	1		1					0		3	8
33	1997	2	2		1	1				1		0		5	7
34	1998	3	2	1	2							0		5	8
35	1999	4	2	1								0		3	7
36	2000	4	3	2								0		5	9
37	2001	4	3	2								0		5	9
38	2002	3	4	1	1							0		6	9
39	2003			2	1							0		3	3
40	2004	5	1	1	2	2						0		6	11
41	2005	3	1	4	1	1	1					0		8	11
42	2006	7		5	2	1			1			0		9	16
43	2007	3	1		1							0		2	5
44	2008	6	1	1	1	1						0		4	10
45	2009	9	4	6		2						0		12	21
46	2010	7	4	4	2		1					0		11	18
47	2011	7	12	23	13	4	5	4		1		0		62	69
48	2012	4	14	17	13	5	6	1	3	3		0		62	66
49	2013	3	9	16	12	16	16	4	1			1		75	78
50	2014	2	5	11	10	7	6	4	1			0		44	46
51	2015	2	3	7	7	3		2			1	1		24	26
52	2016	1	4	3	2		1		1			0		11	12

No.	Year	Single *	2*	3*	4*	5*	6*	7*	8*	9*	10*	More than 10	Not Specified	MAP	Total
53	2017	3	6	4	3	2		1				0		16	19
54	2018	2	4	6	3	1	3	1				2		20	22
55	2019	6	3	8	7	4	1			1	1	0		25	31
56	2020	7	2	8	5	1	1	2		1	2	0		22	29
57	2021	12	6	9	6	3	3	1			1	1		30	42
58	2022	5	4	7	9	5	3	2	1	1		0		32	37
59	2023	7	12	9	7	4	1	3		1		2		39	46
60	2024	3	9	5	8	4	9	5	1	1	1	6		49	52
	Total	**220**	**167**	**190**	**130**	**74**	**64**	**32**	**11**	**11**	**6**	**14**	**27**	**726**	**946**
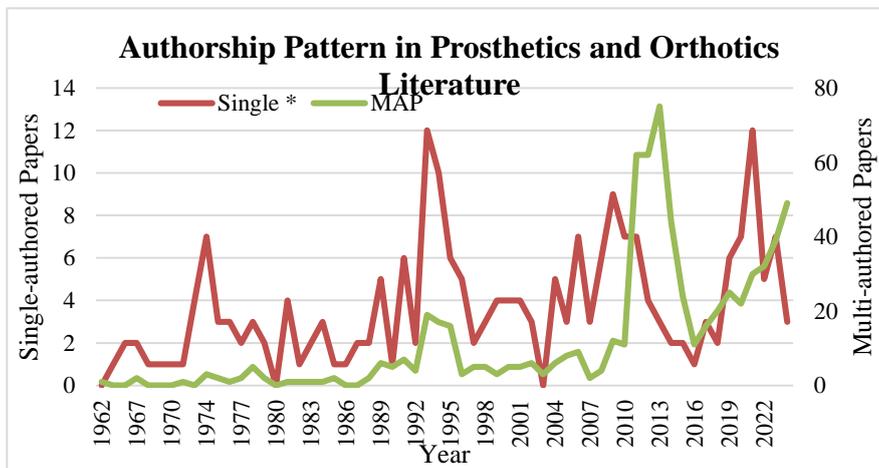
Figure 3: Authorship Pattern in Prosthetics and Orthotics Literature
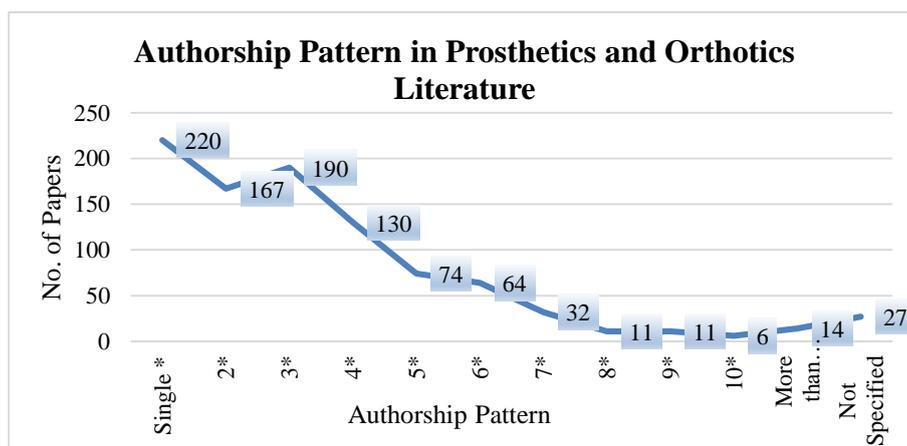
Figure 4: Authorship Pattern in Prosthetics and Orthotics Literature

The table No. 3 Shows the authorship patterns in the literature related to prosthetics and orthotics, categorized by the number of authors per publication for each year from 1962 to 2024.

This table provides a detailed count of publications with a varying number of authors in each year.There is a general trend towards more multi-author publications over the years. However, there were periods where single-author publications were still common, such as in the earlier years (1960s-1970s). The highest count of single-author publications occurred in 1993 with 12 publications.As the number of authors per publication increased, multi-author publications became more frequent. For example2011, the number of publications with 12 authors peaked. The trend continued into the 2020s, with years such as 2023 showing many publications with 9-12 authors.From the mid-1990s onward, there is a clear increase in the number of publications with more than 5 authors. This might reflect a trend in academic research towards more collaborative projects, possibly due to the complexity of the topics in prosthetics and orthotics and interdisciplinary research.Some years, like 1993 and 1994, saw a particularly high number of publications with multiple authors (including up to 10 authors). The dataset also highlights that in recent years, publications with 10 or more authors, while still a minority, are becoming increasingly common.Years like 2011 and 2012 saw peaks in the total number of publications, with a large number of multi-author papers across various categories.

Table 4: Distribution of Prosthetics and Orthotics Literature in Different Channels of Communication

S. No.	Channels of Communication	Total	%	FPY	LPY
Distribution of Prosthetics and Orthotics Literature in Different Channels of Communication					
1	Prosthetics and Orthotics International	367	38.79	1977	2024
2	Journal of Prosthetics and Orthotics	154	16.28	1988	2024
3	Canadian Prosthetics and Orthotics Journal	29	3.07	2018	2024
4	Annual International Conference of the IEEE Engineering in Medicine and Biology - Proceedings	15	1.59	1974	2005
5	Archives of Physical Medicine and Rehabilitation	15	1.59	1978	2024
6	Journal of Rehabilitation Research and Development	15	1.59	1988	2013
7	Disability and Rehabilitation	14	1.48	1984	2024
8	Orthotics and Prosthetics	13	1.37	1973	1983
9	Disability and Rehabilitation: Assistive Technology	10	1.06	2009	2024
10	Artificial limbs	9	0.95	1965	1971

11	Physical Medicine and Rehabilitation Clinics of North America	7	0.74	2000	2014
12	Clinical Biomechanics	5	0.53	1991	2016
13	Four Papers Published in 6 Different Journals	24	2.54	1980	2024
14	Three Articles Published in 11 Different Journals	33	3.49	1973	2024
15	Two Articles Published in 36 Different Journals	72	7.61	1975	2024
16	Each article published in 164 different Journals	164	17.34	1962	2024
	Total	**946**	**100.00**	**1962**	**2024**

Table No. 4represents the distribution of Prosthetics and Orthotics literature across various communication channels, along with the total number of publications, percentages, and the earliest and latest years of publication.Prosthetics and Orthotics International leads the distribution with 367 publications (38.79%), ranging from 1977 to 2024.Journal of Prosthetics and Orthotics follows with 154 publications (16.28%), spanning from 1988 to 2024.Other significant sources include the Canadian Prosthetics and Orthotics Journal (29 publications, 3.07%), and the Annual International Conference of the IEEE Engineering in Medicine and Biology - Proceedings (15 publications, 1.59%).Several other journals and conferences have smaller contributions, with publications ranging from 5 to 15 articles.The majority of publications are concentrated in Prosthetics and Orthotics International and the Journal of Prosthetics and Orthotics, making up over 50% of the total literature. smaller journals like the Canadian Prosthetics and Orthotics Journal and Disability and Rehabilitation also contribute significantly, though to a lesser extent.

Table 5: Different Types of Data Published in Prosthetics and Orthotics Literature

Different Types of Data Published in Prosthetics and Orthotics Literature			
S. No.	**Types of Data**	**Total**	**%**
1	Article	662	69.98
2	Book	10	1.06
3	Book chapter	28	2.96
4	Conference paper	63	6.66
5	Conference review	2	0.21
6	Editorial	42	4.44

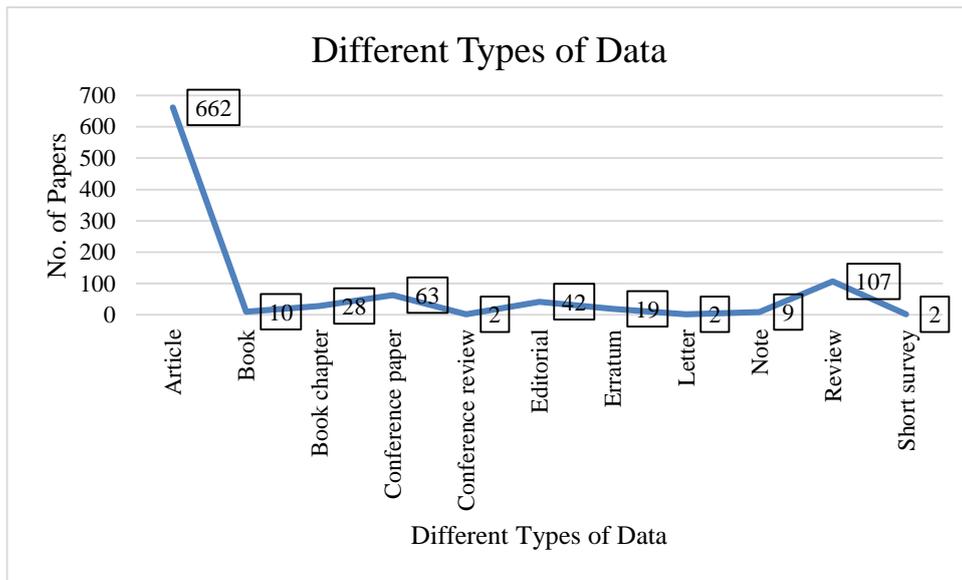| 7	Erratum	19	2.01
8	Letter	2	0.21
9	Note	9	0.95
10	Review	107	11.31
11	Short survey	2	0.21
	Total	**946**	**100.00**

Figure 5: Different Types of Data Published in Prosthetics and Orthotics Literature

The table No. 5 reflects the majority of publications are articles, making up nearly 70% of the total. Reviews and conference papers also constitute significant portions of the published data. Other types, such as books, letters, and short surveys, are less common, it is also been represented in figure no. 5.

Table 6: Language-wise Distribution of Orthotics & Prosthetics Literature

Language-wise Distribution of Orthotics & Prosthetics Literature			
S. No.	**Language**	**No. of Papers**	**%**
1	Azerbaijani	2	0.21
2	Chinese	6	0.63
3	Croatian	1	0.11
4	Czech	1	0.11
5	Dutch	2	0.21
6	English	903	95.45

7	French	3	0.32
8	German	9	0.95
9	Japanese	2	0.21
10	Portuguese	2	0.21
11	Russian	3	0.32
12	Slovenian	1	0.11
13	Spanish	3	0.32
14	Turkish	1	0.11
15	undefined	7	0.74
	Total	**946**	**100.00**
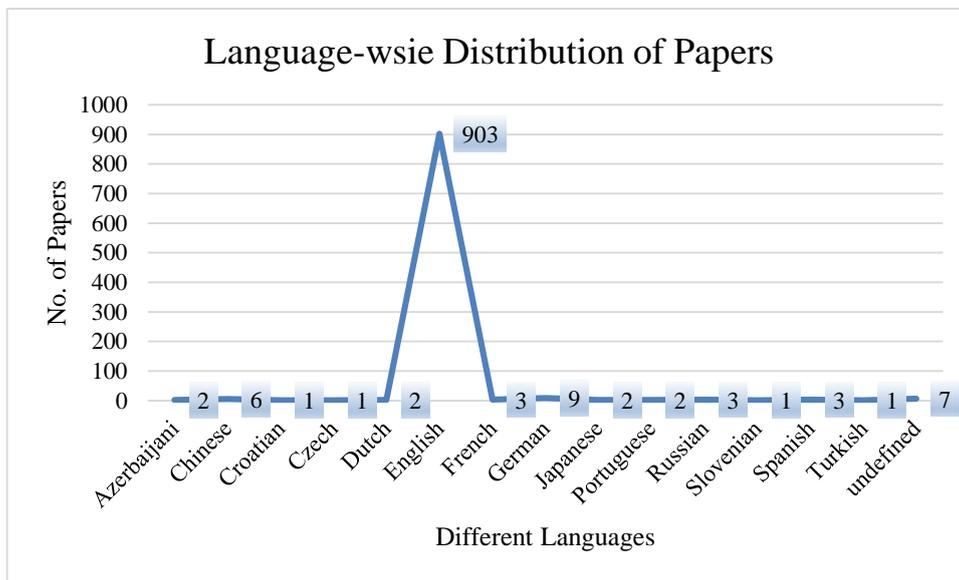
Figure 6: Language-wise Distribution of Orthotics & Prosthetics Literature

The table no. 6 reveals that, English is the most prevalent language, making up 95.45% of the total literature with 903 papers. Azerbaijani, Dutch, Japanese, Portuguese, and Turkish each have 2 papers (0.21% each). Croatian, Czech, Slovenian, and Turkish each have 1 paper (0.11% each). Chinese, French, German, Russian, and Spanish each have 3 papers (0.32% each). Undefined: There are 7 papers with undefined language, which account for 0.74% of the total.

Conclusion: -

The importance of prosthetics and orthotics extends beyond physical rehabilitation—they are essential for improving a person's overall quality of life. By restoring mobility, reducing pain, and enhancing function, these devices enable individuals to lead active, independent lives and fully participate in society. Moreover, they provide significant psychosocial benefits, helping

individuals regain confidence, self-esteem, and emotional well-being. Through advancements in technology and customized care, prosthetics and orthotics continue to play a transformative role in the lives of those with physical impairments.

The study of prosthetics and orthotics literature is essential to driving innovation, improving patient care, and advancing the field. By engaging with the latest research and developments, professionals can enhance their knowledge, adopt best practices, and improve the quality of life for individuals who rely on prosthetic and orthotic devices. This ongoing learning process is key to ensuring that the field continues to evolve and meet the ever-changing needs of patients, healthcare systems, and society.

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The Technologies Emerging in Health Science Libraries and Its impact on Library services: An Overview

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Abstract:

Any recent new developments in advanced technologies will impact in the library field very soon. Particularly the information and communication technology directly relates to the library services and as a result the tremendous changes occurs in the librarianship. Let us just overview on the current emerging technological trends covered in the library field and how it impacts in library services. The upcoming technologies like Artificial Intelligence, cloud computing, mobile computing, e-resources and virtual technologies are the now reality of advancement of new technology which changes the library environment. Here an efforts have been made to analyze the application of emerging technologies like Artificial Intelligence, cloud computing, Internet of Things and virtual technologies in the health science library and its impact on library services.

Keywords: Artificial Intelligence, Humanoid Robots, Robot Technology, Cloud Computing, Internet of Things, Big Data Visualization

Introduction:

Libraries must be always a strong desire to accept the new technologies and must understand doing so the significant changes can bring in the field. But a proper study is required on viability of these technology is necessary before we applying. There is a mind set with few intellectual peoples that library don't implement the new technologies unless and until the patrons are desire to implement. Probably it is true that library doesn't have the its own fund to any development work. Specially health science library completely relying on management decisions. Nevertheless, it is the responsibility of a librarian to come out with the relevant planning and perceive the management the necessity of the particular activity. But very important point is, any plan must be user oriented and they must be the most beneficiary of these exercise.

The new technologies like Artificial Intelligence and cloud computing are recently developed extended part of information and communication technology. The basic idea of these technology

is computer enabled science. As new technology developed the environment, methods, operating systems, network systems, digital media, devices so on... everything changes simultaneously. These kind of vigorous changing digital transformation affects the many types of libraries like government or public sector libraries which are struggling the information and communication technology challenges. The American Library Association identified these problems and launched an initiation to tackle the problems future library.

 The American Library Association (ALA) launched Library of the Future (Centre for the Future of Libraries), an initiative that identified trends for librarians and libraries (Sandhu, 2018). Digital library transformation has primarily affected several types of libraries, such as governments, public sector libraries, and institutional repositories, which are involved in tackling ICT challenges. Digital transformation is a type of change management that incorporates activities, processes, competencies, and models to fully leverage the changes and opportunities of a mix of digital technologies and their accelerating impact across society in a strategic way, with present and future shifts in mind. The speed of digital transformation is altered the libraries to an unpredictable result in librarianship in order to achieve the aim and objectives of digital transformation.

The improvement in a substantial manner in modern technology like computerization, information and networking technologies, storage and dissemination technologies are caused significant changes in librarianship job. Now the libraries have arrived at a moment where librarian and library have to think in a multiple level how they will coordinate the employees and technologies simultaneously. In a commercial point of view competitiveness and innovations are most important specially for the modern health science library. Now we are in the era of Artificial Intelligence and Big data technology. Instead of printed books the digital interfaces and drones are common in modern technology based block chain.

Intelligence is refereed as ability to think of a man. Man can learn the facts and develop the skills and apply then where necessary. In modern technology machine acts like human being. It grasps, perceives, learn and behave like man. Intelligence of the human being measured by Intelligent Quotient (IQ) passing through different aptitude test and functioning. Similarly, computers also developing to measure its ability by testing in a different aspects of intelligence like human being. According to ExLibris the intelligence in computer gives the devices not only ability to learn but also they made to improve the functions without any confusion and better than human being.

In the present scenario Artificial Intelligence touches in all the technical and computing process of our daily activities. Now almost all the computer systems and mobile technology developed with artificial intelligence features. But it may not aware to the users that they are intelligence device. For example, a car gives attentions and speaks when car door is open while moving. A self -driving car or recognition of speech in computer systems or a mobile likewise many. In future every bit of a machine will have a well-defined features of Artificial Intelligence. Artificial Intelligence made computers powerful and speedy than human being. It recognizes pattern efficiently at a large scale that man cannot. The modern growing society demands the access of information in lighting speed. Library could be the prime source to provide this information better than any other source. There is tremendous shift in information technology in a rapid advancement especially in artificial intelligence which forces the library to provide the supply of demand of society. But until and unless libraries move to exploit the new technology as demand rise it may face a serious drawback in the new era.

Justification of Applying Modern Technology in Library:

As we know libraries have gradually evolved on content –wise and structurally in different eras like ancient, medieval and modern. In the ancient era the information was transmitting through clay tablets and stones. Then it was passed through papyrus and parchments in medieval era. And in modern era paper and microform were widely accepted and now it is extended with digital or electronic media. Through out of all these eras Libraries have maintained to meet the needs of its user communities. Earlier libraries were identifying its physical building structures where books were arranged for reading and other purpose. However, the definition of library is now changed from physical structural walls to virtual libraries where there is no walls and services could be rendered through electronic media to its user even in remote area. Meantime libraries have successfully managed to provide the relevant information in relevant time to its clientele from the various sources. So the collections of the libraries have reached to the highest level and consequently the users could be satisfied through the services. In a way libraries have passed, explored, incorporated and metamorphosed through a different era in different technological evolutions like clay tablet, stones, papyrus, parchments, paper, microfilms, computers, internet, virtual libraries, library 2.0, cloud computing applications etc. Now currently its artificial intelligence that has evolved with lot of expectations with its promising applications in libraries. So in spite of its pro and cons unlike the human beings the libraries have to think of AI, in order to extend its benefits to the user and to build up its maximized service

delivery. It is expected libraries can maximize its services through the speed, efficiency and effectiveness in processing library materials and library services at 24/7 without getting tired at all the levels.

Concept of Artificial Intelligence:

When we talk about artificial Intelligence usually the images of the concept come in our mind as something like robots or talking computers. But Artificial Intelligence is an aspect of computer science that makes on how computers learn, explain information, recognizing character, analysis pictures, 3D perception and modelling of the function of the eye, recognition of speech, understanding and use of natural language and expertise systems to gain more attention.

However, there is lot of confusion everywhere about A I. Sometime people may not understand that whether A I is in exist. Because people work with computer or mobile technology as usual and they do not feel that there is a huge change in a daily activity. The question comes, when suddenly everyone speaks about A.I technology and spread its huge applications and benefit in society. In the beginning common people started to think that an unexpected change may occur in our daily life. Like a miracle happen in life style. Slowly now people understanding it is also one kind of modern application which may help in computer technology or information technology.

In general, Artificial Intelligence (AI) refers as capable of performing any kind of complex tasks smoothly which a human could do. Man can make decisions, solve the problems and can think reasoning that a computer or a machine can do the same is called as Artificial Intelligence or AI. At present AI relate to a broader range of technologies knowingly or unknowingly of everyday what service we use. Most of the time we may not aware that a particular service or a task we did or we received due to A I. Now even a software developed to chat or interact with human being called as Chat bot which is example of AI.

When we talk about artificial Intelligence usually the images of the concept come in our mind as something like robots or talking computers. But Artificial Intelligence is an aspect of computer science that makes on how computers learn, explain information, recognizing character, analysis pictures, 3D perception and modelling of the function of the eye, recognition of speech, understanding and use of natural language and expertise systems to gain more attention.

Artificial Intelligence and Health Science Library.

Any kind of emerging technology effects the very soon to health care field. Because the research field in health science demands all kind of innovations from all the corner. Information technology directly hits out to the health science care field and it booms the health science to rush towards the higher level.

When technology runs beyond the line, it is natural to every field to follow and try to catch up the benefit of it. Likewise, it is inevitable to library to run with the technology. The vigorous advancement of Artificial Intelligence forced to health science library to walk with new technology environment. So now it is time to create a smart library with artificial intelligence programming and reach out to the patrons on their expectations. It is not impossible for any library but just matter of time. Application of artificial intelligence in health science library system surround cataloging, issue and reference services, random shelf searching, subject indexing, retrieval of information, dissemination of information, data sharing etc.

Terminology of A I

Before applying Artificial Intelligence technology in library it is very important to get to know about terminology of AI

Few key terms are discussed here to know the developing competency and their applications.

➢ **Machine Learning(ML)**: This is most discussed terms in artificial intelligence technology by the developers. Machine learning is part of AI and computer science that enables computers and AI to focus, learn and to make decisions including images and to enable AI to imitate the way human being do.

➢ **Natural Language Processing (NLP):**This is a sub field of computer science and AI which uses machine learning to make able computers to understand and communicate with human language. It can support text analysis and search functions such as topic building, analysis of sentiment, and entity recognition.

➢ **Neural Networks**: This is a type of machine learning that imitates human brain in analyzing and learning patterns from data. It can be applied in learning and readout the human behavior and can set a data analysis in large.

➢ **Language Modeling:** This is algorithms to understand human language. It will support information retrieval in library, summarization of text and to support chat bots.

➢ **Computer Vision:** This can be applied in digitizing library materials or for advanced image based services. To replicate the perform and automate the human capabilities computer vision seeks in Artificial Intelligence.
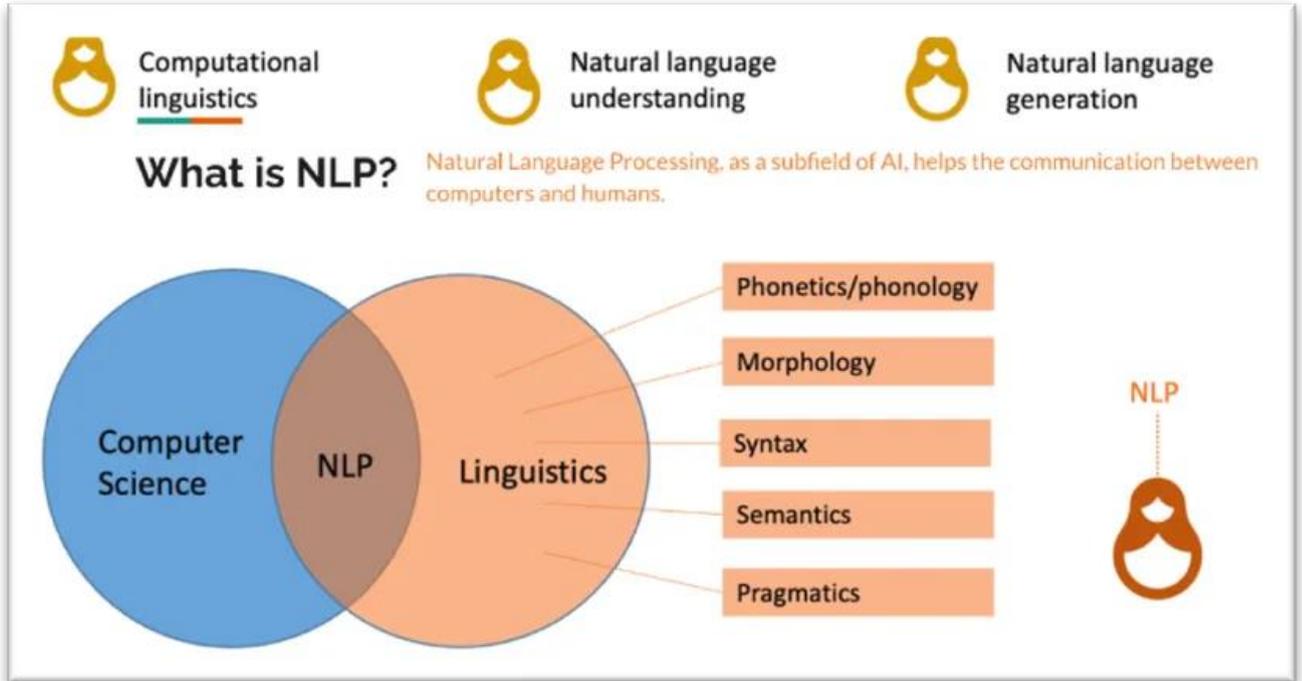
Natural Language Processing(NLP)

➢ **Topic Modeling:** This is a model to discover text based documents. This model used for organizing digital collections, enhancing metadata and improving scholarly search tools and statistically discover the documents.

➢ **Generative Artificial Intelligence:** Generative A I is type of artificial intelligence that can develop new ideas and content like conversations, pictures, stories, videos and music. It can learn any kind of subject matter like art, chemistry, biology, human language and programming languages. It solves any kind of new problems arise in this process. Interestingly it can learn any language and can form words and sentence. For Example: Can learn English vocabulary and create poem from the words.

Generative AI can use for various purposes like chat bots, creation of media, design and develop different products.

Artificial Intelligence (AI) remodeling the health science library services and strengthening user experience. It's developing a new era of efficiency, ease of access, and plenty of innovations.

Here we discuss how AI reshapes the landscape of health science library, initiation of new generation efficiency, approachability and innovations takes place in library activities.

Applications of AI in Health Science Library:

➢ AI in Automation Tasks: Artificial Intelligence's most remarkable contribution to health science libraries automation of regular tasks. Librarian can now rely on AI Algorithms for the cataloguing and organizing to library streamline. This may save the valuable time of librarian, so that he can engage with intellectual proactive activities and can uplift the more accurate and well-organized library system.

➢ Boosting Resource Exploration andAccess: AI supported search engines can understand any kind multiplex enquiries which lead to a relevant and customized results. This will resolve the frustration and ensure a smooth journey in a huge health science library.

➢ Personalized Recommendations: AI can analyze behavior of patrons to generate personalized recommendations, introducing users to a useful and relevant resources. Chat bots and Virtual Reference Services: AI supported chatbots can provide an uninterrupted 24/7 virtual resource searching services to the users.It offers and ensures patronsan immediate assistance when required.

➢ Preservation and Conservation: AI technology can analyse images of library materials to recognize the signs of disintegration, enabling timely intervention and preventive measures. This will protect the valuable collection of library.

➢ Ethical Consideration and Ensuring Impartial Access: When a library applies AI it must be followed by a careful consideration of ethical significances, like data privacy, bias of algorithms, and impartial access. Library must ensure that AI tolls are employed responsibly and maintained an indiscriminate or unbiased resource sharing, recommendations or service provision.

➢ Robots: Humanoid robots or social robots that are supported with artificial intelligent have spreading widely in every aspect of life, including libraries. That can do the things more efficiently than human being does in the library.

Cloud Based Computing in Health Science Library

Cloud based library solutions are now common in health science library to enhance their services and offerings to the patrons and for the better access of resources. Users can exchange and share

the digital resources hosted in the cloud. This can accessible like a ready reference online materials without the physical present. Cloud hosted library solution may improve the capacity of accessing resources with less costs. This can also improve the mobile user experiences for libraries. Now health science libraries all over the world turning to implement cloud based computing system to provide modernized and economical services to the patrons.

Cloud based library system can create a high level of digital library and repositories in the library. The possibility of better utilization of infrastructure, human resources, library resources are can be more positive guaranties on cloud computing.

Internet of things (IoT)

Internet of things or (IoT) another emerged modern technology which is used in most of the well-established library and library management to send the data or information automatically to the users or without any intervention of human being. Libraries can use IoT to identify users, inventory management and prevent theft of library materials. In addition, it may use as higher quality circulation desk operations, speed up the book reservations, detect fire shorts etc. IoTsimplifies e-library services of library. User's also can have a personal experience with IoT technology. IoT gives notifications and recommendations to the users of their location, interest and previous searches. If the customer has to pay fine or any other payments can pay online by using Internet of Things technology and for the same they will receive notifications. The devices of IoT make it easier to collect data from the various resources on user behavior and usage of resources. This data may be used for the improvement of library services and the decisions on the development of library. Library can adopt IoT based appliances like intelligent hand sanitizers, automated fire alarms, smart air conditioners, and advanced security technologies by Internet of Things.

Big Data Visualization

Big data visualization refers a technique and tools application to graphically represent large and compounded datasets to understand and interpret. Process of presenting a large scale of data visually using graphs, maps, charts and other visual aids are called as Big Data Visualization.

Big data visualization is characterized in its ability as per following

➢ Volume: The big amount of data requires a very strong visualization tools which can effectively summarize and present data without losing any information.

➢ Variety: Data comes in various formats like structured, unstructured or semi-structured from the different sources. For an effective visualization it must allow this diversity.

➢ Velocity: data flows in a high speed in sources like social media and IoT devices. Real-time visualization is necessary to speed up with the data streams.

How Big Data Visualization helps to Library?

Information become very instinctive mind set in human being and provokes the identification of patterns, trends, and massive amount of data. Using this technology library can access a huge amount of data and integrate more information globally.

With ample amount of information in its fingertips, it supports readers attract to the libraries. Big data visualization insights in to user behavior and preferences so that academic libraries can improve their offerings and services. The huge amount of organized and unstructured data produces across the countless sectors are referred as Big data. Health science library can adopt big data analytics to monitor its databases, e-books, and journal resources are used. This supports to determine which resources are most useful, popular, and how much the resources are utilized and what kind of devices are used in this process. The Harvard University Library have developed a tool which helps users and librarian identify patterns, usage data, collections and other data. Big Data analytics can better satisfy user needs by optimize the services and resources provided by the libraries.

Conclusion:

The emerging modern technologies always effect very soon in health Science and library field vigorously apart from IT. It is not easy to cope up with new technology and environment as IT field handle the changing situation. However, it is inevitable to move with the mainstream of modern technology for health science and health science library. Because at present it is impossible to imagine any of the development process in every field without modern technology. If we are not going with flow, we will setback and remain sidelined. Health Science is one of the very important field in the world which is need of having a more necessary and possibilities to adopt new technology. Obviously health science library and librarians too need to keep its footsteps with growing health science developments. Hence health science librarians have the lot of responsibility and they must keep alert on focusing the changing environment of his/her field.

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Purpose of use and attitude towards AI sources and services among NIMHANS users: a study

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Abstract:

Artificial Intelligence (AI) is dominating all sector around the world. The researchers analyzed and described about use of AI sources and services for review of literature, Paraphrasing, Grammar, tone, data extraction and synthesis creating impactful charts, graphs, and infographics, attitude towards transforming industries, societies and economies, and AI increased efficiency and productivity etc. among NIMHANS users in this article.   The questionnaire method have used to collect the data in this study.

Keywords: Artificial Intelligence (AI), Attitude, AI sources and services, NIMHANS users

Introduction:

The National Institute of Mental Health and Neurosciences (NIMHANS) is one of the premier hospital and research institution for mental health and neurosciences in India. It has received 4th rank among medical institutions in the current National Institutional Ranking Framework 2024 (NIRF) [1]. The institute offers various Under Graduate (UG), Post Graduate (PG), Ph.D. and other courses in the field of mental health and neurosciences. It has excellent organizational structures and the infrastructure such as buildings, and biomedical equipment's, which required to run a patient care and safety [2] . The Library and Information Centre is a key academic unit of the National Institute of Mental Health and Neuro Sciences. It supports the growth and development of Institute research and training by providing necessary academic information and support to

users. The Library has a large collection of print and electronic resource material in the field of mental health and neurosciences, and in allied disciplines of medical and social health. The Library subscribed to 9126 journals and 5586 books in electronic form in the year under review either directly or through databases, and in the form of clinical materials and special themes.

Artificial Intelligence (AI) is a field of computer science focused on creating systems that can perform tasks that would typically require human intelligence. These tasks include learning from data, recognizing patterns, solving problems, making decisions, and understanding natural language [4]. AI has dominated all sectors worldwide, but human intervention is needed to operate it. Some researchers think AI helps humans by maintaining accuracy or fewer errors and analyzing large/complex data belonging to any field, and some are worried about spoiling natural thinking and ethics. In view of these developments, the researcher intended to analyze the attitude towards AI resources and services of NIMHANS Library users through this article.

Objectives of this study:

1. To analyze the purpose use of AI sources and services of NIMHANS Library users.
2. To analyze the attitude towards AI sources and services of NIMHANS Library users.

Scope and limitations of the study:

Sample

A total of 98 respondents who are perusing Ph.D. courses in the different departments at NIMHANS were selected through stratified random sampling. Of the 98 samples, 41 were males and 57 were females.

Tool employed

The purpose means an intention to a particular task, and the attitude is a state of mind or a feeling. To study the purpose and attitude towards AI resources and services of NIMHANS Library users, questionnaires with highly, moderate and little scale were developed by the researcher in consultation with experts in the field, and they had sufficient reliability and validity.

Procedure

In the first step, the investigators obtained prior permission from the respondents and requested to read each sentence of the scale carefully and select the best option for each statement. They were briefed about the study and informed of the concept, and consent was obtained so that they

could opt-out at any stage of data collection. Once the data collection was over, the questionnaires were scrutinized and checked for completeness, and the responses were fed to the datasheet for statistical analysis.

Limitations

The scope of this study is limited to users who are pursuing Ph.D. courses in the different departments at NIMHANS.

Results and Interpretation:

a) Purpose of use of AI sources and services

Table 1: Use of AI sources and services for review of literature

Purpose	Male	Female	Total
Highly	23 (56.10%)	28 (49.12%)	51 (52.04%)
Moderately	12 (29.27%)	12 (21.05%)	24 (24.49%)
Little	6 (14.63%)	17 (29.82%)	23 (23.47%)

The respondents' level of use of AI sources and services for literature reviews is displayed in the above table. Of the respondents, 51 (52.04%) said they used AI sources and services for literature reviews highly, 24 (24.49%) said they used them moderately, and 23 (23.47%) said they used them little. Compared to female respondents (28, 49.12%), male were used AI sources and services for literature reviews highly.

Table 2: Use of AI sources and services for Paraphrasing, Grammar, tone, and style Using AI writing assistant's

Purpose	Male	Female	Total
Highly	32 (78.05%)	35 (61.40%)	67 (68.37%)
Moderately	8 (19.51%)	12 (21.05%)	20 (20.41%)
Little	1	10	11

	(2.44%)	(17.54%)	(11.22%)

Figure 1 Use of AI sources and services for Paraphrasing, Grammar, tone, and style Using AI writing assistant's

Highly	Moderately	Little
61	20	11

(with a final category showing 0)
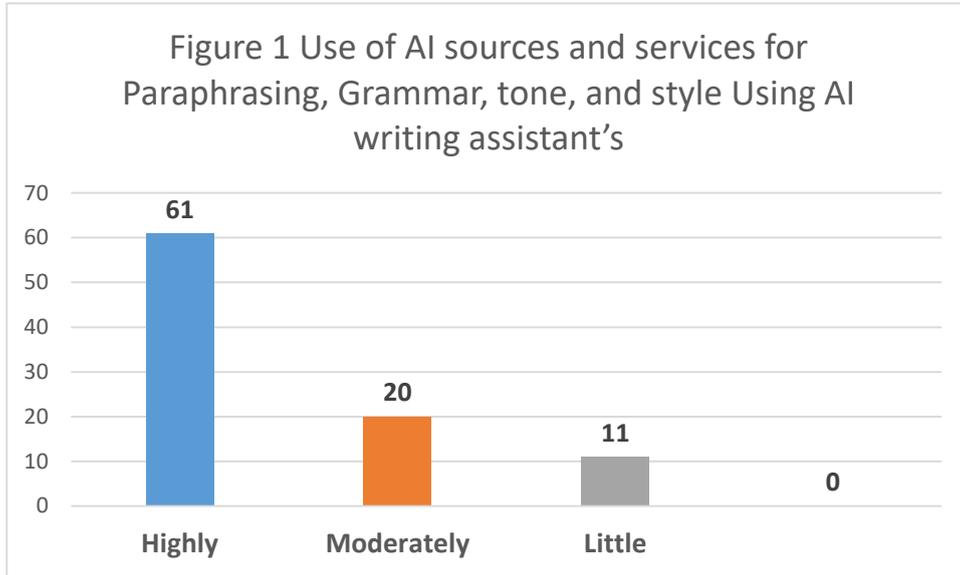
According to the statistics in the above table, the majority of respondents—68.37 percentages of were used AI sources and services for paraphrase, grammar, tone, and style highly, while 20.41 percent were used it moderately and 11.22 percent were used little. Female respondents (17.54 %) indicated little level of use of AI sources and services for paraphrase, grammar, tone, and style compared to males (1, 2.44%)

Table 3: Use of AI sources and services for data extraction and synthesis

Purpose	Male	Female	Total
Highly	18 (43.90%)	24 (42.11%)	42 (42.86%)
Moderately	16 (39.02%)	17 (29.82%)	33 (33.67%)
Little	7 (17.07%)	16 (28.07%)	23 (23.47**%)**

Figure 2 Use of AI sources and services for data extraction and synthesis

Highly: 42
Moderately: 33
Little: 23
0
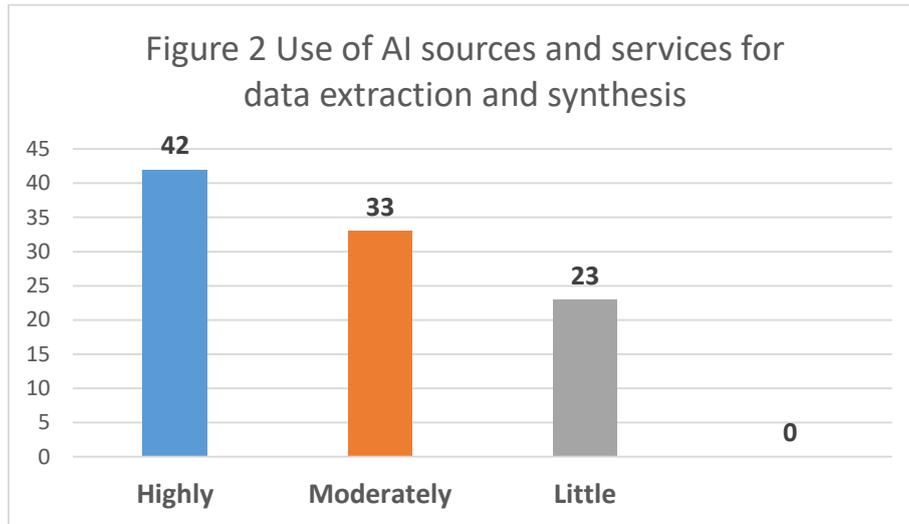
According to the above table, the majority of 42.86 percentages respondents were used AI sources and services for data extraction and synthesis, while 33.67 percent were used it moderately and 23.47 percent were used little. Male respondents (43.90 %) indicated high level of use of AI sources and services for data extraction and synthesis compared to males (42.11%)

Table 4: Use of AI sources and services for creating impactful charts, graphs, and info graphics

Purpose	Male	Female	Total
Highly	14 (34.15%)	17 (29.82%)	31 (31.63%)
Moderately	19 (46.34%)	16 (28.07%)	35 (35.71%)
Little	8 (19.51%)	24 (42.11%)	32 (32.65%)

The respondents' level of interest in using AI sources and services to produce powerful charts, graphs, and infographics is displayed in the above table. Of the respondents, 31 (31.63%) said they used AI sources and services for literature reviews highly, 35 (35.71%) said they used them moderately, and 32 (32.6%) said they used them little. Male respondents (34.15 %) have used AI

sources and services for creating impactful charts, graphs, and infographics highly, compared to women (29.82%),

b) Attitude towards AI sources and services

Table 5: AI is transforming industries, societies and economies, etc.

Level of agreements	Male	Female	Total
Strongly disagree	5 (12.20%)	10 (17.54%)	15 (15.31%)
Disagree	2 (4.88%)	4 (7.02%)	6 (6.12%)
Neither disagree nor agree	3 (7.32%)	8 (14.04%)	11 (11.22%)
Agree	24 (58.54%)	29 (50.88%)	53 (54.08%)
Strongly Agree	7 (17.07%)	6 (10.53%)	13 (13.27%)

For the statement, "AI is transforming industries, societies and economies, etc", 54.08 percent of the respondents agreed, 15.31 percent of the respondents strongly disagreed, 13.27 percent of them had strongly agreed, 11.22 percent of them ambiguity , and remaining 6.12 percent of them disagreed. Amon the respondents males (58.54%) were high agreement compared to females (50.88%).

Table 6: AI is increased efficiency and productivity

Level of agreements	Male	Female	Total
Strongly disagree	4 (9.76%)	8 (14.04%)	12 (12.24%)
Disagree	3 (7.32%)	6 (10.53%)	9 (9.18%)
Neither disagree nor agree	5 (12.20%)	8 (14.04%)	13 (13.27%)
Agree	18 (43.90%)	21 (36.84%)	39 (39.80%)
Strongly Agree	11 (26.83%)	14 (24.56%)	25 (25.51%)

Figure 3 : AI is increased efficiency and productivity

■ Strongly disagree ■ Disagree ■ Neither disagree nor agree ■ Agree ■ Strongly Agree
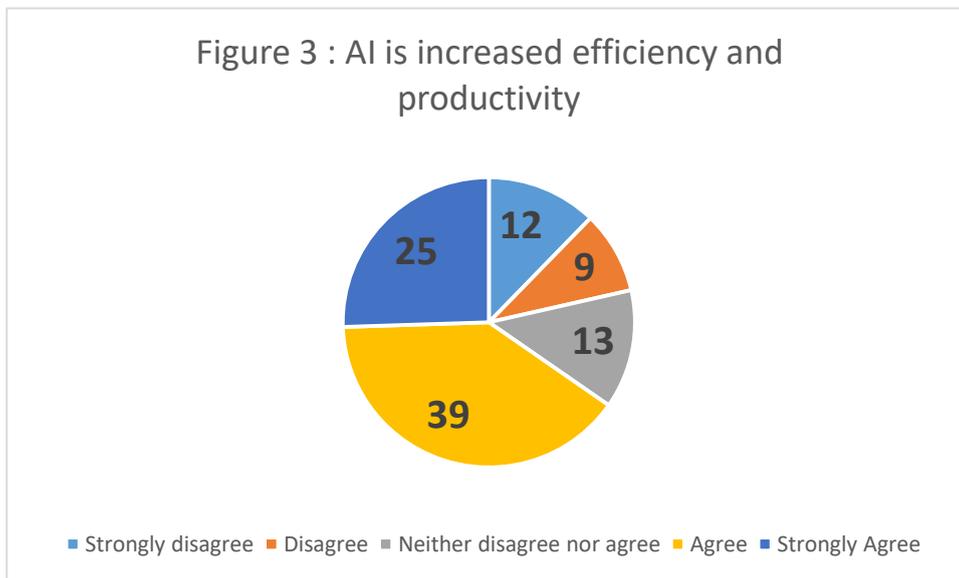
When the statement, "AI is increased efficiency and productivity" is analysed , 39.80 percent of the respondents agreed, 25.51 percent of the respondents strongly agreed, 13.27 percent of them had ambiguity, 12.24 percent of them strongly disagreed, and remaining 9.18 percent of them

disagreed. However, female respondents strongly disagreement (14.04%) compared to males (9.76%).

Table 7: AI Reduces of Human Error

Level of agreements	Male	Female	Total
Strongly disagree	9 (21.95%)	3 (5.26%)	12 (12.24%)
Disagree	13 (31.71%)	9 (15.79%)	22 (22.45%)
Neither disagree nor agree	11 (26.83%)	22 (38.60%)	33 (33.67%)
Agree	6 (14.63	16 (28.07%)	22 (22.45%)
Strongly Agree	2 (4.88%)	7 (12.28%)	9 (9.18%)

For the statement, "AI Reduces of Human Error", 33.67 percent of the respondents had ambiguity, 22.45 percent of the respondents strongly agreed and disagreed, 12.24 percent of them strongly disagreed, and remaining 9.18 percent of them strongly agreed. However, the females (28.07%) respondents highly agreed for the statement compared to males(14.63%).

Table 8 AI Avoid human intervention

Level of agreements	Male	Female	Total
Strongly disagree	21 (51.22%)	15 (26.32%)	36 (36.73%)
Disagree	16 (39.02%)	23 (40.35%)	39 (39.80%)
Neither disagree nor agree	1 2.44%)	11 (19.30%)	12 (12.24**%)**
Agree	3 (7.32%)	6 (10.53%)	9 (9.18%)
Strongly Agree	0 (0.00%)	2 (3.51%)	2 (2.04%)

Figure 4 : AI Avoid human intervention
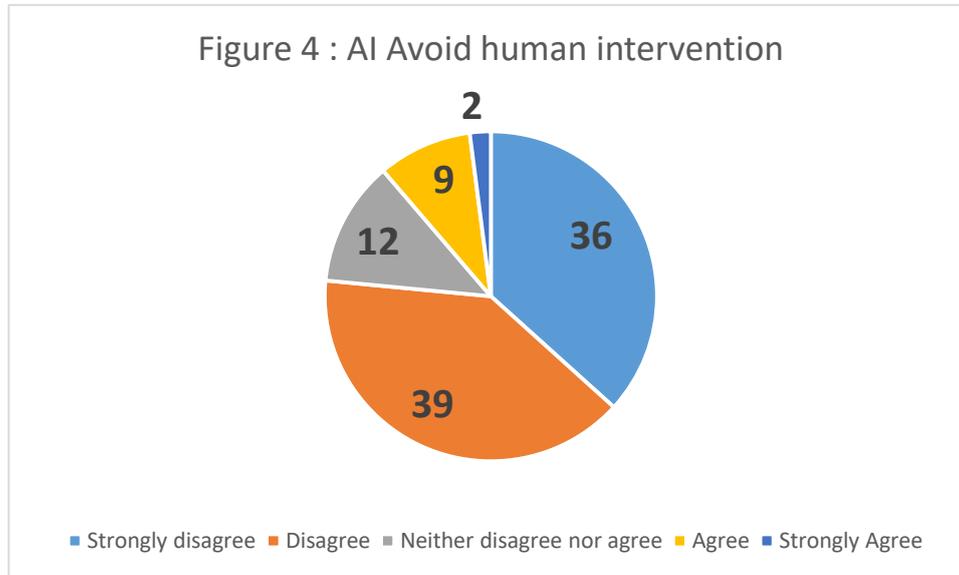
There were 2.04 percent of the respondents agreed, 9.18 percent of the respondents strongly agreed, 12.24 percent of them had ambiguity, 39.80 percent of them disagreed, and remaining 36.73 percent of them strongly disagreed for the statement "Ai avoid human intervention". However, the above data indicated that disagreement from males (51.22%) were high compared to females (26.32%) towards statement

Findings of the study:

- Majority of research scholars were responded highly towards use of AI sources and services for review of literature.

- Majority of research scholars (68.37%) were used AI tools as a research assistant for review of literature, Paraphrasing, Grammar, tone, and so on.

- Majority of 42.86 percentages respondents were used AI sources and services for data extraction and synthesis.

- 54.08 percent of the respondents agreed for the statement, "AI is transforming industries, societies and economies, etc",

- 33.67 percent of the respondents had ambiguity for the statement, "AI Reduces of Human Error",

- Disagreement from males (51.22%) were high compared to females (26.32%) towards statement :Ai avoid human intervention".

Conclusion:

The rise of growth of advancement in technologies has made research scholars to reconsider their information seeking behavior by using AI tools and technologies. AI is growing role in addressing the challenging communication and information needs of researchers. The exploration of its value as a tool in everyday technology is as exciting asset and challenging. It is found from the study that Artificial intelligence has become a vital instrument for researchers for their research and learning process. The study shows that most of the research scholars have average knowledge of AI resources and services. The knowledge of AI tools are very much essentials efforts and should be made to train and explore them in a better way including awareness of ethics and human original thinking.

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The Application of Artificial Intelligence (Ai) in Smart Libraries: An Overview

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Abstract

Smart libraries represent the next evolution in library services, integrating advanced technologies to enhance user experience and operational efficiency. Artificial Intelligence (AI) plays a pivotal role in this transformation, enabling libraries to offer intelligent search systems, personalized recommendations, predictive analytics, and automated processes. This paper explores the application of AI in smart libraries, with a focus on literature review, current implementations, benefits, challenges, and future directions.

Keywords: Artificial Intelligence, Smart Libraries.

Introduction

The concept of smart libraries combines traditional library services with cutting-edge technologies to address the growing demand for efficient, user-centric information access. AI, as a transformative technology, has become integral to the development of these libraries, offering solutions to automate routine tasks, optimize resource management, and personalize user services. This paper aims to examine the role of AI in enabling smart library ecosystems.

Libraries have long served as hubs of knowledge, adapting over time to technological advancements to meet the changing needs of their users. The emergence of smart libraries marks a significant milestone in this evolution, integrating Artificial Intelligence (AI) to enhance operations and user services. A smart library leverages AI to automate routine tasks, personalize user interactions, and optimize resource management, thereby offering a seamless and efficient information experience.

The adoption of AI in libraries addresses the growing demand for user-centric services in a digital-first era. By enabling intelligent search capabilities, predictive analytics, and accessibility tools, AI transforms traditional libraries into dynamic, responsive ecosystems. This paper explores the applications, benefits, and challenges of AI in smart libraries, providing a comprehensive overview of its transformative potential.

Artificial Intelligence

Artificial Intelligence (AI) in the context of smart libraries refers to the integration of advanced computational technologies to enhance library services, operations, and user experiences. By leveraging AI, libraries can automate routine tasks, provide personalized services, and improve resource management, thereby transforming traditional libraries into more efficient and user-centric institutions.

Key Applications of AI in Smart Libraries

- **Automated Cataloging and Classification:** AI systems can automatically organize and classify library materials, streamlining the cataloging process and reducing the workload for library staff.

- **Robotic Assistance:** Robots equipped with AI capabilities assist in tasks such as book retrieval and inventory management. For example, North Carolina State University employs "BookBot," a robotic book delivery system that enhances the efficiency of book retrieval for users.

- **AI-Powered Search and Recommendation Systems:** Advanced algorithms analyze user behavior and preferences to provide personalized search results and resource recommendations, improving information accessibility.

- **Virtual Assistants and Chatbots:** AI-driven virtual assistants offer real-time assistance to library patrons, answering queries and guiding them to relevant resources, thereby enhancing user engagement.

- **Facial Recognition for Seamless Access:** Some libraries implement AI-based facial recognition systems to facilitate seamless checkouts and access control, enhancing security and user convenience.

By embracing AI technologies, smart libraries aim to provide more efficient, personalized, and accessible services, ultimately enriching the overall user experience.

Smart Library

A smart library is an advanced information center that integrates cutting-edge technologies to enhance its services, operations, and user engagement. By leveraging tools such as the Internet of Things (IoT), artificial intelligence (AI), and data analytics, smart libraries aim to provide efficient, personalized, and interactive experiences for their patrons.

Key Characteristics of Smart Libraries

- **Technological Integration:** Smart libraries employ various technologies to facilitate the interaction between people and resources and between people and libraries, while enhancing the efficiency and effectiveness of library services.

- **User-Centric Services:** By analyzing user data, smart libraries offer personalized services, such as tailored resource recommendations and customized search results, to meet individual needs.

- **Enhanced Accessibility:** Features like automated checkouts, digital catalogs, and remote access to resources ensure that users can conveniently utilize library services anytime and anywhere.

- **Sustainability:** Smart libraries often implement energy-efficient systems and sustainable practices, contributing to environmental conservation efforts.

In essence, a smart library transcends traditional library functions by embracing innovation and technology, thereby creating a dynamic and responsive environment that caters to the evolving needs of its users.

AI systems operate by analyzing large amounts of data, identifying patterns, and making predictions or decisions based on that data. They can adapt to new information and improve their performance over time without explicit human intervention.

The field of AI encompasses various sub-disciplines, including machine learning, natural language processing, robotics, and computer vision, each focusing on different aspects of enabling machines to mimic human cognitive functions.

Literature Review

The literature review provides an overview of existing research on the integration of AI in library operations and services.

AI in Library Operations

- **Cataloging and Metadata Management:** According to Smith et al. (2020), AI-powered tools like machine learning algorithms are increasingly used to automate cataloging processes, significantly reducing manual errors and processing time. Natural Language Processing (NLP) facilitates the generation of enriched metadata for digital and physical resources.

- **Predictive Analytics:** As noted by Zhang and Ma (2021), predictive analytics driven by AI enables libraries to anticipate user needs and manage collections effectively. These tools analyze historical data to optimize acquisition strategies and resource allocation.

AI in Library Services

- **Personalized User Experience:** Kumar and Singh (2022) highlight the role of recommendation systems powered by AI, similar to those used by e-commerce platforms. These systems analyze user behavior and preferences to suggest relevant resources.
- **Virtual Assistants and Chatbots:** Research by Goh and Chua (2020) emphasizes the importance of AI-driven virtual assistants in providing 24/7 support for library users. Chatbots equipped with NLP capabilities handle user inquiries, book reservations, and database navigation efficiently.

Accessibility Enhancements

- AI has been instrumental in making library resources more accessible. Tools like text-to-speech (TTS), speech-to-text (STT), and translation services enable users with disabilities to access information seamlessly (IFLA, 2021).

Challenges Highlighted in Literature

- **Ethical Concerns:** Several studies, including those by Smith et al. (2020), underline the ethical implications of using AI, particularly in data privacy and bias within algorithms.
- **Implementation Costs:** Goh and Chua (2020) identify high costs as a barrier to adopting AI, especially for smaller institutions with limited budgets.
- **Skill Gaps:** A recurring theme in literature is the need for training library staff to effectively use and manage AI tools.

Applications of AI in Smart Libraries

- **Intelligent Search Systems:** AI enhances search capabilities by understanding user queries contextually. Semantic search systems powered by AI provide more accurate and relevant results, reducing search fatigue.
- **Resource Management:** AI enables efficient resource planning through predictive analytics, helping libraries identify underutilized resources and forecast demand trends.

- **Automation of Repetitive Tasks:** AI automates tasks such as inventory management, overdue notifications, and document classification, allowing librarians to focus on more complex responsibilities.
- **Enhanced Learning Platforms:** AI integration with Learning Management Systems (LMS) supports adaptive learning, offering personalized content recommendations and performance tracking for users.

Benefits of AI in Smart Libraries

- **Improved User Experience:** AI-powered personalization fosters user engagement and satisfaction.
- **Operational Efficiency:** Automation reduces the workload of library staff, allowing for more strategic focus.
- **Inclusive Access:** AI tools ensure accessibility for diverse user groups, including those with disabilities.
- **Data-Driven Insights:** Predictive analytics facilitate informed decision-making.

Challenges and Considerations

- **Privacy and Ethical Concerns:** Handling user data through AI tools raises significant privacy issues. Robust data governance policies are essential to mitigate these concerns.
- **Cost and Infrastructure:** AI implementation requires substantial investment in hardware, software, and training.
- **Algorithm Bias:** Bias in AI algorithms can lead to unequal access to resources, necessitating careful design and testing.
- **Skill Development:** Training library staff to effectively utilize AI tools remains a challenge.

Future Directions

- **Integration with IoT:** Combining AI with Internet of Things (IoT) devices can create fully automated, smart library environments.
- **Advanced AI Models:** Incorporating AI advancements like GPT and multimodal models can enhance information retrieval and user interaction.
- **Sustainability:** Exploring cost-effective AI solutions for small and medium-sized libraries to promote widespread adoption.

Conclusion

AI is a cornerstone of the smart library paradigm, transforming traditional library operations and services into dynamic, user-focused ecosystems. Despite challenges like ethical concerns and high costs, the benefits of AI in improving accessibility, operational efficiency, and user engagement are undeniable. Future research should focus on developing scalable, ethical, and inclusive AI solutions to ensure that smart libraries cater to the diverse needs of their users.

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AI Tools in Medical and Dental Education: Perspectives from Faculty and Students at Subbaiah Institute Sciences, Shivamogga.

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Abstract

In the academic world, educators, students and researchers are always looking for resources and tools to enhance their learning capabilities and knowledge sharing. Artificial intelligence (AI) has facilitated the development of numerous tools for content analysis, scientific writing, editing, and literature searches in the academic filed. These tools are helpful to get depth and insight to the content of academic studies . by using these tools , researchers can increase the quality of their work . save time , and concentrate more on important areas of their research. Research and teaching in academia can benefits and students and staffs from Subbaiah institute of Medical & Dental Sciences,Shivamogga.

Key Words: - Chat GPT, Learning, Knowledge, research, assessment, academic activates, Medical & Dental students & facilities, artificial intelligence.

Introduction

Artificial intelligence (AI) is one of the most disruptiveinnovations in health care, and the topic has attracted the attention of physicians, clinicians, researchers, and medical device industry professionals. Recent advancements in machine learning (ML) and deep learning (DL) algorithms and cloud.

Computing have increased the adoption of AI. Consequently, applications that can handle a large number of unstructured data underlying AI concepts. This paper will focus on the emerging need for formal AI education in medicine and health informatics,

The popularity of artificial intelligence (AI) in healthcare has exponentially risen in recent years, attracting the attention of professionals and students alike. With the debut of Open AI's Chat Generative Pre-trained Transformer (Chat GPT) in November 2022, a large language model (LLM)-based Chabot with human-like conversational capabilities, this development has gained

further momentum. Although not primarily trained with medical data, ChatGPT-3.5 was barely able to pass the United States Medical Licensing Examination (USMLE), while its successor, GPT-4, surpassed it substantially with a zero short accuracy of 84.3%. Specialized medical LLMs, such as Google's MedPaLM-2, have advanced the field even further, achieving over 85% accuracy on the MedQA dataset of USMLE-like questions and being the first model to pass the MedMCQA dataset, which includes medical exam questions from the All India Institute for Medical Sciences and the National Eligibility cum Entrance Test.

On the other hand, the introduction of medical AI into clinical routine and medical education poses new challenges, such as ensuring patient and user autonomy, beneficence, non-malfeasance, and justice according to the core biomedical ethical principles. Therefore, especially in a field as critical as medicine, where vital measures can be taught and sensible data is handled, it is essential to include education about both the benefits and risks of AI already in the medical curriculum, preparing students for its qualified and responsible use from their career's onset.

These tools are helpful to get depth and insight to the content of academic studies. By using these tools, researchers can increase the quality of their work. Save time, and concentrate more on important areas of their research. Research and teaching in academia can benefit greatly from the thoughtful and ethical incorporation of AI. The various AI tools and technologies that are available are compiled and made clear in this article. Which benefits faculties and students from Subbaiah Institute of Medical & Dental Sciences. Shimoga.

Methodology:-

A 20 – questions survey was distribute through Google Forms to all medical and dental faculties and PG – students at Subbaiah institute Medical & Dental Sciences, in January 2025. It consisted of various sections aiming to evaluated the medical and dental faculties and students' knowledge about AI tools and possible applications in medical and dentistry. Respondent's anonymity was ensured.

To understand the perception of medical and dental college library users (Students & faculties) on the AI-based tools.

➢ To identify the AI-based tools utilized by medical and dental college library users.
➢ To gather opinion of medical college library users on AI-based tools.

➢ To understand the satisfactory levels and identify the challenges in using AI-based tools.

➢ To assess the impact of AI-based tools on the learning experience, academic performance, and research productivity of medical and dental students and on the teaching process of faculty.

➢ To understand impact of AI-based tools on library services and what are their future perceptions.

To recommend medical and dental college libraries to optimize the integration and usage of AI tools for user satisfaction and academic success.

Results

Table: 1 Category wise Distribution of Questioner under Survey

Designation	Frequency	Percent
PG Students	95	86.4
Faculty	15	13.6
Total	110	100

From Table,1 it can be interpreted that Medical and Dental PG Students & Faculty constitute the study population though PG students are comparatively more (86.4,%=95) while more than Eighty percent is constituted by faculty's (N= 15) . More than half of the study population is constituted by PG students.

Table: 02 Frequency distributions of the study variables (n= 110)

Gender	Frequency	Percent
Male	39	35.45
Female	71	64.55

The questionnaire contained closed questions referring to (i) general data (gender, level of study, and field of study), (ii) the use of specific artificial intelligence tools, and open questions (iii) about using artificial intelligence for study purposes.

Table: 3 Descriptive statistics for the use of AI tools,

AI Tools	Frequency	Percent	P Value
Chat GPT	26	23.64	
Grammarly	21	19.09	
Machine learning	20	18.18	
Medical Imaging	10	9.09	
Diagnosis / Drug Discovery	9	8.18	
AI Robot Assisted Surgery	8	7.27	0.001
Google Bard	5	4.55	
AI Chatbot	4	3.64	
Jasper Chat	3	2.73	
Virtual simulation for Learning	3	2.73	
Flash Cards	1	0.91	

Since ChatGPT and Grammarly were the tools used most often among students, we tested if there were any significant differences between males and females and students of different study fields. No statistically significant differences were found between genders (ChatGPT: $T = 0.26$ and $P = 0.001$, Grammarly: $T = 0.21$ and $P = 0.001$) and between students of various study fields (ChatGPT: $F = 26$ and $P = 23.64$ Grammarly: $F = 21$ and $P = 19.09$).
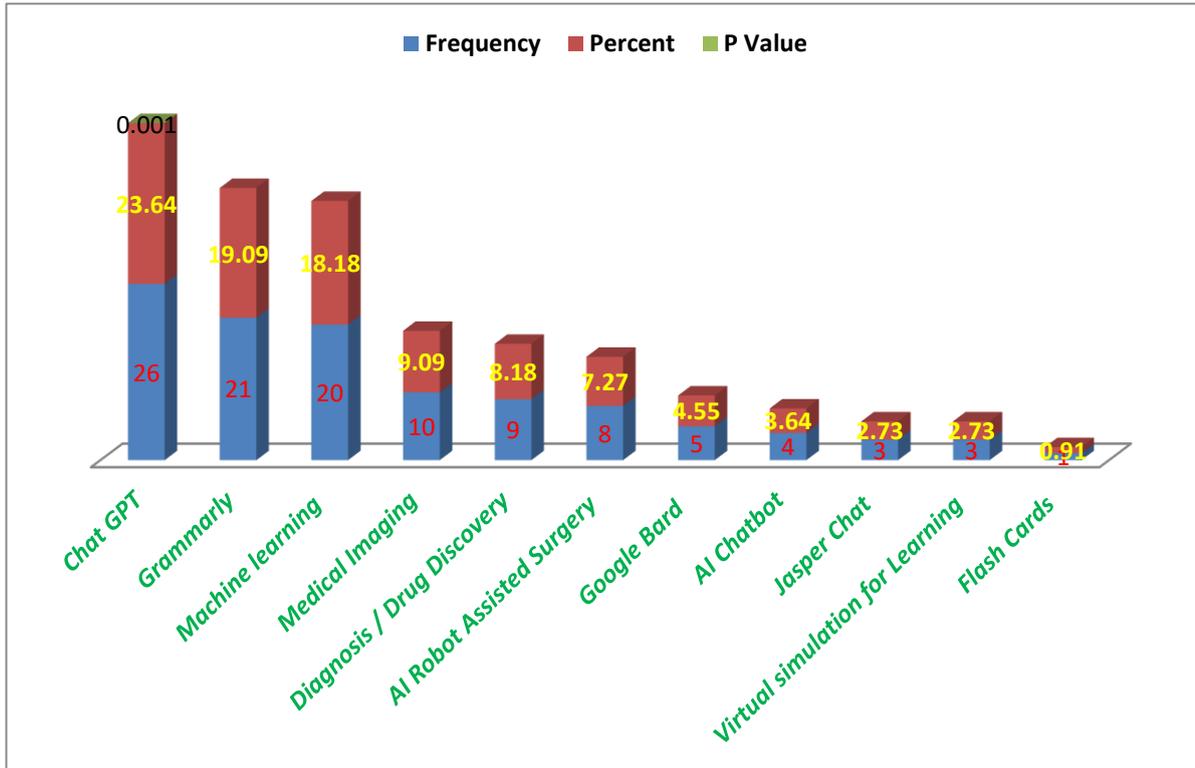
Table 4. Descriptive statistics for skills in using AI tools (How skilled are you in using AI tools?)

	Frequency	**Percent**
Not very skilled	02	1.2
A little skilled	02	1.2
Partially skilled	65	58.2
Skilled	38	34.5
Very skilled	03	2.7
Total	110	100

We also asked students how skilled they are using AI tools. We can that most students (58.2%) are partially skilled or skilled in using AI tools. More details can seen in table – 4. The mean value is 2.7 % (Very skilled).

Table 5. **Descriptive statistics of areas where using AI tools benefits students,**

Area of Using	Frequency	Percent
Faster Learning	30	33
Generating ideas	20	22
Writing seminar papers	21	23
Searching for information	20	22
Explanation of material	08	8.1
Tasks solving	11	10

Statistically significant differences between genders were revealed only for generating ideas (t = -2.325 and p = 0.021). There were no statistically significant differences between students of various study fields regarding the areas where using AI tools benefits them. However, we found statistically significant differences between Faculties and postgraduate students regarding faster learning (t = 2.218 and p = 0.014) and task solving (t = 1.998 and p = 0.047).Post students find AI tools more helpful for faster learning (M = 3.4 andSD = 1.076) than Faculties (M = 2.95 and SD = 1.371).Postgraduates students also find AI tools more helpful for task solving (M = 3.01 and SD = 1.185) than Faculties (M = 2.63 and SD = 1.139).

The sixth and last set of questions concerns the issue of involving artificial intelligence tools in the educational process. The questions and answers can be seen in Table 6.

Table 6. Descriptive statistics for the third set of questions,

Questions	N	YES		NO	
		Frequency	Percent	Frequency	Percent
Do you think using artificial intelligence positively affects the quality of your study?	110	95	86.36	15	13.63

Do you think that artificial intelligence will be even more involved in Medical educational processes in the future?	110	101	91.81	09	8.18
Do you think Medical students should learn more about how artificial intelligence works during their studies ,	110	90	81.81	20	18.18
Do you think that educational institutions should offer training in the medical field of using artificial intelligence for studying	110	85	77.27	25	22.72

Dissections: -

Most PG students reported familiarity with AI concepts, which aligns with AI's growing awareness and integration into various aspects of society. However, their ability to articulate this understanding in their own words was limited. The best explanation, in the words of a student, was "a software tool that "takes" data from a wide database, according to our "requirements."". Students' statements about missing "a single AI that can use text and images and can take a picture of text and have it automatically written" or "AI tools for simplifying very general and broad topics, so there's no need to search for information and read entire books or articles" indicate that some are unfamiliar with AI tools and their capabilities.

ChatGPT and **Grammarly** emerged as the most frequently used AI tools, which resonates with broader trends. Natural language processing tools and writing assistance applications are widely adopted due to their versatility and direct relevance to academic tasks. A few students listed to the majority lesser- known AI tools like Flash card.

The predominant use of AI tools among students was for information retrieval and idea generation. The perceived benefits of AI tools in faster learning, idea generation, and information retrieval are commonly known. Students also use AI tools for writing seminar papers, task-solving, problem-solving, material simplification, and a more straightforward understanding of matter and tasks. Most students expressing satisfaction and excitement with AI tool usage aligns

with the generally positive attitude towards technology adoption in education. However, specific factors contributing to satisfaction may vary and could be explored further.

The anticipation of increased AI involvement in medical educational processes aligns with the overall trajectory of AI adoption in education globally. Studies often reflect an awareness of the evolving role of AI in shaping educational practices. Most students supporting the incorporation of AI training into educational curricula are consistent with recognizing AI as a crucial skill set for future professionals. This aligns with the broader discourse on preparing students for the AI-driven workforce.

Students stated that since there are many valuable artificial intelligence tools, they should learn to use as many AI tools as possible at the faculty. They want to involve artificial intelligence more in their studies and use it to assist them in various projects they must complete at faculties. They want to learn how to use artificial intelligence most skillfully. They think it would improve the quality of learning and reduce the time needed for specific tasks related to the study purposes. One student stated, "Instead of suppressing the use of AI, we should use it to our advantage, such as obtaining key data." Another statement was, "It would be excellent if we could use artificial intelligence without getting into trouble."

Some students miss easier fact-checking, like citing sources in responses, which would enable the checking. They miss better guidance on sources when searching for relevant medical literature They would like to know "how to best obtain as accurate information as possible from artificial intelligence since it often happens that it does not provide accurate information or does not 'understand' what they need and gives completely wrong answers." Students also miss better AI tools for solving mathematical problems, better assistance in programming, and better and more accurate information. They state "most AI tools cannot solve and explain more challenging tasks. For example, **ChatGPT** often solves computational tasks incorrectly." Based on the results and students' statements, we suggest that educational institutions should offer training in using AI for studying purposes.

Conclusion:

The study conducted at the postgraduate students and faculty of Medicine& Dental,in Subbaiah Institute of Medical& Dental Sciences,Shivamogga.Karnataka. gives critical information

concerning academic members' and medical students' opinions and thoughts about adopting AI in medical education. The study's results unveiled a generally positive feeling about integrating AI into medical Learning that can be used for research, knowledge acquisition, assessment, and simulation and that this integration will improve both the quality and efficiency of the learning experience. However, the study also highlighted several ethical concerns raised by faculty members and students. The findings indicate that while most PG students and faculties reported familiarity with AI concepts, their ability to articulate this understanding in their own words was limited. ChatGPT and Grammarly emerged as the most frequently used AI tools. And the perceived benefits of AI tools in faster learning , Idea generation , and information retrieval are commonly known.

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Empowering Library System with AI: Artificial Intelligence for Library Services

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Abstract:

Artificial Intelligence (AI) is new in computer trends and is also used in library applications. It entails teaching computers to perform tasks considered intelligent if performed by humans. The ultimate objective of artificial intelligence in libraries is to create computer systems or computers that are capable of thinking, acting, and even surpassing human cognition; this has clear implications for librarianship. Among these are virtual reality for immersive learning, book reading and shelf reading robots, and expert systems for reference services. Despite the belief that doing so will drive librarians away from their consumers, artificial intelligence is likely to assist libraries in achieving more rather than replacing them. It will improve the way they provide services. Artificial intelligence will have a significant positive impact on library operations and services. It will also enhance and increase the importance of libraries in a rapidly evolving digital society.

Keywords: Artificial intelligence, information organizations, knowledge management.

Introduction:

Computational science's artificial intelligence (AI) field focuses on teaching machines to solve challenging problems like human beings. The cognitive traits of humans are taken, modeled, and combined into algorithms in a way that computers can comprehend and use to produce an output or outcome. We can conceptualize artificial intelligence as a neural network, a network of synthetic neurons or nodes that replicate the organic functions of human neurons. It was created in a system that mimicked the anatomical arrangement of human brain activity. As the neurons move from one to the next, the neural network as a whole produces well-informed conclusions. As it processes data, it models biological processes and makes educated estimates. Therefore, a type of machine learning system, or artificial intelligence system, is a neural network.

The 2016 IFLA Trend Report states that AI may currently both supplement and augment current library services. To remain relevant in their roles, librarians must think creatively. According to the IFLA Trend Report, one of the growing technologies of this century is artificial intelligence. Future libraries can expect to see the following three main effects of artificial intelligence: Browsers will be able to optimize search results beyond term search and text analytics of web content. Real-time, multi-language translation will be supported by integrated speech recognition, language translation, and speech synthesis; cloud services will be able to translate and identify complex and dynamic web content.

Definition of AI:

Artificial intelligence is the design and development of computers to do activities that need human intellect, such as speech recognition, decision-making, goal-setting, language conversion, communication, and recognition of mental states. (Wright, Palepu, and Irizarry-Nones, 2017).

Artificial Intelligence (AI) is the science that enables robots to move, think, learn, reason logically, solve problems, and, to some extent, plan and display creativity. Liu (2016) therefore defined artificial intelligence (AI) as intelligent robots or intelligent systems that mimic AI to replicate human intellect while advancing research into human intelligence. Artificial intelligence (AI) is a subfield of computer science that studies machine learning (ML), Artificial intelligence processes data and interprets the world using a range of techniques, including character identification, image evaluation, three-dimensional perception, and eye function modelling. In addition, it includes speech production, voice recognition, understanding and applying natural language processing, and an increasing focus on expert systems.

Literature Review

The various uses of AI in library settings have been the subject of numerous studies. Systems with AI capabilities have been applied to collection management, helping to choose and acquire resources according to user preferences and demand trends (Fernandez P., 2016). AI has also made the process of creating metadata and cataloguing more efficient.

Methods that increase accuracy and efficiency, include machine learning algorithms and natural language processing (Tella A.2020). Recommendation engines powered by AI have demonstrated significant promise in improving patron interaction and experience with library

materials. It has been discovered that customized book recommendations based on each user's reading interests and habits boost user satisfaction and circulation rates (Shinet.al., 2021). Notwithstanding AI's exciting promise in libraries, a number of difficulties have been noted. It can be difficult and resource-intensive to integrate AI with current library systems, particularly for smaller and underfunded libraries (Omehia A, 2020). In order to prevent biases in library services from continuing, it is also crucial to guarantee the fairness and accuracy of AI algorithms (Shin D, 2021). However, AI offers chances to improve library operations and services, allowing librarians to devote more time to higher-value pursuits like user interaction and specialized assistance (Hobohm et al., 2018). Successful use of AI in libraries depends on an understanding of user viewpoints. According to studies, customers typically embrace AI-based services that improve their experience, such tailored suggestions and quicker access to pertinent data (Gul S, Bano S, 2019). Nonetheless, privacy and data security issues have also been raised, emphasizing the necessity of open consent procedures and transparent data handling (Makri et al., 2022).

The Study Objectives:

1. Determine whether using artificial intelligence technologies in libraries to improve knowledge management is feasible.

2. Revealing how artificial intelligence systems can be used to create technical and administrative procedures in knowledge management libraries.

3. Being aware of the obstacles libraries face when implementing artificial intelligence applications.

Objectives

Framework Development: This paper's primary objective is to create a thorough framework for the intelligent integration of AI into Indian academic institutions' current library systems. This framework will offer a precise implementation plan for integrating AI technology to boost user experiences, optimize operations, and improve library services.

Effectiveness and Economic Efficiency: The primary objective of this research is to utilize artificial intelligence (AI) to enhance the cost-effectiveness and efficiency of library operations. This involves automating repetitive tasks, optimizing resource allocation, and implementing predictive analytics to manage library resources more effectively. The project aims to reduce operating costs while maximizing the value that libraries provide.

Artificial Intelligence in Libraries:

Artificial Intelligence and Ranganathan's Principle of Librarianship

1. Books are for use

All procedures and activities encourage the utilization of the library's information resources. Artificial intelligence technologies facilitate simpler access to and utilization of books and other information materials for users. Now that most books are available digitally, people can use them more than ever before because of their increased accessibility.

2. Every reader his/her book

Regardless of the kind, libraries provide services to many people. As a result, the library purchases information resources to fulfill a wide range of requirements. Every person possesses a specific book or information resource that fulfills their information needs at that given moment. Library users must obtain the book. This is made feasible by intelligent systems like the recommender system. It can suggest resources for the collection development librarian to obtain from the library as well as the best information that satisfies the user's information demands.

3. Every book its reader

Every book has a specific readership. It is improper to utilize or leave books or other information resources on the shelf. They need to have a designated spot in the library, regardless of how few people decide to use them. Artificial Intelligence serves as a mediator between users and books, enabling the book to reach its audience as well as the users of the book.

4. Do not waste the time of a user

This is the ultimate objective that the use of AI in libraries aims to accomplish. Users get more agitated and busy. An intelligent system may rapidly ascertain the requirements of a library user and offer the user with the answers to their questions. Additionally, the quickest path from the user's current location to a library information resource location can be found thanks to an intelligent algorithm. This clever technology can determine the locations of both users and books and provide instructions to link them.

Library is a growing organism

Libraries have changed during the past ten years. This is because a library is a dynamic establishment that should never adopt a static viewpoint. Both the theory and practice of

librarianship have grown in some respects. AI is being used in libraries and information centres to improve services for library users while also fostering growth.

Artificial Intelligence Used in Library Processes

a) AI for Cataloguing and Classification

Artificial Intelligence in Classification and Cataloguing Modern libraries' cataloguing and categorization systems have undergone a considerable transformation thanks to artificial intelligence (AI) technology, which has improved user experience, accuracy, and efficiency. To expedite these procedures, recent developments in artificial intelligence (AI) have brought advanced tools that make use of machine learning, natural language processing (NLP), and deep learning. For example, the classification of library resources is now automated using machine learning techniques. These algorithms are capable of accurately classifying resources by analyzing information, text, and images. Machine learning models can continuously increase their categorization accuracy because they can learn from enormous volumes of data.

A 2023 study by Smith et al. found that AI-driven classification systems cut the time needed for cataloguing in half while demonstrating a 20% boost in accuracy over conventional techniques. Cataloguing has been further improved by Natural Language Processing (NLP), which makes it possible to better comprehend and extract information from unstructured material. NLP tools can read complex bibliographic data and transform it into structured representations appropriate for library catalogues, according to recent study by Chen and Wang (2024).

b) AI for Circulation (OPAC)

1. Better Search and Discovery: AI-driven search algorithms improve information retrieval systems, making it possible for users to locate pertinent resources more rapidly and precisely. More user satisfaction results from improved access to library collections made possible by advanced search capabilities.

2. Effective Metadata Management: By automating the creation and administration of metadata for library resources, artificial intelligence (AI) technologies lessen the labour of librarians while guaranteeing cataloging accuracy and consistency. This makes library operations more efficient and makes it easier for users to find resources.

3. 24/7 Virtual Assistance: Chatbots and virtual assistants driven by AI offer library services round-the-clock assistance. This improves accessibility and user happiness by providing prompt support when required.

4. Data-driven decision-making: AI gives libraries the ability to examine vast amounts of data, such as usage patterns and user reviews, to learn more about the preferences and behavior of its patrons. Strategic planning, collection development, and service enhancements are made easier by data-driven decision-making, which guarantees that library resources satisfy users' changing needs.

c) AI for Reference Services

Intelligent systems are developed to refer library patrons to information resources likely to answer their reference queries within the library system. More work has been done on systems for reference services than on any other service or section in the library to enable users to obtain information resources and have their reference queries answered in real-time through developed digital reference resources and services in libraries (Chemulwo and Sirorei, 2020). These systems aim to guide library patrons to a suitable reference resource, especially when a librarian is not available to help them. Some reference referral systems cover a particular or restricted subject area (highly specialized domain or subject area), while some cover knowledge as a whole (general reference in its coverage). The reference service is a crucial activity of any library and the artificial intelligence tools will function as a complement to the reference librarian. The following are some examples of the application of artificial intelligence tools for reference services: AMSWERMAN is an agricultural knowledge-based system that answers reference queries or questions about topics in agriculture. It narrows down the subject of the query and the type of tool needed using a series of menus. It can function as a front end to external databases or as a consultation system with CD-ROM reference tools (Mogali, 2014).

d) AI for Collection Development

AI tools can be utilized in selecting vendors or book dealers for library materials. An intelligent system to identify a vendor or bookseller can be designed based on previously successful transactions in supplying publications of a specific kind. Such tools would be of particular importance in the procurement of information materials that are less routine, such as conference proceedings, publications in foreign languages or other countries, and certain technical reports, among others. Also, studies have revealed that AI systems have also been developed within the librarianship profession to assist in the process of selection. Such systems include: The Monograph Selection Advisor, which is an innovative effort in applying this emergent technology to building library information resources. Specifically, the system modelled the item-

by-item decision task that a subject bibliographer carries out in selecting monographic resources. The system's knowledge base must be sufficient and the interface features must be sufficiently simple to ensure that the library can obtain the desired results from the AI system.

e) AI for Indexing

Indexing of library resources, especially periodicals, is another area where AI tools are being designed. The basis for document retrieval is indexing. The purpose of indexing is to enhance precision (ensuring that the fraction of the retrieved material is appropriate); and recall (the percentage of appropriate materials retrieved). The keywords which have been determined by an expert (indexer) or a body as being fundamental to human thought on a specific topic will be programmed into the electronic database in a way that will generate the citation on the computer screen for an article or material whenever a searcher inputs these keywords in the proper sequence into the system. Indexing a periodical article entails identifying key components, translating them into verbal descriptions, and choosing and allocating controlled vocabulary terminologies that are conceptually equal to the verbal descriptions. The purpose of automating the cognitive features of indexing is to enhance consistency and indexing quality. The indexing systems can automatically select the proper favourite terms to allocate the appropriate subdivisions based on the information provided by the indexer (Afolayan, et al, 2020).

Difficulties in Using Artificial Intelligence in Libraries

There are still several technological, societal, and economic challenges facing artificial intelligence. Artificial intelligence techniques are still prohibited from entering the information management sector due to major internal misgivings, even though librarians and library administrators are becoming more aware of how important it is to integrate new technologies. These difficulties consist of, but are not restricted to, the following:

a) Financial Uncertainty

Cultural organizations and institutions, like libraries, usually see a drop in their funding whenever public revenue and funds decline and socioeconomic or political developments take place globally. Libraries are unable to justify funding or exhibit cost-effective procedures, particularly if they do not leverage technology innovations to upgrade their physical spaces, launch novel services, and improve the overall experience of library patrons. These all need more money. It is difficult for libraries and librarians to determine the value of integrating these

emerging technologies into library systems due to a lack of appropriate information and knowledge regarding the operational benefits and practical cost-savings that the application of artificial intelligence techniques can offer to libraries. As a result, modern libraries frequently struggle with finance and are unable to provide value without significant financial commitment. Moreover, proprietary software powers the vast majority of AI systems. Libraries are not currently seeing a lot of interest in researching AI-based breakthroughs; further discussion and clarification among specialists are still needed.

b) Openness to Change

The majority of librarians worldwide fear that artificial intelligence (AI) will take over the workplace and eliminate their jobs. The introduction of new technologies and changes to operational procedures are met with infamous resistance from humans. Library staff often display resistance, if not outright defensiveness, to technological change. This could be the result of a range of ideologies, technophobia, or even employment anxiety.

c) Technical Knowhow and Slow Learning Curves among Library Staff

An increasing number of libraries are indicating a desire to adopt extremely inventive procedures and technological integrations. Nonetheless, most libraries lack comprehension or awareness of the tools' use, and staff adoption rates of the tools continue to be high. Skill gaps in digital literacy are impeding the usage of AI tools and technology.

d) Users' Privacy

Artificial intelligence eventually learns to detect particular data sets through machine learning when it is fed enormous volumes of data. Nowadays, personal data is a commodity that can be utilized for evil purposes. AI has the potential to compromise data privacy, which has always been a vital asset to libraries and is even more so in the current technological world. Librarians must safeguard users' privacy by permitting anonymous communication between users and AI systems. Furthermore, since searches and inquiries are logged, this data might be used against specific people. There is a risk while requesting and receiving communications from AI systems since machine learning could collect private information.

e) Linguistic Capabilities

Chatbots aren't able to manage a wide vocabulary or a range of conversational styles because they have a limited amount of memory. Because languages differ by location and preprogramed interactional techniques might not be acceptable for every kind of discourse, developers face a difficult issue in any multilingual nation: anticipating the forms of interaction and creating appropriate responses to them.

f) Understanding of Users' Emotions

Due to AI's efficiency, human creativity and empathy would be diminished, leading to a future in which the library's community ties and other important human qualities would be scarce and undervalued. Because they have feelings and are able to sense each other's emotions, humans are superior to machines. A vital quality for any library employee is empathy, which improves the delivery of information resources and services and helps to meet users' information demands. AI should be used to accomplish things, to help, and to process functions differently rather than being permitted to take values away based on the access and exchange of information.

Demerits of Artificial Intelligence in Libraries.

Artificial intelligence has drawbacks even though it's a potentially unique and intriguing notion for the library system. The following are some drawbacks of artificial intelligence, as stated by Shohana (2016):

1. Artificial intelligence systems possess the capacity to supplant human labour, thereby elevating the unemployment rate within the community. Librarians have been worried about this for many years. There is concern that smart devices that can retrieve information, respond to customer inquiries, shelf books, and serve as reference desks could eventually displace librarians, forcing them out of business. According to Jasrotia (2018), there is a chance that artificial intelligence (AI) would affect librarians more than libraries because these machines are capable of reading digital resources, analysing data, and providing personalized services, insights, and answers more quickly than librarians. This is most likely the reason why a large number of librarians find artificial intelligence in libraries objectionable. However, Guion (2019) contends that the need for librarians would persist because AI-powered machines would not always be able to fully understand the needs of library patrons, as search terms may not always accurately describe what is needed, nor be able to assess how well the outputs of these machines adhere to the fundamental library values of intellectual freedom, copyright, and privacy.

2. It is possible for artificial intelligence systems to malfunction and carry out tasks for which they were not designed. Ex Libris (2019) cites the concern as being the potential for AI systems to spread false information should the algorithms that drive them encounter difficulties.

3. Misuse of artificial intelligence systems has the potential to cause widespread devastation.

4. Because a robot now does cataloguing and classification, an over-reliance on artificial intelligence systems may cause librarians to lose sight of the core processing needed in library operations.

5. Does not have a "human touch." Some users would rather communicate personally and express their emotions with people than with a machine.

Conclusion:

Applications of artificial intelligence in libraries are a veritable tool to attain this goal of re-examining processes and innovating services if libraries are to prosper in the new information economy. Artificial intelligence systems for technical services, resource management, circulation, reference, and information retrieval/dissemination will be of significant help to libraries. Artificial intelligence will significantly improve library operations and service delivery, despite rumours that it will make librarians obsolete. It will also increase libraries' relevance in a constantly evolving digital world. Furthermore, similar to many other emerging technologies, artificial intelligence is also seen as a link between librarians and the human element in libraries. As such, its eventual acceptance and integration into library services will undoubtedly highlight the great promise artificial intelligence holds for the field of librarianship. Artificial intelligence won't replace the human element in libraries or weaken the bonds that libraries have with their users anytime soon.

The adoption of AI technology by libraries is seen as a new catalyst for the growth of smart libraries. Librarians have initiated the integration of artificial technology in specific library sections to stay up to date with global trends. The following list shows creative uses of artificial intelligence in school, college, and university libraries Expert systems are used in reference services, cataloguing, classification, indexing, and acquisition in addition to AI's use in NLP, pattern recognition, robotics, and other library operations. Utilizing intelligent computers in library operations decreases tedious and error-prone procedures, improves research material accessibility, and lessens the need for human intervention and replacement.

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Application of Artificial Intelligence (AI) in Different Areas of the Academic Library

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Abstract

Academiclibrariesarecrucialpartsofeducationalestablishmentslibraries are called the heart of the institutionsand its given access to a wealth of knowledge resources. This article examines how artificial intelligence (AI) can change academic libraries and raise the caliber and effectiveness of service delivery in reference, circulation, cataloguing and classification to meet thechanging needsoflibraryusers.ExamplesofAIapplicationsinacademiclibrariesaregiveninthestudy. The study explores the possible benefits of AI in academic libraries and impediments to its integration. The study concludes that the use of AI in academic libraries is a big step toward better satisfying users' changing needs and offering helpful assistance for teaching, learning, and research. It is recommended that academic libraries embrace artificial intelligence (AI) as a vital tool in their service delivery as technology develops, ultimately improving the academic experience in general. Additionally, the management of the library should work to educate and train staff members to use AI effectively for library services.

*Key Words***:** Academic Library, Library Service Delivery, Artificial Intelligence (AI)

Introduction:

Academic libraries are vital to research and teaching globally. Midpoints of learning and knowledge, they serve researchers, teachers, and students. Cataloguing, classification, circulation, and reference have traditionally been done by people. Information and knowledge availability has long been a priority for libraries. Libraries adapt to new technologies to improve user service in the digital age. AI is one of the most revolutionary technologies libraries can deploy. AI in libraries can improve services and provide accurate information, which can boost growth in this information age. According to Divayana et al. (2015), AI can improve library operations by performing tasks more efficiently. AI helps libraries finish projects faster than humans. This new future appears to have AI and librarians working together to serve users best. Thus, AI can benefit librarians, not threaten them.

Academic library services have been transformed by AI integration. AI is improving academic libraries' information distribution, organisation, and search operations. Kristin Whitehair (2016) states that AI applications can help libraries adapt to shifting information access habits. AI makes it easy to apply this information and get better results. Libraries use AI to increase content access. Future libraries will be shaped by artificial intelligence and powerful computer technology, and quality will differ from our current predictions. Tella (2020) found that libraries in rich nations have fully integrated AI technologies into their operations, while libraries in underdeveloped nations are just starting. Grant and Camp (2018) found that many academic libraries, especially in industrialised nations, use AI for circulation and reference services. AI integration and adoption could improve library services, which are now being explored and considered (Massis (2018)). This article investigates how AI is changing the way academic libraries provide their services with a focus on reference services, circulation services, and cataloguing and classification services in particular.

Components of Artificial Intelligence

The two major components of artificial intelligence are machine learning and its subset, deep learning. Ali, et al, (2020) among other scholars identified the following components of artificial intelligence.

1. Machine Learning:AI technology called Machine Learning (ML) lets systems learn on their own without being trained. A consuming machine-learning system regulates output and reaction from data. Unique programming can train a machine learning system to recognise case study models by exposing it to the massive data collection. When using its own output as an input or data source, the system can be tested and programmed again. Two machine learning systems can work together or compete in ML systems. (ALA 2019). Computing algorithms that use data to teach themselves are the emphasis. Library information services can benefit from machine learning systems. AI uses Machine Learning techniques including Big Data, TDM, Robotics, Pattern Recognition, and Chatbots**.**

2. **Deep Learning Deep Learning (DL):** is a machine learning subset. The human brain inspires the algorithms and artificial neural networks which then learn from enormous amounts of data. Even with a data set that is unstructured, very diversified and interconnected, machines solve complicated issues through deep learning. Natural Language Processing (NLP), Image Processing (IM), and Neural Networking are examples of AI tools used in the context of Deep Learning

3. **Natural Language Processing:**NLP lets computers understand a query or solution's main language impressions. Subject indexing, information retrieval systems, and bibliometrics are all ways NLP can help build a digital library. Research found that text mining is used to organise large amounts of linguistic data (i.e., convert unstructured data to structured data) and describe textual concepts.

4. **Pattern Recognition:** Pattern recognition automatically finds data patterns and consistencies. Machine learning includes pattern recognition, data mining, and database knowledge finding. Pattern recognition relies on past knowledge or structure statistics. Classifying patterns often involves clusters of observations or measurements that define points in a multidimensional space. The Completely Automated Public Turing Test (CAPTCHA) is used at the front-end interface to verify human or robot status.

5. **Robotics:** Library jobs require manual labour, which robots can aid with. Robots now perform numerous library tasks, including dangerous and time-consuming ones. A robot employs artificial intelligence to do automated tasks under human control, pre-defined instructions, or generic procedures. The PESIST central library in India has a robot that files, sorts, and replaces volumes. Libraries with large collections utilise robots for inventory. A Temasek Polytechnic Library robot named 'Robbie' can scan over 32000 books every day. Another library robot, 'Bobbie', can distribute newspapers, magazines, pamphlets, and direct guests and pupils between areas. Automated robots are answering library clients' FAQs. Although robots have artificial intelligence, they are human-made and require human interaction to operate.

6. **Chatbots:** Chatbots (Known as intelligent agents, digital assistants, or virtual agents, these software applications may engage in intelligent conversation through speech, text, or perhaps by embodied expressiveness. Their design closely mimics human discourse to facilitate communication and interaction with individuals. This was accomplished in the Turing Test for artificial intelligence. Amazon's Alexa, Google Assistant, and Siri exemplify contemporary chatbots utilised in daily life.

Application of AI in Library Operations

1. Reference Services

Reference services have always been important in academic libraries. Academic libraries provide reference services to connect clients to the massive data held in their holdings. Reference

services at academic libraries help clients find information and research resources, answer questions, and navigate the collection. Reference librarians help students find course materials, suggest reading, answer research questions, and advise on research. AI can potentially be utilised in libraries to improve reference services, textbook scanning, and subject category recognition, according to Tredinnick (2017). AI can improve library reference services and streamline information and research support.

The AI listed below can be used to enhance library reference services:

a. **Chatbots and Virtual Assistants:** Reference librarians used to answer users' enquiries manually, which took longer. AI-powered chatbots in library management systems or websites can immediately answer frequently asked user questions, relieving librarians. To save up library staff time for more sophisticated enquiries, these chatbots can answer general questions, library policies, and easy research questions. AI chatbots like ChatGPT are helping academic libraries, according to Adetayo (2023). They are available outside of library hours and reply to enquiries quickly and accurately. AI-powered chatbots and virtual assistants can also provide resources and help with research citations. These chatbots are always there to help. Panda and Chakravarty's (2022) study on integrating intelligent AI chatbots with library information services found that they can provide virtual aid, improve reference services, and promote a "library without walls." Libraries could consider AI-enabled chatbots as virtual assistants to meet user information demands. The study examines how AI integrates with other technologies and affects intelligent information services.

b. Search Optimization: Reference librarians can advise users on complex research assignments. These sessions provide personalised research guidance. AI has the ability to enhance search results, simplify resource discovery, and enhance database and library catalogue search functionality. AI techniques can also extract important information from massive textual databases in text and data mining, making it easier for academics to find and study library content.

c. Natural Language Processing Natural Language Processing (NLP)can understand and analyse user requests. It can improve reference service effectiveness by providing more exact and contextual responses. Johnson & Brown (2019) say NLP algorithms help consumers search more conversationally, understand context, and get more accurate results**.**

c. **Content Abstraction and Summarisation:** Librarians often construct subject guides, or pathfinders, with recommended reads. These guides are essential for anyone pursuing a special interest. However, AI may simplify big documents or articles to help readers understand the

main points. Busy students and researchers benefit from it.

d. **Recommendation Systems:** Recommendation Systems: AI algorithms can create library patron recommendations. These systems propose books, articles, and other materials based on a user's borrowing or reading history. This helps users find research-related materials. This personalisation helps consumers find materials they might not have noticed, improving the user experience. The "potential for library systems to use AI techniques" and the usage of AI in Iran's libraries are examined by Asemi & Asemi (2018). The data show that recommender systems are the most advanced and natural language processing the least.

e. **Data analytics:** Data analytics: AI can analyse library usage data to identify trends like the most popular resources, subjects, and times of peak usage. This data can inform resource allocation and collection development. AI improves dataset analysis in academic libraries, especially for large datasets analysed across several datasets, according to Sivarajah et al. (2017). Benefits include eliminating tedious and repetitive tasks.

f. **Virtual Reference:** Virtual Reference: Library customers can get 24/7 help from AI-powered technologies. They offer 24/7 reference services, allowing patrons to receive help while the library is closed. This minimises librarian burden and provides 24/7 support, making libraries more accessible (Harris & Turner, 2021). Virtual Reference: Many libraries offer email, chat, and instant messaging reference services.

g. **Language Translation:** A wider range of users will be able to access library resources with the AI's ability to translate content into various languages.

h. **Digital Preservation:** AI can help with digital preservation, which helps to guarantee the long- term availability of digital resources. AI can also help with the curation and preservation of digital collections.

i. **User Behavior Analysis:** User Behaviour Analysis: AI can analyse users' behaviour and preferences to help libraries meet their customers' needs. According to Williams (2019), AI personal assistants like Siri, Alexa, Cortana, and Google Assistant have changed how customers expect answers to their questions. Students increasingly expect databases to understand and know what they are searching for, changing their database search expectations.

2. Cataloguing and Classification

Cataloguing and classification are academic libraries' main tasks. Cataloguing and categorisation organise and describe library materials for better retrieval. Librarians use standard cataloguing criteria and metadata like subject headings, classifications, and keywords to make library

resources more accessible through catalogues and databases. Previously, librarians manually catalogued books and other resources by subject, author, and other variables. This was laborious and error prone. AI can automate the following technologies to transform these services by integrating AI into much of this work. Asefeh and Asemi (2018) list various ways AI might improve library services, including circulation, book shelving, cataloguing, and more. Some of the artificial intelligence (AI) in cataloguing and classification are as follows:

a) **Natural language processing:** Natural language processing: Automatic metadata compilation for digital materials helps speed up cataloguing. Content-based classification utilising machine learning models reduces human error and ensures consistency. Machine learning algorithms can identify the subjects of books, papers, and other materials and make them more discoverable for readers by assessing their content (Smith et al., 2021). Libraries can better invest in community outreach and education due to their efficiency. NLP is used in many domains, including library and information science. Indexing underpins document retrieval in search databases like the Online Public Access Catalogue.

b) **Automation:** By making it easier for users to find library resources, AI can help generate metadata and tag new library materials, enhancing cataloguing efficiency. This speeds up user access to new items and reduces librarian workload.

c) **Improved Search and Discovery:** Advanced AI algorithms can increase library catalogue search performance. Even with mistakes or synonyms, users can find materials faster. Fernandez (2016) noted that AI in academic libraries will improve massive data processing, metadata development, and search translation. Thus, using AI in academic libraries will boost material availability and allow staff to answer users' AI questions.

d) **Digital Content Management:** Digital Content Management: Librarians manually classified digital materials. Cataloguing and classification of digital items like e-books, music, and video can be done with AI. Content can be tagged using machine learning models for easier discovery.

e) **Content Recommendation:** AIcan also help with content recommendation, guiding users to relevant resources based on their perceptions and interests. Artificial intelligence (AI) can generate tailored recommendations by examining past search trends and user behaviour, which can improve the discoverability of library materials.

3. Circulation services

A well-functioning library's circulation service is essential to the smooth exchange of materials between the library and its patrons. The management of library resources that are checked out to

users is a part of circulation services. Circulation services include managing holds and reserves, renewing loans, checking out and in materials, issuing library cards, and enforcing loan policies, among others. However, Integrating AI in circulation can streamline these services by automating repetitive tasks like check-in and check-out as well as overdue notifications. Ways by which artificial intelligence (AI) can enhance circulation service are as follows:

a) **AI recommendation systems:** The circulation service increases access to books, journals, multimedia, and other resources by lending and returning them to patrons. Users check out materials at the circulation counter, where staff handle paperwork. Staff scans records, library cards, and user IDs to confirm item availability. AI can predict material demand and help regulate inventory, ensuring popular things are available. AI recommendation systems can revolutionise library services by proposing appropriate books, enhancing user experience, and offering new research opportunities by assessing users' borrowing patterns and historical selections (Chen & Lee, 2020). These customised suggestions enhance user experiences and help find new books and resources.

b) **Accessibility Services:** Efficient and seamless access to library resources is guaranteed by circulation services. To give people with disabilities equal rights to library resources, AI can help transform printed materials into formats that are accessible for people with disabilities, like text-to-speech or audio descriptions for images.

c) **Self-Check out and Return Kiosks:** Self-Checkout and Return Kiosks: The circulation service makes books, periodicals, multimedia, and other resources more accessible by lending and returning library materials. Users check out materials at the circulation desk, where library staff handle paperwork. Staff scan user IDs or library cards, check item availability, etc. AI-powered self-checkout and return kiosks allow users manage their borrowing. These systems use computer vision and RFID to scan and process many objects at once, reducing wait times. Tredinnick (2017) believed AI technology may help library customers find content through automated library services and intelligent tutoring systems.

d) **Automated Fine Management:** The library circulation service lends and returns books, tracks due dates, renews loans, handles hold, and collects overdue fines. AI-powered technologies simplify these processes. AI algorithms can determine overdue materials, calculate fines, and waive fines. This automation ensures fair fine handling and reduces administrative burden.

e) **Predictive Maintenance:** Libraries establish a favorable user experience through their effective circulation services, which in turn promote patron satisfaction and repeat business. AI

analytics can be used to for ecastwhen self-checkout machines and other library equipment will need maintenance. This pro active strategy guarantees sless down time and unimproved user experience.

However, despite libraries' minimal representation in current AI initiatives, Bradley (2022) contends that the industry actively engages in consultations to ensure an ethical and transparent future for AI. The author argues that libraries can still bein volvedin AI legislation because it is still in its early stages.

4. AI for Collection Development: AI tools can be utilized in selecting vendors or book dealers for library materials. An intelligent system to identify a vendor or book seller can be designed based on previously successful transactions in supplying publications of a specific kind. Such tools would be of particular importance in the procurement of information materials that are less routine, such as conference proceedings, publications in foreign languages or other countries, and certain technical reports, among others. Also, studies have revealed that AI systems have also been developed within the librarianship profession to assist in the process of selection. Such systems include: The Monograph Selection Advisor, which is an innovative effort in applying this emergent technology to building library information resources. Specifically, the system modeled the item-by-item decision task that a subject bibliographer carries out in selecting monographic resources. The system's knowledge base must be sufficient, and the interface features must be sufficiently simple to ensure that the library can obtain the desired results from the AI system.

I. Benefits of AI in Academic Library

The integration of AI in to academic library services offers several benefits, including:

- AI integration enhances library service accessibility and diversity. Jackson et al. (2018) agree that these changes helped the library's purpose of providing knowledge to everybody, regardless of ability or language. Hussain (2023) examined library AI integration opportunities and obstacles. The results showed that AI can improve library services. Talley (2016) advised university librarians to employ AI to better assist scholars and other library users.

- AI-powered chatbots and virtual assistants provide fast, continuous help, boosting customer satisfaction and knowledge. The importance of AI in library services is

studied by Al-Aamri and Osman (2022). The findings demonstrate that many libraries have integrated AI technology into technical assistance and reference services to make information access easier.

- AI chatbots and virtual assistants improve client satisfaction and knowledge by providing fast, constant support. The importance of AI in library services is investigated by Al-Aamri and Osman (2022). The findings show that many libraries use AI in technical assistance and reference services to simplify information access.

- AI suggestions improve resource discovery by assisting users in locating pertinent content that they might have overlooked otherwise. According to Yuan (2021), the direction libraries take in the AI era will have a significant impact on research on technological innovation and library development.

- By potting possible security threats, AI help stomake libraries safer places AI can also improve library security. Artificial Intelligence (AI) can monitor library spaces by utilizing machine learning and surveillance technology to identify anomalous behavior and notify staff about possible problems. This keeps the library's environment secure and safe for patrons.

- Library network security: Li, (2021) investigates the use of artificial intelligence (AI) technology in library network security. The study assesses network security scenarios, it offers an analytical hierarchy process and an AI technology approach that enhances prediction accuracy and real-time performance.

- situation assessment. The efficacy of the suggested AI models in anticipating and evaluating library network security scenarios is demonstrated through experimental research. The results imply that AI can improve the security and defence of library management networks.

- AI helps with improved inventory control and resource allocation which is known as resource management.

- Text-to-speech and speech-to-text features offer assistance to people with hearing or vision impairments.

II. AI integration challenges in academic libraries

In contrast to other fields where AI has been adopted and applied, where its use has been growing exponentially, library and information science have not experienced this.

Initial Costs: Libraries have historically struggled to adopt new money-related trends due to financial constraints. Farag et al. (2021) note that lack of physical equipment is the first main issue in integrating AI into libraries, followed by a lack of local AI technology vendors. Echedom and Okuonghae (2021) examine the pros and cons of AI in African academic libraries. The investigation found infrastructure and training deficiencies. The authors advise the government and library administration to collaborate on AI adoption in African libraries and design relevant policies. However, libraries must budget for AI implementation, which might be pricey.

Insufficient user privacy protection: AI systems collect and analyse data, which may raise concerns regarding misuse. Libraries must secure user data and handle it responsibly (Williams & Davis, 2020).

Lack of AI literacy: Liu et al. (2022) conducted a study on AI technology in university libraries' information retrieval. The project sought to improve intelligent information retrieval systems. AI information retrieval technology for university libraries was plagued by difficulty learning new information, imprecise knowledge representation, and poor natural language comprehension, according to a survey. Library workers may need training to use AI technology effectively. Abayomi et al. (2021) say artificial intelligence (AI) can improve work performance and user satisfaction, but libraries need to be more conscious of its value. The study recommends that academic librarians learn about AI's benefits from library management, attend conferences, and train to prepare for its use. Weijia (2022) also advises training library workers in artificial intelligence, encouraging them to explore AI implementation, and creating a welcoming environment.

The possibility of bias in AI algorithms: Inadequately thought-out AI systems may inadvertentlyreinforcepreexistingbiasesinthecontentselectionandrecommendation process.Tosolvethisissue,librariansandAIdevelopersmustcollaboratewhileaiming for impartiality and fairness (Smith & Martinez, 2019).

Library personnel job loss risk: Abayomi et al. (2021) examine Nigerian academic librarians' awareness and perception of AI in university library management. The findings showed

academic librarians understood AI's use in libraries. They feared losing their jobs if it was adopted. Johnson (2018) believes that as AI advances, people may rely more on technology and stop using libraries and librarians. AI improvements could cause employment polarisation or job losses, according to Korinek and Stiglitz (2017). Automation and AI adoption could worsen inequality. Li (2021) further notes that AI-generated prior art reduces scientists' incentives to patent crucial discoveries.

Conclusion:

AI technology helps libraries worldwide provide better services. AI is revolutionising academic library services by improving cataloguing, categorisation, circulation, and reference. The literature review showed how swiftly, and widely academic libraries are using AI. It has many benefits for usability, efficacy, and accessibility. Academic libraries using AI can better meet users' evolving demands and aid teaching, learning, and research. Libraries are using AI to better serve their communities and give access to knowledge and information in a changing digital world. Despite the challenges, integrating AI into library services could revolutionise information access and use in the 21st century.

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IOT-Enabled Smart Library: An overview

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Abstract

I recently stayed at a five-star hotel in a big city. When I scanned the card given to me at the reception, my room door opened and the entire room glowed. Later, when I entered the working area, I was given instructions on how to use the equipment and other code-activated electronic gadgets. I was also told to use the same card for all purposes. Currently, this is the situation in a lot of offices, apartments, and other service centres. Where normal processes are getting more productive and efficient, internet of things integration is becoming more widespread. We are grateful that technology is giving us more time and space to innovate and provide better services.

Keywords: Internet of Things, Smart Library, Digital, Data, Communication

Introduction:

The Smart Library a library that uses 'Internet of Things technology" to operate effectively and efficiently while also offering services that draw user's in. In order to collect and exchange data, the Internet of Things (IoT) connects actual objects—such as books, furniture, equipment, and devices—to the internet. By implementing these affordable technologies, an out-dated, visually appealing library can be transformed into a sophisticated, one. IoT characteristics in libraries include:

1. Radio Frequency Identification, or RFID

These days, it's typical for many large libraries as well as medium-sized libraries to adopt this tag-oriented identification technique for simple book tracking and user check-in and check-out capabilities by offering kiosk facilities. These have made it easier for the library's daily operations to locate misplaced books using real-time inventory.

2. Smart Shelving

Sensors can be added to library racks to monitor the stock of books on the shelves. The system automatically updates to reflect the removal or return of books, giving users up-to-date information on the availability of books.

3. Environmental Monitoring

In order to create the ideal atmosphere for users and books, sensors can monitor and manage variables like temperature, humidity, and lighting. This helps preserve delicate materials and enhance reader comfort.

4. Customization and User Involvement

Personalised recommendations can be given by tablets and e-readers depending on the user's previous reading preferences. With the use of aided mobile apps, technology can help patrons find specific books or sections by providing navigation or search assistance.

5. Protection Mechanisms

IoT cameras and sensors can improve security by monitoring the movements of books, stopping theft, and guaranteeing the safety of expensive purchases.

6. Smart Study Spaces

Consider utilising smart lighting, such as bulbs that can change the brightness and colour temperature to suit mood and degree of concentration, readers can use wireless charging stations to keep gadgets fully charged and use headphones to tune outside noise.

7. Automated Notifications

One important factor in improving the smart library user experience is automated notifications. Libraries can raise patron engagement and satisfaction by offering timely information and tailored recommendations. Here are some main sorts of automated notifications used in smart libraries are personalized suggestions, hold and reservations, over-due notifications, library events and programs, new material and digital content related notifications.

8. Integration with Digital Libraries

The way users interact with and access library resources is being revolutionised by the integration of Internet of Things (IoT) devices and technologies with digital libraries. IoT makes it possible for libraries to provide better services, more efficiency, and individualised experiences

by linking physical devices to the internet. Digital library systems and IoT systems can collaborate to enable users to move between physical and digital collections with ease.

Benefits of Internet of Things

Efficiency-Staff and users save time and money when regular chores like document management and environmental control are automated.

User Experience: Libraries become more interactive and easily accessible with personalised services and up-to-date information.

Sustainability: By using smart energy management systems, libraries can cut operating expenses by using less energy.

Challenges and Considerations:

Data privacy: Make sure that user data is collected and stored securely.

Make that various IoT systems and devices are compatible with one another through interoperability.

Cost: Investing heavily in IoT technology at first can be costly.

Maintenance: To keep IoT systems operating correctly, regular maintenance and updates are needed.

User Adoption: Teach customers how to make efficient use of IoT-enabled capabilities.

Conclusion:

Similar to how coffee-blend flavour intensifies user experience, IoT-enabled smart libraries offer a fusion of the physical and digital worlds, which is a crucial component of library operations both now and in the future.

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Artificial Intelligence Usage in Library Services

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Abstract

Application of Artificial Intelligence in Libraries Artificial Intelligence matters to libraries because it be used for organizing and Artificial intelligence is the newest technological advancement empowering the digital library. The goal of artificial intelligence is to create computer systems or machines that are capable of thinking, acting, and even achieving human intellect. This has clear ramifications for the field of librarianship. Library operation and services will be greatly improved by artificial intelligence, which will also make libraries more important in today's quickly changing digital world.

Keywords Artificial Intelligence, Library Service, Learning Tools, Technology Integration.

Introduction

The technique of developing machines possessing like a human cognitive function is known as artificial intelligence. It is capable of actions deemed "smart." Unlike humans, artificial intelligence (AI) systems can process enormous amounts of data in many ways. AI wants to be able to do human-like tasks including pattern recognition, decision-making, and judgment.Artificial intelligence has already touched many of our daily computing tasks. Artificial intelligence is present in most modern computer systems and cell phones, and we have probably used them for years without realizing that they are sophisticated instruments.

Objectives

- To Improving Library Services with AI Technology.
- To introduce more Search and Learning Tools.
- To providing accurate results.

Definition

Originally appearing in 1955, The late Stanford professor John McCarthy defined it as "the science and engineering of making intelligent machines." Though a lot of research has shown

that humans can teach robots to play sophisticated games like chess, our attention is currently focused on machines that can learn, at least in part, like humans. The simulation of human intelligence processes by machines, particularly computer systems, is known as artificial intelligence.

The Purpose of AI in The Service Sector

Artificial intelligence (AI) has the potential to significantly increase efficiency and performance in the service industry, as demonstrated by recent application cases. To effectively reap the benefits of AI, service organizations must ensure that technology improves rather than modifies employee workflow.

Literature Review

Librarians are change agents of the modern and cutting-edge technologies since they have always adapted to new technology that improves their services. At first, automation and digitization were the only additions made to the library's processes and services. Hussain (2022a, 2022b).

Libraries maintain expensive hardware, such PCs, scanners, photocopiers, and multimedia, on hand while managing data. Security cameras must monitor the area from multiple angles to prevent library materials from being taken. Facial recognition algorithms for security and safety have also been made possible by artificial intelligence (AI) surveillance applications. (Ali and colleagues, 2020).

Current Developments in Artificial Intelligence (AI)

Artificial intelligence involves a wide range of general research areas, including robotics, speech recognition, planning and decision support, computer vision, intelligent control systems, expert systems, intelligent computer-assisted instruction, image processing, natural language processing, and speech recognition (Asemi & Asemi, 2018).Some of the most recent developments and trends in the field of library science include big data, blockchain technology, podcasts, vodcasts, data everywhere, drones, robotics and artificial intelligence (AI) technology, unplugged, makerspace, and the internet of things (IoT).

A Few Essential Artificial Intelligence Applications For Libraries

OCR is an acronym for "Optical Character Recognition." It's a method for recognizing words in an image captured digitally. One capability that is frequently used is recognizing text in digital documents and photographs. An image or hard copy paper document can be converted into an electronic version that is readable and rich in text by using OCR software.

Deep Learning

Deep learning (DL) is a type of machine learning. The human brain serves as the model for algorithms and artificial neural networks, which subsequently absorb information from enormous amounts of data. Examples of Deep Learning used to AI approaches are artificial neural networks, processing images, and natural language processing.

DDS

The term "document delivery service" (DDS) or "document supply service" describes how a document from a library collection can be physically or electronically sent to a library user's home or place of work upon request.

NLP

Natural language processing (NLP) is a machine learning approach that allows computers to comprehend, control, and interpret human language.

CHATBOTS

Also referred to as artificial intelligence digital personal assistants, or virtual agents, chatbots are computer programs that possess the ability to communicate effectively through text, voice, or possibly embodied expression. This was achieved in the artificial intelligence Turing Test. Some of the most popular chatbots of today include Siri, the Google Assistant, and Alexa from Amazon.

BIGDATA

Big data is typically gathered from a variety of sources, including sensors, devices, networks, log files, video/audio, online, social media, and transactional applications. Its quantity and nature exceed the capacity of conventional relation databases to collect, store, and handle the data.

Robotics

In real time, telepresence robots can offer library patrons individualized support in the form of locating books or other resources, responding to inquiries, or offering advice on available services. RFID (Radio Frequency Identification) tags are being incorporated into library collections. Using wireless, portable RFID scanners and readers, these barcode-style tagswhich are used to swiftly scan the library's collection— contain distinct identification identifiers for every book there. Smart shelves with many RFID antennae may detect automatically when books are taken out of their stacks or put back, according to Li et al. (2015). This can be used to create reports for missing or incorrectly shelved volumes and for automatic shelf reading.

Artifcial Intelligence in Libraries

Robots in Libraries

Artifcial Intelligence in Libraries

Robots in Libraries

Robots in Libraries

Robotics is a subfield of artificial intelligence and it focuses on the perceptual and

motor tasks. It also refers to the branch of technology that deals with the design,

construction,

The Advantages of Artificial Intelligence For Libraries

- Reduces Human Mistake.
- Speeds Up Decision-Making.
- Round-the-Clock Availability.
- Reduces Risk, Automates Repetition.
- Provides Electronic Helpers,
- Offers Smarter Being Human Workflows.

The Disadvantages of Artificial Intelligence For Libraries

- Expensive.
- Unemployment.
- Creating AI models and robots costs a significant sum of money in many industries, AI can readily replace humans.
- Lacking thinking.
- Increases people's slowdown, dependence, and lack of critical thinking.

- Security and privacy of data.

Conclusion

Through the implementation of AI, libraries will be able to more easily assist both present and former users when they are in need. Libraries in both wealthy and developing nations are still learning how to use this technology. While libraries have a wealth of AI literature, most of it only addresses specific library applications. AI in library services has a bright future ahead of it. Customization, accessibility, robotics, interaction, and innovation are just a few areas where AI may be further integrated. Researchers and library workers need to be open to change, encourage creativity, and create plans for successfully incorporating AI into library services.

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Artificial Intelligence in Learning: Transforming Educational Knowledge
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Abstract

The utilization of AI applications in education has changed in recent years as it provided various ways of enhancing learning processes. For instance, in recent years, it became possible to convert texts into videos hence changing passive information to dynamic and interactive learning methods. AI enables teachers to produce instructional videos efficiently without too much explaining and of complex instructional ideas. In this paper tools are focused on the use of AI in video creation based on text for educational purposes and tools for such use, challenges and advantages of such a technological implementation in the learning environment.

Keywords: AI tools, text-to-video, video generation.

Introduction

In digital era, how educational contents are delivered is transformed from the classroom based traditional method to multimedia driven platforms. One of the most promising developments in e-learning is the ability to generate educational videos from text using AI technologies. These AI tools automatically generate videos by converting the textual information into visual, auditory and in some cases interactive type of media is introduced. This could be ideal in particular for education and training activities where large number of educational videos on various subjects are needed to be produced rapidly and are tailored to the requirements of students.

1.Review of Literature

There have been studies that indicate video content improves business student engagement and understanding. This is in line with Mayers Cognitive Theory of Multimedia Learning (2001). The creation and integration of graphics and audio is likely to lead to better learning experiences for learners since they can take in information in different forms. Ai- generated videos seem to agree with this theory by helping learners experience both text and audio because both of these aspects are merged into the videos.

It is pointed out by Kim and Johnson (2022) that AI based video technologies have the capability to facilitate the video creation process for users making it possible to come up with

video lessons in straight forward manner. In spite of such changes O'Leary (2023), states that there still the issue of the confidence, flexibility and relevance of these AI generated videos in particular context or subjects of very high technicality.

2.   AI Tools for generating educational content:

There are various platforms that enable the user to transform text into videos with the help of AI algorithms. Making the learning process more interesting, and lively. These include content narration and broadcasting software that integrates natural language processing (NLP), machine learning and meticulous video rendering technologies to develop effective teaching tools.

2.1   Lumen5 (Pdf to Video):

Lumen5 is a cloud-based software solution for content marketing primarily used to create video or transition text and other materials such as blogs, articles. Lumen5 is directed towards content writers, marketing specialists and other companies who want video in professional quality in a few clicks and have no experience in video editing.

Key Features of Lumen5:

i)   Text-to-Video:

Text to video feature has the capacity to convert one of the foremost forms of content, text into video by providing the tools to analyses the input content for ideas while providing relevant visuals, animations and sounds for the end results.

For Lumen5, rather than a blog frame user may insert message posts, articles or even a few words and within the platform, not outside the video is built.

ii)   Drag and Drop Interface:

The drag and drop functionality is a very user friendly features which is available in the platform in order to make the recording of video components adding and deleting text and altering the looks of the video.

iii)   Media Library:

Lumen5 makes available some stock pictures, clips and seeded works to add on the user's videos and therefore caters from millions of video pictures to background music for the user.

iv)   Editable Layouts:

Editable layouts are available templates ready to be used and can be modified to suit different needs such as social media, marketing for a presentation.

v)   Automatic Storyboard creation by AI Algorithms:

The input text is analyzed by Lumen5's AI and a storyboard is created from scratch without even the user designing it which shows how the video layout would be before construction of the video. This function helps in reducing the time span design sector of the video.

vi)   Brand Design Features:

Brand design features helps YouTube content creators and it will benefit them by uploading their videos and brand them, as the users will be able to include their logos, respective colors and choice of font in the video.

vii)   Encrypted Output Videos for the social sites:

Encrypted output videos for the social sites like Facebook, Instagram, LinkedIn and YouTube are delivered and Lumen5 ensures in doing so, the delivered video formats of the system match the target requirements.

Use Cases:

i)   Content Repurposing:

Lumen5's most significant contribution is the conversion of written content into short videos which can be used online or for marketing anyone in the video industry.

ii)   Marketing:

Marketing content creation helps one to creates promotional videos, explanatory videos and social media contents.

iii) Education:

Lumen5 application is video oriented toll which is used by educational content makers to create instructional or tutorial videos.

2.2   AI. InVideo.io (Text to Video):

InVideo.io is an online service where users proceed to generate video content from the text. It facilitates the work of video content creation process enabling such individuals and businesses with little skills and experience in video production.

Key features of AI. InVideo.io:

i)   Text to Video:

In Text to Video feature if the script is being written, the app creates an interesting video for it by choosing the pictures, moving images and sound. Users can enter some text and the AI presents a video made with adequate media elements.

ii)   Templates and Themes:

InVideo.in has number of no cost templates that customers can select. All these templates are editable and ready for different type of projects like promotional videos, social media posts, animated explanations etc.

iii)   Media Library:

Media library is a huge collection of stock pictures, video clips and audio clips that the user can integrate into his videos without having to go and look for those things.

iv)   Voiceovers and Text to Speech:

Voiceovers and text to speech have the text to speech technology for those who do not want to record themselves. There are other options like many different accents and language variants.

v)   Easy Editing:

In easy editing feature once the AI creates the video, users have the option to edit and customize the video by changing the text, graphics, transitions and the duration to better fit their requirements.

vi)   AI Resources:

AI Resources are the data base that the AI uses for the context of the provided script or content is used to recommend a video clip and music or any item the AI determinates would fit the subject matter of the particular created script or content.

vii)   Intuitive Platform:

The Intuitive platform allows ease of use enabling people whether newbies or seasoned creators to come up with videos within no time and with little work.

Use Case:

i)   Media Videos:

In media InVideo is used for speedy creation of content for Instagram, YouTube etc.

ii)   Marketing:

Marketing people use AI for Promotional videos, product views and ads.

iii)   Corporate:

In Corporate sector AI is used for Internal training videos and corporate webinars for employees to improve efficiency.

2.3   Haiper (Visual Video Generator):

Haiper is a tool that creates videos and saves time by combining great features and intelligent solutions to every process of making videos. Hiper is aimed at content creators, marketers and anyone who needs to produce engaging video content quickly without needing advanced video editing skills. The tool provides a user-friendly interface, realistic motion effects, and a variety of use cases from social media posts to marketing videos.

Key Features in Haiper:

i)   Ease of use:

Anyone can make videos by putting only text as prompts and the AI makes a video out of the provided input.

ii)   Images to Video Animation

Images to Video Animation feature lets you animate still images using an AI program to turn them into videos.

iii)   Video Repainting:

Video repainting lets you modify the style, colors and subjects in an existing video adding new artistic touch to your visuals.

2.4   Small pdf (pdf summarizer)

Small pdf is an AI tool embedded within a cloud-based platform that utilizes artificial intelligence to create an effective summary of any pdf document in a shortest time.

This function will help such readers to comprehend the major intentions and main aspects of unstudied texts to the reader, avoiding needless reading.

Key Features of Small pdf:

i)   Time Factor:

Using the AI mechanism of summarizing the long independent documents will only take a couple of minutes since all it does is cuddling the most significant pieces of the documents. Reports, Research, Capital Projects, Legal Contracts that may take precious hours to go through will take only minutes.

ii)   Mastering:

The AI is designed to extract core sections, divisional keywords, and the key sentences within any document so as not to state the main points of the particulars but present the important overall.

iii)   Convenient:

Convenient is a tool that is deployed within the Small pdf system therefore it is the user who has to upload the document, click the summary icon and Ai will get the summary without enhancing any complicated measures.

iv)   Versatile File Support:

Versatile file support works within the pdf ecosystem and it is designed to handle various document formats like word converted to pdf and can be applied to variety of content types, such as essays, reports and more.

4)   Benefits of AI Generated Videos in Education:

Looking at educational application of AI generated videos, each of them seems to provide more prospects for enhancing the educational experience. Incorporating video usually increases the amount of information retained in the audience, particularly visual and auditory learners.

4.1   Enhanced Engagement:

Videos are considered to be better than text as most students are visual and auditory. AI generation of the videos supported by illustrations, narration and different transition effects help pull the attention of the students and keep their concentration to the content being delivered.

4.2   Time Efficiency:

AI tools are able to cut down the time to great extent so it is being used in making such video lessons. Rather than physically shooting and editing video material, teachers can give a verbal or written brief and get the AI to create the video. This gives educators time to attend to the learners and even go further to design the study curriculum that they had set out to do.

4.3   Personalized Learning Experience:

Personalized learning is made possible for most of the educators to develop learning content and enhance current learning material to the students according to their ways of learning. For example, certain AI videos can be used for certain students for individual needs.

 4.4   Scalable Content Creation:

AI powered video generation allows educators to create large volumes of content at scale. This is particularly useful for massive open online courses or distant learning platforms where large number of students need access to instructional material.

4.5   Multimodal Learning:

Multimodal learning works by integrating text, images, video and audio, AI generated videos support multimodal learning which has been shown to improve knowledge retention. Learners are more likely to absorb and retain information when it is presented in multiple formats, enhancing overall compensation.

5.   Challenges and Limitations of AI Generation Tools:

Despite the advantages, there are several challenges and limitations, that must be considered when using AI tools to generate educational videos.

5.1   Content Quality:

The benefits of AI tools like text to video generation are well understood today but the content quality including content accuracy and relevance is still a major issue. Self-produced videos are capable of addressing these issues but do not always have the effect required to effectively deliver theories with high order of complexity.

5.2   Lack of Human Emotion and Interaction:

In text to video application, AI voice and avatars of the instructors are emotionless compared to human instructors. Due to this over a period of time videos became robotic and students interest is lost.

5.3   Limited Possibilities for Customization:

Although some AI video generators provide customizing options the level of customization is limited. The educators face difficulties in delivering desired teaching methods.

5.4   Ethical Concerns and Bias:

Video content AI tools are likely to reproduce biased content that are present in derived data sets. Moreover, there are concerns about the ethics of using AI which sometime recreates the biased content. And also there is a growing concern about the usage of AI in education which people fear will compromise the trust and authenticity of education.

 5.5   Accessibility and Digital Divide:

Not every student is capable of acquiring high speed internet access or some devises needed to effectively watch video materials. Such a digital divide may hamper the extent to which AI generated videos can reach those who are ill serviced geographically and technologically.

Conclusion:

The growing AI tools that allow the generation of video from the text suggest a breakthrough to the educational system through providing active, expansive content that can be desirable for the students. These tools can assist instructors to conserve their time, tailor the process of learning and more effectively involve students with the help of additional content. However,

it is also praiseworthy to state that such development has its own setbacks such as the quality of the content, ethical aspects, and accessibility of such tools when teachers deem it appropriate to use order provision in their instructional actions.

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The Impact of Artificial Intelligence on Smart Libraries

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Abstract:

Artificial intelligence plays a crucial role in modern society and has significantly contributed to the evolution of smart libraries. This article explores the fundamental aspects of smart libraries and artificial intelligence, examines AI applications in the library domain, and highlights the value of AI in enhancing library services. The integration of artificial intelligence will be instrumental in the continued advancement of smart libraries.

Keywords: Smart Library, Artificial Intelligence, Big Data

Introduction

In recent years, emerging technologies such as the Internet of Things (IoT), big data, cloud computing, RFID, artificial intelligence (AI), and virtual reality (VR) have significantly contributed to the evolution of smart libraries. These technologies have enhanced physical space management, streamlined information organization, optimized service delivery, and refined administrative processes. The primary goal of smart libraries is to foster seamless information connectivity, provide diverse knowledge-sharing platforms, and offer high-quality, efficient services to patrons. Various applications, such as intelligent inventory and positioning systems, 3D/AR/VR navigation systems, mobile self-renewal platforms, smart seat reservation tools, and 24/7 self-checkout systems, have already become well-established in modern libraries.

As smart libraries continue to evolve as an advanced form of digital libraries, integrating sophisticated technologies becomes crucial in elevating user experience and service quality. AI is expected to be a major driving force behind these developments, complementing existing technologies like IoT and RFID, which alone are insufficient in meeting the growing technical demands of smart libraries. This paper explores the role of AI in smart libraries, reviews its current applications, examines existing challenges, and envisions future developments in AI-driven library services.

Artificial Intelligence

Artificial Intelligence (AI) refers to the development of computer systems capable of performing tasks that typically require human intelligence, such as speech recognition, decision-making, problem-solving, and language processing. AI seeks to replicate human cognitive functions while advancing research on intelligence and automation. Various AI methodologies, including machine learning (ML), deep learning, neural networks, and reinforcement learning, enable AI systems to process and interpret information efficiently. AI also incorporates natural language processing (NLP), speech synthesis, and expert systems to enhance data comprehension and usability.

Libraries leverage AI to enhance information organization and accessibility. The integration of AI-driven systems has transformed libraries beyond traditional search functions, offering advanced tools to classify and retrieve information effectively. AI is instrumental in cataloging, acquisitions, reference services, circulation, and indexing, providing users with a more personalized and efficient library experience.
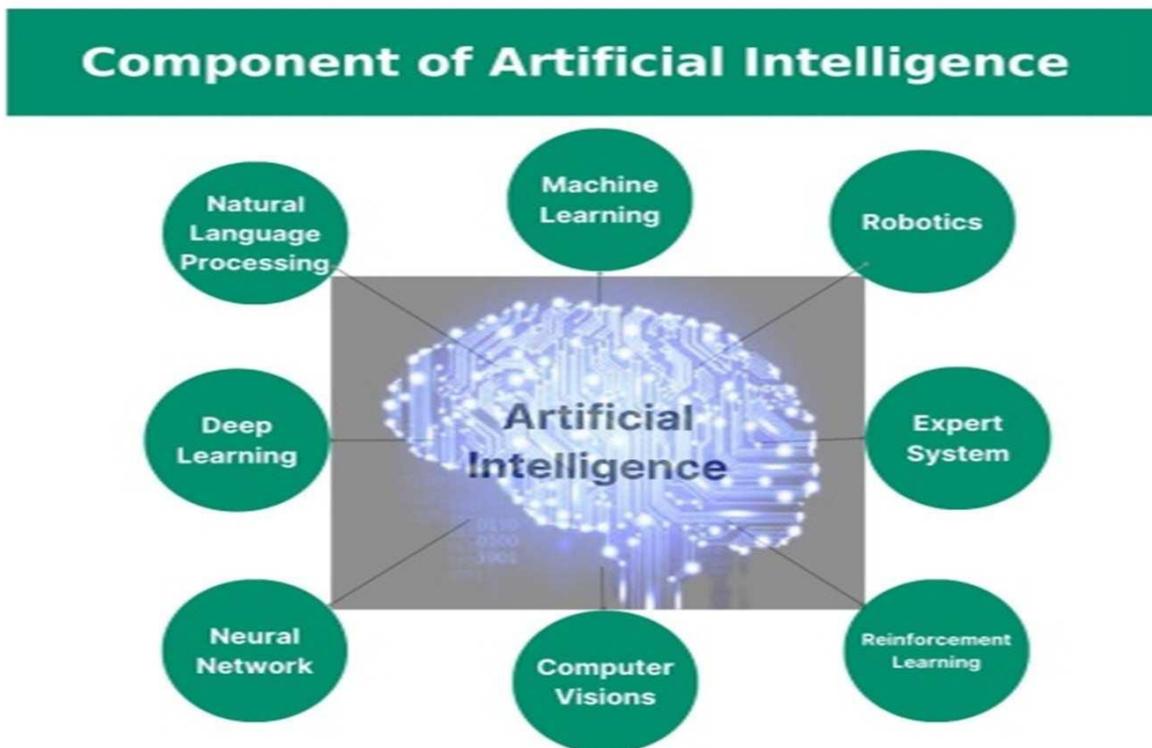
Applications of AI in Smart Libraries

AI in Cataloging

AI has revolutionized cataloging by automating metadata generation, classification, and indexing. Using NLP techniques, AI can analyze textual content to extract relevant details such as titles, authors, and subject matter. AI enhances authority control by identifying

inconsistencies in author and subject names, ensuring uniformity across databases. It also facilitates multilingual cataloging by translating and transliterating metadata, making information accessible to a broader audience. Additionally, AI can detect duplicate records and merge them, streamlining catalog database management.

AI in Acquisitions

AI optimizes the acquisition process by analyzing vendor performance, market trends, and library usage data. It assists in vendor selection, budget allocation, and predictive analytics for resource procurement. AI can recommend materials based on user preferences and borrowing history, ensuring libraries acquire relevant resources. Additionally, AI aids in subscription management for digital resources, tracking expiration dates, and suggesting cost-effective licensing options.

AI in Reference Services

Smart libraries integrate AI-driven virtual assistants and chatbots to provide real-time support for users. These systems offer 24/7 assistance, answering frequently asked questions and guiding users through library resources. NLP-powered AI enhances search capabilities by understanding user queries in natural language, providing more accurate and context-aware search results. Personalized recommendations based on user behavior further improve user engagement with library collections.

AI in Circulation

AI enhances circulation services through automation, predictive analytics, and smart notifications. Self-checkout and renewal systems powered by AI reduce manual workload and improve efficiency. AI assists in managing book reservations, prioritizing holds, and optimizing resource allocation based on demand patterns. Additionally, AI combined with RFID technology streamlines inventory tracking and automated book sorting, enhancing operational efficiency.

AI in Indexing

AI-powered indexing automates document classification, content categorization, and entity recognition. AI enhances search engine ranking by analyzing user behavior and improving result accuracy. It facilitates cross-language indexing, ensuring information is accessible to a global audience. AI-generated summaries and highlights help users quickly assess document relevance, improving information retrieval efficiency.

Robotics in Libraries

Robots are increasingly being integrated into library environments to improve operational efficiency. Robotics applications include automated book retrieval, inventory monitoring, and security surveillance. Robots equipped with robotic arms facilitate material handling, reducing physical strain on library staff. AI-driven security robots patrol library premises, ensuring safety and preventing unauthorized access.

Robotics can be applied to various library functions to improve efficiency, improve user experience and streamline operations. These include:

Library security and retrieval: Robots with robotic arms can store and retrieve books and other materials. This reduces the workload of librarians and ensures that items/books are kept on the shelves/containers.

Inventory Management: Robots can constantly monitor inventory by scanning shelf locations and comparing scanned information to library databases. This helps identify missing or misplaced items and ensures that the catalogue is up-to-date.

Security: Autonomous robots equipped with cameras and sensors can patrol library spaces to monitor for security breaches or unauthorised access, providing additional security.

Document Sorting: Robots can conveniently sort documents and return documents for processing, reducing the time required for manual processing and allowing workers to focus on other tasks.

Figure 2: A talking robot from Mohd. Bin Rashid Library, Dubai.

Youtub link: [Dubai's Stunning Mohammed Bin Rashid's Library Powered by Robots — Warehouse Automation](#)

Advantages of AI in Libraries

1. **Enhanced Information Discovery:** AI-powered search engines improve information retrieval through advanced indexing and recommendation algorithms.

2. **Automation of Repetitive Tasks:** AI streamlines cataloging, sorting, and metadata generation, allowing librarians to focus on more strategic tasks.

3. **Improved User Experience:** AI chatbots and virtual assistants provide instant responses and personalized services.

4. **Personalized Recommendations:** AI tailors content recommendations based on user preferences and browsing history.

5. **Efficient Resource Allocation:** AI analytics assist in collection development and budget management.

6. **Enhanced Metadata and Content Enrichment:** AI refines search results by adding contextual metadata and summaries.

7. **Increased Accessibility:** AI-powered tools facilitate text-to-speech and language translation services, improving access for diverse user groups.

8. **Data-Driven Decision-Making:** AI insights help libraries optimize their operations based on user behavior and resource usage.

9. **Improved Security:** AI-driven monitoring systems enhance data protection and prevent cyber threats.

10. **Cost Savings:** Automation reduces operational costs by minimizing manual labor and optimizing resource management.

Challenges and Limitations of AI in Libraries

1. **Privacy Concerns:** AI systems collect vast amounts of user data, raising concerns about data security and ethical use.

2. **Job Displacement:** Automation may reduce the demand for certain library staff roles.

3. **Algorithmic Bias:** AI models may inherit biases from training data, affecting content recommendations and accessibility.

4. **Limited Context Understanding:** AI struggles with nuanced queries requiring human interpretation.

5. **High Implementation Costs:** AI integration requires significant investment in infrastructure and ongoing maintenance.

6. **Technical Challenges:** AI systems may have limitations in handling complex requests or providing contextualized responses.

7. **Integration Difficulties:** Implementing AI into existing library systems requires careful planning and adaptation.

8. **Reduced Human Interaction:** Over-reliance on AI could diminish the personalized support provided by library staff.

9. **Cybersecurity Risks:** AI-powered systems are vulnerable to hacking and data breaches.

Some Smart Libraries around the world

Tianjin Binhai Library, China

National   Library   of   Singapore

Helsinki Central Library Oodi, Finland

Qatar National Library

Bibliothèque nationale de France (BNF), Paris

New York Public Library, USA

Conclusion

AI is transforming smart libraries by enhancing service efficiency, improving accessibility, and optimizing resource management. While AI offers numerous benefits such as automated cataloging, personalized recommendations, and real-time reference services, challenges such as privacy concerns, bias, and implementation costs must be addressed. The successful integration of AI into libraries requires a balanced approach that combines technological

advancements with human expertise to maintain the integrity and inclusivity of library services.

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AI Manages E-Resources in Libraries

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Abstract:

Artificial Intelligence (AI) can play a significant role in managing e-resources in libraries by automating, streamlining, and enhancing various processes. The services of most of the academic libraries are not confined within the four walls but are integrated into local, regional, national and even international networks. With the rapid development of electronic publishing, libraries are not only acquiring reading materials such as printed books and journals but also arranging for providing access to various learning resources in electronic form. In the new situation, the role of library professionals in collection development has become restricted. In this context, understanding the applications and benefits of AI in managing e-resources is crucial for libraries looking to stay relevant in an increasingly digital and data-driven world.

Keywords: Artificial Intelligence, E-resources, Automating, Libraries, Publishing

Introduction:

In the present scenario, artificial intelligence (AI) has begun to revolutionize the way libraries manage their electronic resources (e-resources), such as digital books, journals, research papers, databases, and multimedia content. AI applications have the potential to transform the traditionally manual, leading to significant improvements in efficiency, user experience, and resource optimization. E-resources is an electronic document is the result of integrating classical book structure or rather the familiar concept of a book, with features that can be provided within an electronic environment is referred to as an electronic book, which is intended as an interactive document that can be composed and read on a computer. Libraries now have access to advanced technologies that automate, streamline, and enhance various aspects of e-resource management. AI can assist in areas such as content organization, resource discovery, personalized recommendations, subscription management, usage analytics, and even digital preservation. The result is a more dynamic and user-

centered library environment that better supports the needs of researchers, students, and faculty.

AI can empower libraries to offer a seamless and intuitive experience, making it easier for users to find, access, and interact with the resources they need. It also enables librarians to manage collections more efficiently, with AI-powered tools helping them optimize budgets, predict future trends, and ensure long-term digital preservation. This shift towards AI-driven e-resource management is not only making library services more efficient but is also opening up new possibilities for personalized, data-driven support that enhances learning, research, and knowledge discovery in the digital age.

E-Resources:

E-resources refer to any type of content that is stored digitally and can be accessed via electronic devices, typically through the internet or a local network. In the context of libraries, e-resources encompass a broad range of materials that are used for research, learning, and reference. These resources are often made available online, providing easy access for library users both on-site and remotely.

Purpose of Using E-Resources:

The main purpose of using e-resources is to improve the efficiency of library, to render services to end users, and to provide effective information services to faculty, research scholars and students in achieving their goals, the transition of research articles, books and journal has compelled to use latest technologies in libraries. E-resources have become one of the most important aspects of a digital library, which change the format of document from a typed paper to electronic form. E-resources play a vital role in creation and dissemination of knowledge. In a relatively short period, e-resources have expanded from a few dozen computerized database bibliographies to the overwhelming information available on the internet. E-resources have moved from accessing on line databases with a dumb terminal to surfing the www.

Importance of E-Resources in Libraries:

- **Access to Current Information**: E-resources provide up-to-date content, often updated continuously, ensuring users have access to the latest research, data, and learning materials.

- **Remote Access**: E-resources allow library users to access materials from anywhere with an internet connection, which is particularly useful for students, researchers, and professionals who need resources outside of library hours.

- **Cost Efficiency**: Digital resources often eliminate the need for physical storage and allow for widespread access to materials without the need for physical copies.

- **Searchability**: Unlike physical books and journals, e-resources can be easily searched by keyword, making it faster and easier for users to locate relevant content.

- **Support for Diverse Learning Styles**: Multimedia e-resources, such as video lectures or interactive tools, cater to a variety of learning preferences, which enhances the overall learning experience.

Challenges in Managing E-Resources:

- **Digital Preservation**: Unlike physical books, digital resources may face issues related to format obsolescence, data corruption, and access problems over time. Libraries must ensure long-term accessibility and preservation.

- **Licensing and Access Control**: Many e-resources require licenses, and managing these licenses can be complex, as libraries need to maintain agreements with publishers and ensure users have the appropriate access rights.

- **Discoverability**: With the vast amount of digital content available, ensuring that users can easily find and access relevant e-resources is a challenge. Effective cataloging, indexing, and search tools are essential.

- **Cost**: Licensing e-resources can be expensive, and managing costs associated with acquiring, renewing, and maintaining access to these resources requires strategic planning.

Need of E-resources:

- Electronic documents need to supports parallel supports and electronic method of knowledge disseminating.

- Increasing Interdisciplinary research.

- Increasing tendency to use e-information sources in academic libraries.

- Application of academic activities such as syllabus, teaching and learning.

- Some publication only published electronic forms.

- Increasing the cost of publication.

- Easy to access.

- Speed of publication.

- Speedily accessed.

- No. necessity of space, shelving cost.

- It can be read anywhere in the world.

Types of E-Resources:

1. **E-Book:** An E-Book is an electronic version of a traditional print book that can be read by using a personal computer or by using an E-book reader. Users can purchase an E-book on diskette or CD, but the most popular method of getting an E-book is to purchase a download file of the E-book (or other reading material) from a websites to be read from the user's computer or reading device. Generally E-book can be download in five minutes or less.

2. **E-Journals:** This is the most widely used digital resource. Hundreds and thousands of e-journals are made available by the commercial agencies, academic institutions and the agencies promoting open access initiative. Simple and advanced search facility is the most useful feature of the e-journals. The whole contents of the journal including the back files could be search for any topic. They are available instantly and could be browsed in the 24x7 modality.

   High subscription rates is the most critical issue related with the e-journals made available by the private agencies such as publishers and aggregators. So also the packages offered by them may not be very convenient to the libraries. Library professionals must negotiate intelligently the licensing terms and conditions. They should also be able to select price models suitable to them.

3. **E-databases:** Today there are number of databases available on the network they are either free or with charges. E-database is an organized collection of

information is of a particular subject or multidisciplinary subject areas, information sources within e-database can be searched and retrieved electronically. The network information sources locally informed database regional or state wise consortia, aggraded database, web resources.

4. **E-thesis and dissertations:** Theses are one of the primary documents made available in limited copies to universities and research institutions where the researcher has carried out his research work. However, the academic world believes that the theses should be made available for further researchers easily. The digital technology has proved very beneficial for the preservation of theses. SHODHGANGA making available theses in the digital format over the internet.

Management of E-resources:

The management of e-resources in libraries has undergone a significant transformation with the introduction of AI, bringing several benefits in efficiency, accessibility, and user experience. Let's compare the traditional methods of managing e-resources with AI-powered management systems:

1. Cataloguing and Classification

- **Old E-Resources Management**: In traditional systems, cataloguing and classification of e-resources were often manually handled. Librarians had to assign keywords, categories, and metadata, a time-consuming process that was prone to human error and inconsistencies.
- **AI E-Resources Management**: AI automates the cataloguing process by using algorithms to analyses content, generate relevant metadata, and classify resources more quickly and accurately. AI can also continuously refine these classifications based on usage patterns and emerging trends, leading to a more organized and efficient catalogue.

2. Search Functionality

- **Old E-Resources Management**: Search systems typically relied on simple keyword-based searches. Users had to know specific terms or phrases to retrieve relevant

information, which could often result in frustrating search experiences if the keywords used were too broad or too specific.

- **AI E-Resources Management**: AI-driven search engines can process natural language queries, understand user intent, and deliver more relevant results based on context, past behavior, and preferences. These advanced search tools offer better accuracy and efficiency, making it easier for users to find the exact resources they need.

3. Resource Discovery and Recommendations

- **Old E-Resources Management**: Traditional systems did not typically offer personalized recommendations. Users were often left to search through extensive lists or databases without much guidance on which resources might be most useful for their needs.

- **AI E-Resources Management**: AI provides personalized recommendations based on user behavior, search history, and interactions with the library's collection. AI systems can suggest relevant articles, journals, or books that users might not have otherwise discovered, enhancing the resource discovery process.

4. Data Analytics and Usage Insights

- **Old E-Resources Management**: Usage data in traditional systems was often limited to basic statistics (e.g., download counts), and analysis was typically done manually, which made it difficult to identify trends or optimize resource allocation.

- **AI E-Resources Management**: AI provides advanced analytics and predictive insights. Libraries can analyses detailed usage data to understand resource popularity, identify gaps in the collection, and make data-driven decisions about acquisitions and resource management. AI can also predict future trends and user demands based on historical data.

5. Content Acquisition and Subscription Management

- **Old E-Resources Management**: Managing subscriptions manually involved keeping track of renewal dates, user needs, and resource utilization. Decisions about which

resources to subscribe to were often made based on limited data and could result in either over- or under-subscribed content.

- **AI E-Resources Management**: AI can help optimize subscription management by analyzing usage patterns, providing insights into which resources are most valuable to users, and assisting in decision-making regarding renewals or cancellations. This helps libraries maintain a cost-effective and relevant e-resource collection.

6. User Support and Assistance

- **Old E-Resources Management**: User support was often limited to in-person or email assistance from librarians. While libraries could provide guidance, the support was typically available only during working hours, and could be time-consuming for librarians to handle routine questions.
- **AI E-Resources Management**: AI-powered chatbots and virtual assistants offer 24/7 support, answering routine queries, guiding users to relevant resources, and even assisting with administrative tasks like renewing subscriptions or accessing account details. This improves user satisfaction by offering quick,anytime assistance.

7. Resource Preservation and Management

- **Old E-Resources Management**: Digital preservation was often managed manually, with librarians keeping track of data integrity, file formats, and long-term storage. Resources could be at risk if preservation plans were not continuously updated.
- **AI E-Resources Management**: AI can monitor digital resources for potential issues (like file corruption or outdated formats) and recommend preservation actions. It can predict which resources are at risk and suggest proactive preservation strategies, ensuring that e-resources are accessible for the long term.

8. Efficiency and Automation

- **Old E-Resources Management**: Many processes, such as cataloging, acquisitions, and renewals, were done manually or with limited automation. This required significant human intervention, leading to inefficiencies and potential delays.
- **AI E-Resources Management**: AI automates routine tasks like content retrieval, metadata tagging, subscription renewals, and usage tracking, reducing the workload

for library staff and freeing up time for more strategic activities. AI's ability to process large amounts of data and handle complex tasks also speeds up overall operations.

9. Accessibility and User Experience

- **Old E-Resources Management**: Access to e-resources was sometimes fragmented across various systems, requiring users to remember multiple logins or interfaces. Navigation could be cumbersome, especially for users unfamiliar with certain databases.

- **AI E-Resources Management**: AI offers a more unified and intuitive user experience, integrating multiple systems and allowing seamless access to resources. Users can easily find and access materials, while AI-powered features (like smart recommendations or personalized dashboards) enhance usability and ensure that resources are presented in an engaging, user-friendly way.

10. Cost and Resource Optimization

- **Old E-Resources Management**: Resource allocation was often based on intuition or historical usage, and managing costs could be more difficult due to a lack of detailed, real-time data.

- **AI E-Resources Management**: AI allows libraries to optimize both costs and resource allocation by analyzing usage trends and predicting future needs. By understanding which resources are most valued by users, libraries can adjust subscriptions and acquisitions accordingly, avoiding unnecessary expenses.

Differences between Old E-Resources Management and AI E-Resources.

Aspect	Old E-Resources Management	AI E-Resources Management
Cataloguing	Manual, time-consuming, prone to errors	Automated, fast, and more accurate
Search Functionality	Basic, keyword-based searches	Advanced, natural language processing, context-aware

Aspect	Old E-Resources Management	AI E-Resources Management
Recommendation Systems	No personalized recommendations	Personalized recommendations based on user behavior
Data Analytics	Basic usage statistics, limited insights	Advanced analytics, predictive insights
Subscription Management	Manual tracking of subscriptions and renewals	AI-driven optimization based on usage patterns
User Support	Limited to working hours, human-driven	24/7 AI-powered support via chatbots and assistants
Digital Preservation	Manual tracking and preservation plans	Automated monitoring and proactive preservation
Efficiency	Often inefficient	Highly automated, faster processes
User Experience	Fragmented access, difficult navigation	Unified, intuitive, personalized interfaces
Cost Optimization	Based on intuition, historical data	Data-driven, optimized for cost-effectiveness

Conclusion:

AI e-resource management in libraries offers significant advantages in terms of efficiency, accuracy, and user satisfaction. It automates many processes that were once manual, enabling libraries to provide more personalized and dynamic services while optimizing resource management. Today library and information professionals are normally stressed with user demands regarding availability, storage and access of e-resources. Use of information technologies has marked a tremendous impact of the all functions and services catered by the traditional library and information professionals. E-resources are now emerging as a vital source of information for all recent and nascent thoughts and ideas coming into existence in whatever area of research. AI is not only enhancing the way libraries manage e-resources but is also paving the way for a more connected, personalized, and accessible library experience. As AI continues to evolve, it will only become a more essential tool for libraries to meet the growing demands of the digital information landscape,

providing better services for users and ensuring that e-resources remain a valuable asset for learning, research, and knowledge sharing.

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Artificial Intelligence in Libraries and Information Centers

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Abstract:

Artificial intelligence (AI) is changing how information is managed, accessed, and used in libraries and information centers. Natural language processing, machine learning, chat bots, and other artificial intelligence technologies are used to improve information retrieval, automate repetitive operations, personalize user experiences, and support decision-making. Positioning libraries as leaders in information management technologies. Positioning libraries as pioneers in technological innovation within information management. This transformation enhances operations, increases the efficiency of library services, and fosters the creation of intelligent, data-driven environments. Examining the function of AI in libraries and information centers is the main goal of this study. This research gathers primary and secondary data through a mixed-methods approach. This study established that artificial intelligence in libraries and information centers augments operational efficiency, enhances user experience through personalized services, and streamlines information retrieval and management. This study may improve user engagement, resource management, and the adaptation of information systems to changing user needs. Artificial intelligence can improve the efficiency, scalability, and accessibility of libraries, establishing them as frontrunners in information management technology.

Keywords: AI; Libraries; Information Centers; Machine Learning

Introduction:

Various businesses, such as libraries and information centers, are experiencing a transition driven by artificial intelligence. Users report significant enhancements in information management, accessibility, and dissemination due to the deployment of AI technology within their businesses. Throughout the course of their existence, libraries have traditionally relied on human classification for the purpose of organizing, managing, and retrieving content [1, 2]. Artificial intelligence is enhancing the reactivity and adaptability of libraries and information centers. Machine learning, robotic process automation and natural language processing (NLP) enhance repetitive operations, optimize information retrieval, and customize user experiences. The library sector heavily utilizes AI to enhance advanced information retrieval systems [3]. AI-driven search engines and recommendation algorithms facilitate the provision of accurate and contextually relevant search results. This aids users in

locating relevant resources within vast data collections. Furthermore, AI systems may evaluate user preferences and behavioral patterns to provide tailored recommendations, hence improving the quality of information retrieval [2, 3, 4]. Furthermore, AI has the ability to revolutionize cataloguing and metadata management operations.

The application of methods that are linked with machine learning makes it feasible to automate the process of resource classification. This is a possibility. The consequence of this is that the possibility of errors brought about by human contact is decreased, and the accuracy and consistency of categorization are enhanced as a result of this. It is possible that the digitization and management of historical collections could be simplified by the application of artificial intelligence. This would ultimately lead to an improvement in the accessibility of materials that are both rare and old. Artificial intelligence is necessary for enhancing user service, which is an important field. Natural language processing gives virtual assistants and chat bots the capacity to respond to questions presented by users, conduct searches, and direct users to resources [5, 6]. This ability is made possible by the use of natural language processing. The utilization of solutions that are powered by artificial intelligence allows for support to be available around the clock. As a consequence of this event, human professionals are now in a position to focus their attention on activities that are more difficult.

 In addition, artificial intelligence has the capability to analyse consumption patterns and trends, which can finally result in modifications to the administration of libraries in terms of the distribution of resources and the capacities of service delivery. This is a particularly useful skill. An intelligent library is a new type of library that has emerged as a result of the integration of artificial intelligence into libraries and information centers. The collection of libraries that make up this collection is outfitted with devices that are connected to one another as well as systems that are powered by artificial intelligence. In addition to providing consumers with a seamless experience, these libraries also make it simple for users to comprehend this experience [7]. As time goes on, libraries are evolving into more dynamic and sophisticated institutions that are able to meet the ever-increasing demands of customers and make use of technology to enhance the quality of services they provide [7, 8]. The occurrence of this metamorphosis is being observed more frequently.

Figure 1: An overview of the future of Libraries[1]

This paper analyses the impact of AI integration in libraries and information centers on operational efficiency, information retrieval systems, user experience customization, and resource management, along with associated obstacles and opportunities. The following section includes thorough evaluations of the relevant literature concerning this topic.

Literature Review of This Study:

This section offers a thorough summary of the body of research on artificial intelligence's use in libraries and information centers.

Table 1: Related Works

AUTHORS AND YEAR	METHODOLOGY	FINDINGS
Bagchi (2020) [9]	With the help of the recently launched, AI-powered open-source conversational software platform Rasa, this study sought to develop a novel library Chabot and promote its possible	A viable option for this architecture is still a library Chabot built with open-source conversational AI and semantic technologies

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	use in libraries. In the study, the fundamental principles of Chabot technology as well as its present applications in libraries were explained in sufficient detail.	like knowledge graphs and semantic reasoning-differencing engines in the backend.
Abayomi et al., (2021) [10]	The study employed a survey design incorporating both qualitative and quantitative methodologies. The study's population consisted of eighty academic librarians from eight intentionally chosen university libraries throughout the country.	The study's findings indicated that academic librarians recognize the presence of AI utilization in university libraries, yet the primary obstacle to adopting these technologies is the apprehension of job displacement, despite their understanding that such innovations could enhance user satisfaction.
Liu et al., (2021) [11]	This research meticulously analysed and enhanced the modern AI educational information system. Following the establishment of the network architecture, a comprehensive demand study was conducted, and the network configuration was refined. The business process and data flow of the website's primary modules (resource centre and collaborative learning) were enhanced. To enhance the algorithm's local search, a multiclass interactive optimization strategy is integrated with the Euclidean distance-based clustering method, transitioning the teaching mode A thorough demand analysis was	The solution exhibits higher accuracy and enhanced stability compared to competing techniques. It excelled in engineering optimization tasks, thereby validating the strategy's effectiveness.

	carried out once the network architecture was established, and the network configuration was improved. The website's main components (collaborative learning and resource center) improved their data flow and business process. The Euclidean distance-based clustering method is combined with a multiclass interactive optimization strategy to improve the algorithm's local search, changing the teaching mode from "one-person teaching" to "multi person teaching."	
Yusuf et al., (2022) [12]	The study elucidated the notion of AI and delineated its origins. It also outlined the advantages of incorporating AI into academic libraries, such as its ease of use, boundless capabilities, and ability to manage intricate tasks, as well as the difficulties library administration faced in implementing this technology, such as unstable finances, the possibility of job displacement, and technical limitations.	The paper advised that government and library management should collaborate to advance academic libraries in accordance with contemporary standards for AI utilization; library personnel should undergo training and retraining in the application of AI for service delivery, among other recommendations.
Hussain (2023) [13]	This study used a qualitative approach using tools for content analysis. For this study, the body of existing literature on the topic was reviewed and analyzed. The benefits and drawbacks of AI in library services are	According to the study's findings, artificial intelligence (AI) is a dynamic technology that may be used in library services. However, obstacles

	discussed in this study along with some possible fixes.	including a lack of financing, librarian attitudes, and technical capabilities make it difficult to integrate AI into library operations.
Harisanty et al., (2024) [14]	Purposive sampling was used to choose 38 participants for the study, and thematic analysis was used to examine the data. Eight themes were identified: knowledge of AI, adoption of AI, advantages of AI, skills required for AI support, resources for AI help, factors encouraging AI adoption, barriers to AI implementation, and expectations regarding AI.	Since leaders, practitioners, and scholars have demonstrated a constructive, responsive, and supportive disposition towards AI, many perspectives have given library stakeholders a wealth of information and enough experience to begin AI efforts in Indonesian libraries.
Semeler et al., (2024) [15]	Using Python libraries and plugins, such as the PyCharm integrated development environment, which is improved by the Machinet AI and Bito AI plugins, the suggested AI-driven technique seeks to help data librarians write code scripts. The procedure entails cooperation between the AI agent and the data librarian, whereby the OpenAI Codex produces the relevant Python solution code and the librarian describes the programming challenge in natural language.	This study demonstrated how AI may be used to help data librarians write code scripts for web scraping activities. For data librarians dealing with the difficulties of large amounts of data on the Internet, artificial intelligence (AI) can be a useful tool.

Research Gap: There is still a significant study gap regarding the long-term effects of AI on staff duties, organizational procedures, and user engagement despite the growing use of AI in libraries and information centers. Even while the technology applications of AI have

advanced significantly, little research has been done on the challenges posed by privacy concerns, ethical considerations, and the need to adapt AI systems to various library environments. Moreover, additional research is required to evaluate the practical obstacles to AI integration, including expenses, personnel training, and the sustainability of AI-driven solutions amid changing technology trends.

Methodology:

This study employed a mixed approach. In qualitative methodology, leveraging secondary data gathered from online databases to investigate the incorporation of AI in libraries and information centres. The research will methodically evaluate and scrutinize current literature, encompassing academic articles, reports, case studies, and white papers, obtained from credible online databases like Google Scholar, JSTOR, Scopus, and IEEE Xplore. A large cohort of library and information science professionals from a variety of institution types, including colleges, technical institutes, universities, medical institutes, management institutes, and research institutes, were selected for the study using stratified random sampling, a quantitative research methodology. Approximately 385 active library professionals were sampled. The survey was distributed via Google Form.

Results and Discussion:

AI has revolutionized numerous sectors, including libraries and information centres. Libraries, formerly custodians of knowledge and information repositories, are now leveraging technology to enhance services and accommodate client requirements. Library operations, information retrieval, and user experiences can all be improved through the application of machine learning, natural language processing, and other similar technologies. This concerns ethics, equity, and the imperative of aiding customers and professionals in acclimating to AI-driven contexts. This research investigates the ethics, professional advancement, and application of AI technologies in libraries [18, 19].

AI Applications in Libraries:

AI has altered library operations, enhancing user experience and efficiency. The use of AI in information retrieval is fundamental. Traditional library searches sometimes yielded irrelevant or overlooked items due to manual classification and keyword alignment. AI-driven search engines use machine learning to provide accurate, relevant, and tailored results. Resource allocation depends on user decisions and circumstances. Praveenraj et al. (2025) [20] found that these tools improve library services by offering quick access to many

information resources. ChatGPT and other AI chatbots increasingly need human answers. They help patrons identify library items, solve complex problems, and provide personalized recommendations 24/7. Ali (2024) [18] said that chatbots improve accessibility and convenience [18]. AI systems suffer with language processing because they must interpret complex queries, cultural differences, and human needs.

AI automates library procedures and boosts productivity beyond information retrieval. AI saves time and effort in categorization and inventory management. Senthilkumar (2024) [19] stressed the need of AI in library regeneration, where machine learning algorithms digitize and organize historical materials. Old and scarce resources are preserved and made available. AI standardizes metadata and eliminates inaccuracies. Anumula et al. (2024) [17] noted that automation allows library staff focus on user contact and resource enhancement rather than administration. These digital solutions increase library efficiency, resource allocation, and time management. Academic libraries need AI for teaching and research. These technologies find trends in massive data sets and inform academic literature studies and specialized research. AI helps ethical and equitable resource access, according to Hodonu-Wusu (2024) [16].AI-powered virtual assistants let non-experts navigate complex datasets. AI aids inclusive education for multilingual and impaired pupils. AI improves patron engagement and research in modern libraries.

Ethical Considerations and Challenges:

AI in libraries raises ethical issues. Equity, accessibility, data privacy, and career flexibility are issues. AI has many benefits but raises equality and inclusiveness problems. Hodonu-Wusu (2024) [16] recommended libraries to create AI systems without biases that may disadvantage some groups. These groups include disabled and underrepresented minorities. Algorithm development requires strict control to avoid bias in training datasets that could slant search results or omit diverse opinions. Rahman (2025) [21] has noted that socioeconomic gaps make AI-driven services unavailable to all, making it harder to close the digital divide. This complicates digital divide. By training and providing fair access to AI technologies, libraries eliminate this gap. Data privacy and security are essential for AI adoption. Search history and preferences are essential for chatbots and recommendation systems. This data could improve personalization, but it could also cause security breaches, misuse, and consumer distrust. Ali (2024) [18] stressed the need of data governance systems,

transparency in data collection, and regulatory compliance to protect user data. AI also requires considerable library personnel changes. Data analytics, machine learning, and ethical AI are required. Anumula et al. (2024) [17] recommended ongoing professional development for librarians to prepare them for AI technology. Senthilkumar (2024) [19] suggested AI aid librarians. Librarians might leave routine duties to automated technologies and focus on resource equity, community participation, and information dissemination. Libraries can improve services with AI while respecting equity, privacy, and professional ethics if they address these ethical challenges.

Opportunities for Empowering Users and Professionals:

AI could improve library users' and professionals' abilities. They improve engagement and satisfaction by assessing user activity to make personalized recommendations [21]. Since AI uses predictive analytics to improve material allocation, it ensures in-demand resource availability and reduces waste [20]. AI integration promotes digital literacy through educational programs, teaching users how to navigate digital resources, critically evaluate information, and use technology effectively, enabling lifelong learning and knowledge empowerment.

Primary data from questionnaire admissions is analyzed in accordance with the survey's initial issues. The study comprised a heterogeneous cohort of individuals, with 62.7% males and 37.3% females. The predominant group possessed 5–10 years of expertise (38%), whilst 13% had less than 1–5 years of experience. The subsequent graphs delineate the primary findings of this investigation.
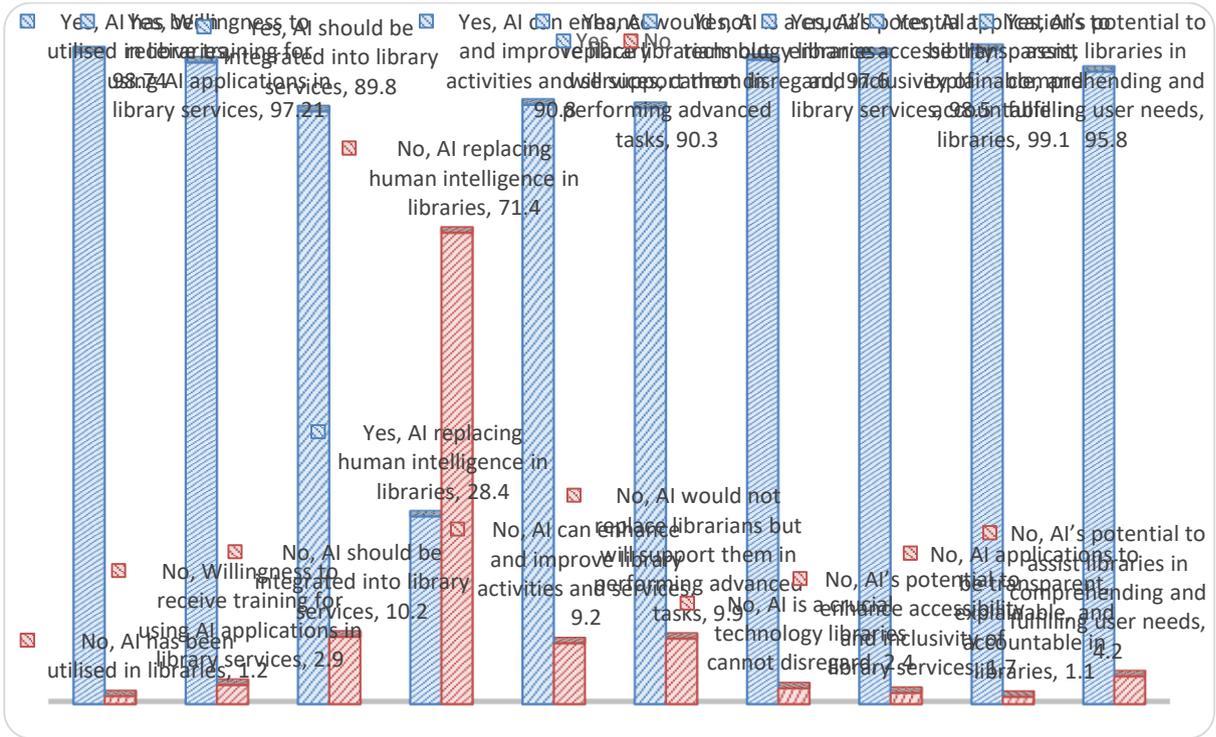
Figure 2: Library Professionals' Viewpoint on AI in Libraries
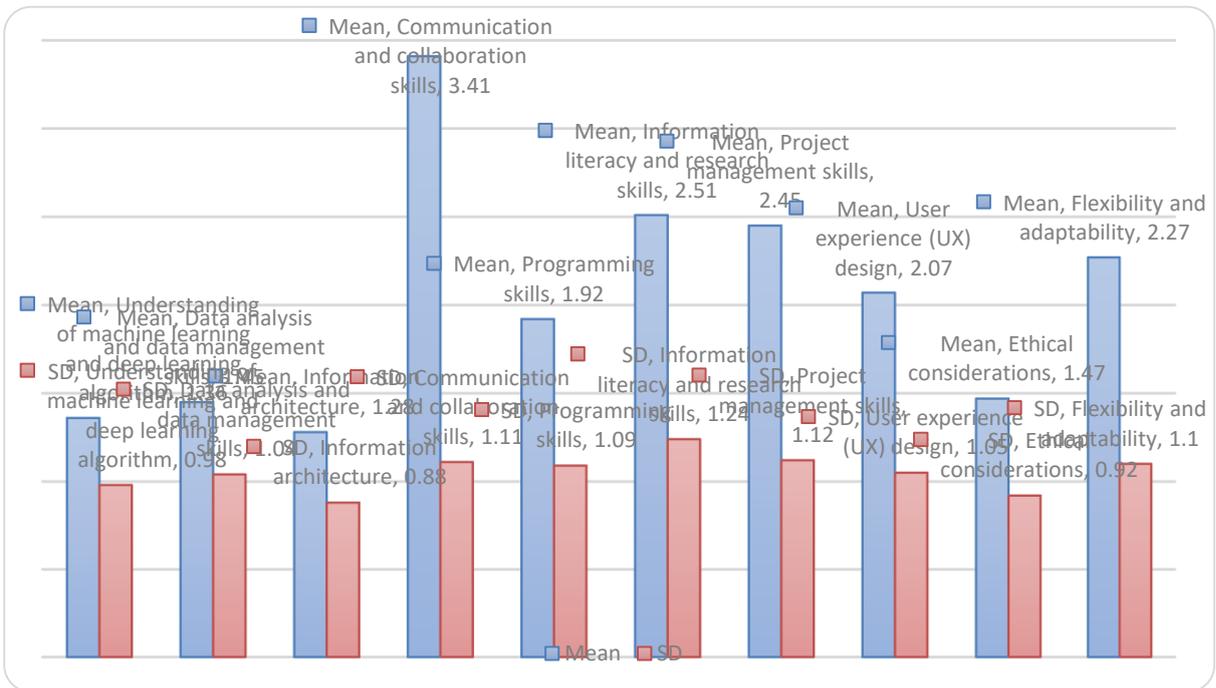
Figure 3: Influence of competencies on AI integration in libraries: a comprehensive analysis
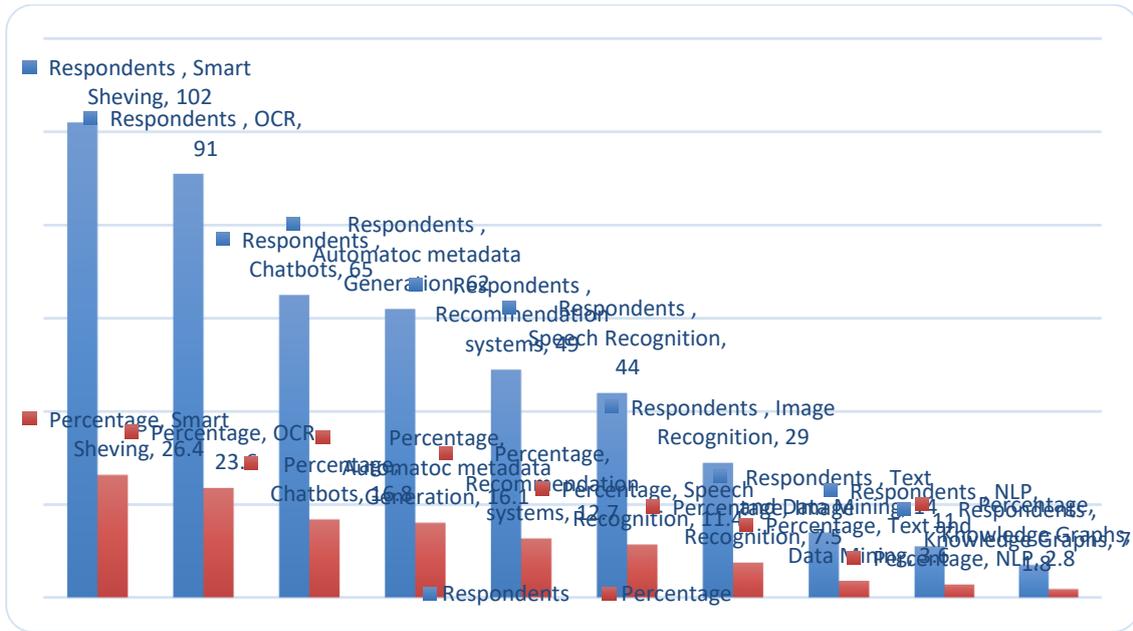
Figure 4: The institute libraries have embraced AI tools and services.

Conclusion:

AI is revolutionizing libraries and information centers, allowing them to deliver more intelligent, efficient, and tailored services. It enables libraries to fulfill the requirements of the digital era by automating mundane processes, improving information retrieval, and facilitating research and learning. AI ethical issues include equity, accessibility, data protection, and professional adaptation. These difficulties require an intentional, ethical, and inclusive approach using technology. AI may aid Indian librarians, according to a survey. Consider user privacy, money, staff skills, and institutional goals while adopting AI systems. AI can make libraries relevant in a burgeoning information economy by creating user-centric knowledge and innovation hubs.

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Concept of Smart Library: A Study

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Abstract

Smart is user-friendly. Like any new paradigm, smartness has risks. Today, a library with 'smart library' technology is open to readers without workers. Automatic doors, lighting, auto-services pavilions, and computers can be controlled and monitored by technology in libraries. It allows 24X7 resource use so readers can utilise the library at their convenience. Smart librarians provide user-centric, user-friendly service in a smart library. Due to shifting user demands, librarians and libraries are changing. SL needs smart users, workers, and services. Users are expecting more from libraries, especially academic libraries, for their intellectual progress and daily information needs, which will expand. Smart libraries, smart services, smart readers, cloud service developing "smart librarians," service visibility, service orientation of smart academic libraries, advocacy, features, vision of SLs, planning for impact, smart governance, smart library place, smart management, smart library staff, green library building, smart librarians, and their e-service in digital era are briefly described. Author-described smart library theory is the basis of this paper.

Introduction

In recent years, the phrase "Smart Library" has been used increasingly frequently for the purpose of labeling a vision of libraries of the future, as a component of the notion that is commonly referred to as "Smart City." Libraries have gone through a number of different eras of development. Throughout the course of their development, libraries have gone through three distinct stages: modernisation, automation, and digitisation (Nahak & Padhi, 2019). The term "Smart Library" is used interchangeably with the term "Intellectual Library" in a number of different settings. In addition, phrases like "Digital Library" and "Virtual Library" can be discovered, among others. The word "smart" refers to something that is adaptable, flexible, extendable, acknowledging, and human. Those libraries that are considered to be of the new generation are known as smart libraries. These libraries function through the combination of smart technologies, smart users, and smart services. Because of the emergence of new smart

technologies, smart libraries are getting more intelligent. This not only improves their operational capacities but also satisfies the users who are affiliated with them. A smart library is one that offers services that are, among other things, interactive, innovative, instructive, current, ever-changing, and international. Through the utilisation of contemporary information technology, the primary objective of a smart library is to fulfil the information needs of its patrons. With the help of various instruments of information technology, it is possible to investigate the information requirements of a user.

An intelligent library facilitates remote management of the facility, encompassing automated doors, public access PCs, and a self-service kiosk. It is a mechanism designed to assist library patrons. This method extends library hours, enabling customers to access services at their convenience. The notion of Smart Libraries has been examined internationally in many contexts and under diverse terminologies. As a result, a variety of conceptual alternatives are produced by substituting 'smart' with other adjectives, including digital, intelligent, and mixed.

Concept of SL

The idea behind SL is to use digital technology in different software programs and the Internet and Intranet to make all library services faster, better, and smarter for the people who use them. In this piece, the author says that SL is a library that is tech-driven and serves smart readers through AI and IoT. The SL makes: Creating of smart environment, Mobileaccess, New knowledge creation

- Active content, Adaptively, Smart technology of content formation
- Smart detection of knowledge, Smart interface (organization of interaction with the user)
- Smart services (e.g., personal informing, & Mobile applications usage

Components for Smart Library

The core elements of Smart Library are:

- High Speed Internet, Uninterrupted Power Supply, Meta Data.
- RFID, Bar Code, Smart Card, plagiarism software, IR software.
- Wi-Fi /Li-Fi-premises of Library, ETD databases.
- Green Library Building, own library web site, library blog.
- Sound budget, Standard ILMS, e-library orientation.

- E-resources (e-databases-books, e-journals- e-reference tools, CD, DVD, Audio sets, e-newspapers, Mandalay reference tools).
- Good Scanner, Printer, Digital Photocopy Machine, CC Camera, Sensor, library digital gate.

Smart Library Services and Features

❖ Automation of processes (Self-checkout kiosks, RFID technology for tracking and locating books, Automated sorting systems)

❖ Digital resources (E-books and audiobooks, Online databases, Virtual reality technology for interactive learning)

❖ Personalized services (Recommendation algorithms, Customized reading lists, Virtual assistance for user queries)

❖ Library Marketing & Promotion Service, Newsgroups/ Newsletter Services

❖ E-SDI, Bulletin Board, Discussion Forum, Start Page/Home Page

❖ Electronic Board Services, Atmospherics, Mash Ups, Linking different datasets

❖ Ask the librarian /Contac us / Feedback Process, Webliography

❖ Collaborative Digital Reference Services, Video Podcast

❖ E- Document Delivery Services, Institutionalisation/personalisation–portals

❖ RSS (Really Simple Syndication), Virtual Library Tours, Streaming Media

❖ Value added, aggregator services, Open access publishing, Metadata schemas

Models for the development of Special Library

To cope up with new digital resources and technological challenges, LIS developed product of new concepts for the e-marketing and advocacy of public and academic libraries. Some of these concepts had impact and were successful insofar as they shaped such a

Information commons: It is used to describe specific services and tools, e.g. library-based open access journals and free available digital libraries. It is a powerful concept for the marketing and promotion for all types of libraries. It means every reader will get information commons from knowledge/ information centres and Learning Centres

Green Libraries: Green libraries aim to minimize environmental impact and enhance indoor environmental quality by selecting sites carefully, using natural materials and biodegradable products, conserving resources, and responsible waste disposal, as part of larger green library buildings and environmental issues.

Global Library: The global library aims to universally market library products and services, requiring a holistic approach in library management and marketing.

Various Features of Smart Libraries

The smart library is a product of library and information professionals' response to the trend of smart city projects, encompassing elements such as smart economy, smart mobility, smart environment, smart people, smart living, and smart governance. Schopfel (2018) contends that the smart library facilitates a coherent depiction of advancements and implementations in public and academic libraries within urban environments and scientific campuses, thereby fostering a novel and dynamic perspective on the libraries of the future. It aids in delineating objectives and strategies for library marketing and advocacy, and its characterisation and evolution can be categorised into four dimensions:

Smart services: These are the final outputs of intelligent actions or work generated and exchanged by the library, anticipated to be utilised by users in efficient manners. Smart services can be delivered to users via RFID, mobile and wireless access, remote assistance, semantic web, artificial intelligence, Internet of Things, machine translation, voice and image recognition, sensors, CCTV, natural language processing, and augmented reality, thereby enhancing the utilisation of information resources (Nahak and Padhi, 2019).

Smart people: These individuals are executing library services or utilising library resources effectively. Schopfel (2018) asserted that smart libraries are designed for and by intelligent individuals. Smart library services are not only user-friendly and user-centred, but they also rest on the premise that the smart library user is an active co-producer of knowledge rather than a passive consumer of information.

Smart place: This is a site or area where information is obtained, processed, disseminated, and utilised in intelligent configurations. Schopfel (2018) contends that a smart library encompasses a "smart environment" and environmental monitoring. He further asserted that we can identify two distinct aspects - the green library and the environment - which integrate innovative characteristics from the green library and illustrate the evolution of the conventional library structure and operation into an intelligent space that enhances both sustainable development and the technological advancement of the city.

Smart governance: These are the methods, procedures, or systems implemented to provide library services efficiently. Intelligent governance encompasses collaboration, cooperation, partnership, and active user involvement and participation. Through a smart library, customers

become stakeholders in the library and participate in its management and administration (Nahak and Padhi, 2019).

Some emerging technologies are used for smart library services

Technology is advancing at an alarming rate that becomes a challenge for library and information professionals to meet up with. Emerging technologies come with various features, guidelines and functions that make them to be thoroughly considered for quality, efficient and effective library services. Based on the empirical evidences (Pal and Sharma, 2017; Ramasany and Kadry, 2021), the following advanced technologies can be deployed for smart libraries services**:**

1.Cloud computing improving technology allows libraries to offer unlimited or permanent services. This paradigm is flexible, allowing libraries to create or configure internet-based apps for other libraries and provide a shared computing platform (Dastagiri and Kumar, 2017). Alizahed and Hassan (2013) defined cloud computing as a user-friendly virtual platform that provides on-demand access to shared computing resources like storage, servers, networks, applications, and services that can be deployed and executed without management or service provider intervention.

2. Internet of Things (IoT): IoT is the advanced phase of the internet that builds a global human-machine connection infrastructure. Library and information services are part of the Internet of Things, which transforms human life worldwide. It was a powerful strategy using modern equipment in multiple domains. Its devices are connected to establish specific purpose schemes and use nodes (sensors) to send information to users or other devices over the internet. Industrial machinery, mobile gadgets, medical instruments, and wireless sensors use IoT nodes. Affordable and intelligent gadgets make the IoT network a smart system (Ramasany and Kadry, 2021), making it suitable for smart library services.

3. Artificial Intelligence (AI):AI is often called machine intelligence. It is computer intelligence, not natural human or animal intelligence. Speech recognition, learning, planning, vision, logical reasoning, and problem-solving are AI functions. AI can predict, adapt, independently make judgements, learn, and perceive the future thanks to its algorithms (Saleh, 2019). AI is ideal for intelligent library services due of these qualities. AI can be programmed to give users information at set times without librarian help.

4. 3D Printing: 3D printing has progressed from layer-by-layer production of 3D structures from CAD models. 3D printing is inventive and adaptable. It opens up new possibilities and inspires

libraries to improve printing and publishing efficiency. Information and production industries have been changed by 3D printing. 3D printing is increasingly used for mass customisation and open-source design fabrication across disciplines (Shahrubudin et al., 2019).

5. Big Data: Big data involves developing and applying technologies to offer the right information to the right person at the right time from a massive and growing dataset. Major IT businesses developed Big Data to give clients real-time access to massive databases. Big Data classifies methods and technology for analysing complex datasets. Big Data has velocity, authenticity, volume, variety, and values (Riahi and Riahi, 2018).

6. Drones: An aerial vehicle or ship guided by remote control or computers is a drone. It uses onboard sensors and GPS to manoeuvre autonomously or remotely using software-driven flight plans in its embedded systems. UAVs or aircraft without crew or passengers may include autonomous drones or remotely piloted vehicles (RPVs) (Uddin, 2020). Libraries can use drones for security and book distribution.

7. Radio Frequency Identification (RFID):RFID uses radio waves to detect, track, identify, and manage objects and people (Pal and Sharma, 2017). RFID is the latest library security and creative services technology. This automatic radio communication method identifies documents wirelessly. A reader or interrogator and an RF transponder that delivers data via electromagnetic waves are the main components. Tags (transponders) may write and update data in the RFID system. This means RFID chip data can be viewed and manipulated remotely. Machine-readable devices can retrieve and transmit RFID data for many applications (Pal and Sharma, 2017).

8. Sensor Pressure Pad The pressure pad sensor has a thin sheet sensor pad with Wi-Fi and a processor that records and administers the system. Pressure pad sensors set in the aisle beneath the floor will track user movement in specific aisles, allowing more books from specified stacks to assure information availability. This technology also integrates with the energy management system to reduce library energy loss.

9. Magic Mirror: The Magic Mirror can be integrated across the library to recognise the user's title, recommend library materials, highlight related events, and preview books. Magic mirrors have many uses as technology advances. Its smart camera and sensor enable Wi-Fi-enabled computer-human interaction. It provides location identification, content evaluation, and similar information. User reviews are stored in the database. This system will quickly become part of daily life, hence excellent user interfaces are essential.

10. Wireless Sensor Network: The Wireless Sensor Network is a network of spatially distributed and specialised sensors that monitor and record item physical states and store the data

centrally. Recent advances in low-power integrated circuits and wireless communications have made small remote sensing devices affordable. These aspects have made a sensor network with numerous intelligent sensors possible, making it easier to gather, process, analyse, and share important information from varied situations.

11. Wireless Technology: Wi-Fi, an IEEE 802.11 standard, is widely used in businesses and campuses to connect multiple devices to the internet. Due to its great performance, low cost, and easy deployment, Wi-Fi connections allow free Internet access (Ikrissi and Mazri, 2020). ZigBee is another wireless technology. Also based on IEEE 802.15.4. It is used to create personal area networks for applications and devices that need long battery life, low data speeds, and secure networking. Monitoring and control applications that require data reliability, energy efficiency, and cost-effectiveness use it.

Advantages of smart libraries

Libraries may take advantage of huge potential in smart libraries. Smart libraries use developing technologies to establish collections, store and organise information and knowledge in digital formats, and enable easy and affordable access to it in numerous locations (Nahak and Padhi, 2019). Smart libraries enhance operations and services in several ways:

A. Improved efficiency

1. Faster check-in and check-out processes

2. Reduced manual labour

3. Real-time availability of resources

B. Enhanced user experience

1. Access to a wider range of resources

2. Personalized recommendations

3. Interactive learning opportunities

C. Increased accessibility

1. Remote access to digital resources

2. 24/7 availability of online services

3. Inclusivity for users with disabilities

Challenges and Future of Smart Libraries

Smart libraries, developed in response to technological advancements, face challenges such as inadequate personnel training, diverse ICT policies and infrastructure, constant technological

changes, and network failure. Other challenges include inadequate ICT infrastructure, insufficient technology utilization, and network failure.

A. Data security and privacy concerns

1. Protection of user information

2. Compliance with regulations

3. Cybersecurity threats

B. Digital divide and access disparities

1. Equitable access to technology

2. Bridging the gap for underserved communities

3. Training and support for digital literacy

C. Future trends in smart libraries

1. Integration of AI and machine learning

2. Expansion of virtual reality applications

3. Collaboration with other institutions for shared resources

Conclusion

The advent of smart libraries has redefined library services and operations by enhancing the development, organisation, preservation, conservation, distribution, accessibility, and use of information resources using developing technology. Emerging technologies have transformed library concepts from just-in-case to just-in-time. The development of this new experience has consequently empowered libraries to deliver services to their users swiftly, efficiently, and intelligently, resulting in extended operating hours, enhanced visibility, and the removal of temporal and geographical constraints.

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Smart Libraries in S R Patil Medical College, Hospital and Research Centre: Concept and Processes, and Library Automation and OPAC

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Abstract:

Along with the development of computer technology, telecommunications and virtual storage, smart library began in S R Patil Medical College Hospital and Research Centre (SRPMCH&RC) This paper also states that the library will provides better services to the library users. In SRPMCH&RC smart library is a combination of both hardware and the software with a broad assortment of opportunities for smart users. The living space of the library will be an inside lab, where the researchers, students and staff can developed the smart technologies and also collect data regarding the study purpose. Modern services can also provide to the smart library users furniture, building, lightning, cooling, heating, internet, smart library card etc. The reason behind that to make a smart library and interactive communication in the library. The Present Study deals with user's opinion on OPAC and accessing of OPAC of Learning Resource Centre SRPMCH&RC in this paper observed the awareness of online public access catalogue, level of access, and satisfaction level of OPAC among the users.

Keywords: smart library, technology, SRPMCH&RC, users, smart card, OPAC, Library automation, users.

Introduction:

As we all know that Ranganathan's 5th Law says that- Library is a growing organism deals with accommodating changes in technology, services, collections and users. With the use of the computer technology, traditional library services are enhancing and modifying in the digital environment. Today's era, the role of the libraries, information services and connection between library and the users is changing extensively. Smart library is a system which is developed to

maintain research and training activity. In digital environment smart libraries is just a library resolution to innovate library and information services. A library is built with smart technology is able to be open to library users without being personnel. The technology facilitates remote control of library building, includes well-furnished furniture, automatics doors, lighting, self-service kiosks and open computers to all users.

The impacts of ICT on libraries are changing the way of library resources, services and management of library collection. It also changed the role of the libraries in acquire, maintain, manage and distribution of the information, to the end users at right time. The main purpose of library automation is to easily access the main modules and functions of the library and is to free the librarians and the library staff and to allow them to contribute more meaningfully to spread of knowledge and Information. Library Automation reduces the repeated manual efforts in library routine work. Library automation has replaced the traditional library work in to automated work.

Library Automation:

Library automation may be defined as the application of automatic and semiautomatic data processing machines to perform traditional library housekeeping activities such as acquisition, circulation, cataloguing and reference and serials control. Today "Library Automation" is by far the most commonly used terms to describe the mechanization of library activities using the computer. Library Automation is the use of automatic and semiautomatic data processing machines to perform such traditional library activities as acquisitions, cataloguing, and circulation. These activities are not necessarily performed in traditional ways, the activities themselves are those traditionally associated with libraries Library has its own website in which all the information and e-resources are available to the users.

Concept of Smart Library:

The concept of smart library began the computer technology and digital interactions. Smart Library is also known as digital library, virtual library and also intellectual library. The concept of smart library emerge in various perspectives such as- the word 'smart' means elegant, flexible, stylish, acknowledging. According to their inquiries and requirements, smart library is a concept of the complexion hardware and software with a wide range of opportunities for searching and providing indispensable information to effective users. Smart library is a library offers all types of services which are innovative, interactive, informative, inventive, changing and so on. The major purpose of the smart library is to convince information requests of the user, using digital

technology. To study an information need of a user is possible through implements of information technology.

Review of Literature:

Schopfel (2018) the purpose of this paper is to provide new perceptions towards public and academic libraries. The study observes that the smart library services described in four dimensions like smart place, smart services, smart governance and smart people. Smart library does not represent a project but a process is less linear or less planned and more original and innovative

Kulkarni and Dhanamjaya (2017) the study defined that public library system is the globally successful with their library space, collection, services, infrastructure, practices etc. The findings of the study will help to develop an importance public library system of international standard and ensure that libraries are transformed into knowledge centers.

Hoy (2016)the study observed that smart library building are provide the modern facilities to the users like furniture, lightning, cooling, heating and also provide good physical security. These facilities will developed the technologies for the smart users and also explore the implications for the libraries.

Baryshev and Babina (2016) the paper smart library concept in Siberian Federal University defined that smart library is a complex program with the hardware and the software with large range of prospects and provide essential information to the students and researchers.

Baryshev (et.al.) (2015) the main purpose of this article is to discuss about the trends in electronic library to a smart library. Major problems were discussed in the circumstances of university and public library areas. The findings of the article were for constructing a smart library with the current thinking about the funds, space, environment and staff of the library.

Sridhar (2004) dispensed a comparative study of use of OPAC and library catalogue of the library The study examines for the declining use of OPAC by finish users and also the associated issues just like the gift information light, negligible use of Boolean operators and combination searches, too several records labelled , too broad descriptors, etc. It concludes that, moving from ancient library catalogue to trendy OPAC.

Tanja and Maja, (2008).in the study draws attention to some important issues concerning Web 2.0 trends for OPAC. They observed that at this point, none of the catalogues offered as vast as a range of features, as Amazon did but one catalogue managed to surpass Amazon in some of the

Islam Maidul (2010) investigated the use of library catalogue in Dhaka University Library. The study employed descriptive research methods and a questionnaire to generate the data. The analysis revealed that 61.38 percent (178) of the users were aware of library catalogue, and 53.45 percent (155) had never used the catalogue. The study also showed that 71.03 percent (206) encountered difficulties in using the catalogue because of lack of proper education and, as a result, 69.31 percent (201) of the users did browsing/reading through the shelves to locate books. The analysis also revealed that 68.97 percent (200) of users indicated that proper user education was a means to easy catalogue use in the library.

Features of Smart Library

Following are the features of smart libraries which are as follows:

1. Smart library providing skills and resources for the library society to confidently control cyber-issues and continue to hold the positive features of online achievement.
2. For all types of libraries smart library is designed to be adjustable and flexible like regional, rural, educational, community, metropolitan, remote and mobile & it also providing useful direction to libraries.
3. Smart library is an expansion of a verified model for the present scenario or the current period.
4. To increase knowledge and skills of the users and staff, smart technology helps to reduce the digital divide in online world.
5. The most appropriate resources and realistic tools in cyber-safety are assembled in single position.
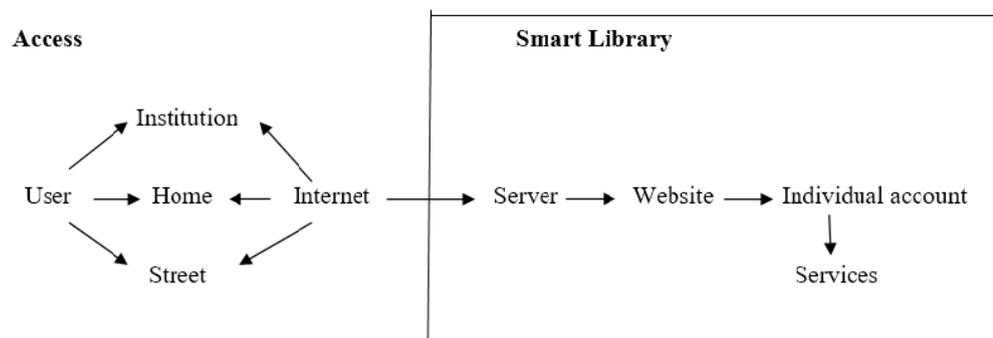
Objective of the Study:

1. To find out the awareness of OPAC from users.
2. To find out the search frequency of OPAC for searching library sources.

3. To find out the extent of fields use in OPAC for the academic purpose at the Library.

4. To find out the level of satisfaction of OPAC.

Methodology

The purpose of the Current Study was to ascertain the Knowledge, attitudes, and behaviors of first-year medial students Participated in the study following section presents the methodology followed in the present study in a concise manner. Collection of catalogue records: The catalogue records were collected in the form of single CSV (comma separated values) file or XLS (Excel Spreadsheet) file from Design and development of a cloud based OPAC for S R Patil Medical College Hospital and Research Centre - Central Library in person

Data sample selection

Present study was limited to S R Patil Medical College Hospital and Research Centre - Badagandiso the only users of S R Patil Medical College Hospital and Research Centre Library, Badagandi re selected for the present study. From MBBS First Year, Second year and final year user group, 50 users per year was selected as sample for the study.

Data sample size

From each class, 50 questionnaires were distributed among users, total 150 questionnaires was distributed. All 150 filled questionnaires are received form library users. Based on convenience sampling selected the sample size in which those users who not uses OPAC for searching resources are neglected for the study.

Survey Method

Descriptive statistics were used for data analysis of data. With the help of well-structured questionnaire opinion of respondents have been collected. The depth incites about the topic has been developed using sources of data such as journals, books and research papers

Data Analysis

Table: 1 Class wise distribution of respondents Class wise distribution

User group	Respondents	% age
MBBS First Year	50	100 %
MBBS Second Year	50	100 %
MBBS Third Year	50	100 %
Total	**150**	**100 %**

Table 1 shows class wise distribution of respondents that 100 % users from each class actively response to questionnaire. 50 questionnaire per class was distributed and all the 50 fulfil questionnaire from each class has been received.

Table: 2 Use of OPAC to search for reading material Use of OPAC to search for reading materials

	User group	Yes	No	Total
S R Patil eMdical College Hospital and Research Centre Library, Badagandi	MBBS First Year	48 (96 %)	2 (4 %)	50 (100 %)
	MBBS Second Year	48 (96 %)	2 (4 %)	50 (100 %)
	MBBS Final Year	49 (98 %)	1 (2 %)	50 (100 %)
	Total	**145 (96.66%)**	**5 (3.33%)**	**150 (100%)**

Search frequency of OPAC

Table: 3 Search frequency of OPAC

Sr. No.	Period	User Group		
		MBBS First Year	**MBBS Second Year**	**MBBS Final Year**
1	Daily	9 (18.75%)	10 (20.83%)	12 (24.49%)
2	Once in two days	6 (12.5 %)	5 (10.42 %)	9 (18.37 %)
3	Once in a week	17 (35.42 %)	19 (39.58%)	21 (42.86%)
4	Twice in a week	4 (8.33 %)	6 (12.5 %)	3 (6.12 %)
5	Once in a two week	8 (16.67%)	3 (6.25 %)	2 (4.08%)
6	Once in month	3 (6.25 %)	2 (4.17 %)	1 (2.04 %)
7	Rarely	1 (2.08 %)	3 (6.25%)	1 (2.04 %)
	Total	**48 (100 %)**	**48 (100 %)**	**49 (100 %)**

The above table no. 3 shows that OPAC search frequency by samples of *S R Patil Medical College Hospital and Research Centre*- Library users. Among class wise users, the majority 12 (24.49 %) of Final year student accessing OPAC daily followed by MBBS Second year users 10 (20.83%) and 9 (18.75 %) of MBBS First year users. Referring another frequency once in a two days majority of 9 (18.37 %) of MBBS Final year followed by MBBS First Year 6 (12.5%) and MBBS Second year users 10(20.83%) are registered. Majority of 21 (42.86%) of MBBS Final followed by MBBS Second year 19 (39.58 %) and 17 (35.42 %) are use OPAC once in a week. While in frequency twice in a week 6 (12.5 %) MBBS Second Year student followed by 4 (8 .33%) First year user and 3 (6.12 %) final year users are registered. Referring once in a two week 8 (16.67 %) of MBBS First yearstudent followed by 3 (6.25%) second year users and 2 (4.08 %) final year users are registered. While 3 (6.25%) of MBBS First year users followed by 2 (4.17%) second year users and 1 (2.04%) final year users are using OPAC once in a month.

Search option use while searching resources in OPAC

Table no. 4 Search option use while searching resources in OPAC

User Group	Frequency	Title	Subject	Author	Publisher	Keywords	Call No.	Combinatio of
MBBS First Year users	Very Frequently	30 (62.5%)	32 (66.67%)	29 (60.42%)	10 (20.83 %)	30 (62.5%)	7 (14.58%)	32 (66.67%)
	Frequently	10 (20.83 %)	6 (12.5 %)	9 (18.75 %)	32 (66.67%)	9 (18.75 %)	1 (2.08 %)	2 (4.17 %)
	Occasionally	8 (16.67%)	7 (14.58%)	6 (12.5 %)	6 (12.5 %)	8 (16.67%)	11 (22.92%)	5 (10.42%)
	Rarely	0 (0%)	2 (4.17 %)	4 (8.33 %)	2 (4.17 %)	1(2.08 %)	29 (60.42%)	5 (10.42%)
	Very rarely	0 (0%)	1(2.08 %)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (8.33%)

MBBS Second Year users

	Very rarely	Rarely	Occasionally	Frequently	Very Frequently	Total	Total
	0 (0%)	3 (6.25%)	7 (14.58%)	11 (22.92%)	27 (56.25%)	48 (100 %)	48 (100 %)
	0 (0%)	2 (4.17 %)	6 (12.5 %)	10 (20.83 %)	30 (62.5 %)	48 (100 %)	48 (100 %)
	0 (0%)	2 (4.17 %)	4 (8.33 %)	11 (22.92%)	32 (66.67%)	48 (100 %)	48 (100 %)
	0 (0%)	3 (6.25%)	30 (62.5%)	6 (12.5 %)	9 (18.75 %)	48 (100 %)	48 (100 %)
	1 (2.08 %)	0 (0%)	6 (12.5 %)	10 (20.83 %)	32 (66.67%)	48 (100 %)	48 (100 %)
	0 (0%)	30 (62.5%)	4 (8.33 %)	6 (12.5 %)	8 (16.67%)	48 (100 %)	48 (100 %)
	2 (4.17%)	1 (2.08 %)	1 (2.08 %)	11 (22.92%)	35 (72.92%)	48 (100 %)	48 (100 %)

MBBS Third Year users	Very Frequently	Frequently	Occasionally	Rarely	Very rarely	Total
	32 (65.30%)	10 (20.41%)	4 (8.16)	2 (4.08%)	0 (0%)	49 (100 %)
	32 (65.30%)	10 (20.41%)	4 (8.16)	2 (4.08%)	0 (0%)	49 (100 %)
	31 (63.26%)	9 (18.36%)	8 (16.32%)	0 (0%)	0 (0%)	49 (100 %)
	6 (12.24%)	8 (16.32%)	14 (28.57%)	20 (40.81%)	0 (0%)	49 (100 %)
	30 (61.22%)	11 (22.45%)	7 (14.28%)	0 (0%)	0 (0%)	49 (100 %)
	4 (8.16)	6 (12.24%)	10 (20.41%)	20 (40.81%)	0 (0%)	49 (100 %)
Total	32 (65.30%)	11 (22.45%)	4 (8.16)	1 (2.04%)	0 (0%)	49 (100 %)

The above table shows the fields used in OPAC while to search a resources. It can be inferred from the above table title field usage by the uses in OPAC. In MBBS First year user group, majority 30 (62.5%) respondents use the title to find a resources very frequently and 10 (20.83 %) are frequently. In MBBS Second year user group, about 27 (56.25%) use title very frequently and 11 (22.92%) frequently as a mode of search n OPAC, whereas, In MBBS Final user group

32 (65.30%) respondents use the title as a searching mode very frequently and 10 (20.41%) of them use the same frequently. Compared to all user group all are use title as a mode of searching in OPAC very frequently.

Findings:

Among all the user *S R Patil Medical College Hospital and Research Centre* - Central Library – Badagandi are accessing OPAC. On daily basis MBBS Final year user group 12 (24.49%) respondent access OPAC high and 21 (42.86 %) respondent on same group access OPAC in once in a week. Search option subject are used by all user group high with 32 (66.67%) respondent from first year group and 32 (65.30%) respondent from final year group. The average ration of search option combination of above is found high in the entire group. Satisfaction level of OPAC is high in all groups highest in MBBS Final user group with 35 (71.43%) respondent. The popularity of OPAC facility is nearby same in the entire group expect 1 to 2 respondents from each group.

 The findings of the present study suggest that there is a need for a regular Orientation programme and information literacy programme in general in all the user S R Patil Medical College Hospital and Research Centre - Central Library – Badagandi The study also suggests that all user group covered under study have to motivate the users to access OPAC. Also suggest arranging library visit for all the users to access OPAC and to retrieve the exact bibliographic details of the resources they need.

Conclusion:

This paper shows that the smart library in India is mainly focuses on the use of new information technology in the library and is considered to be very mutual education atmosphere where users are encouraged to give new thoughts and process. Web-based technology to the users. Buildings of these library be getting attractive but they are still as smart as the people that run them. This paper highlights the library adopt a new technologies quickly with the advance environment. The main reason of this paper is the greater use of new equipment's and interactive communication and to make a smart library for smart users. And Present study provides information on users' opinion on Library automation and OPAC facility in the college library of S R Patil Medical College Hospital and Research Centre- Badagandi As explain in the introduction the main purpose of library automation is, to access the main modules and functions of the library. The

study explains that awareness of library automation services and use of OPAC there is a need of motivate the users to access the OPAC.

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Smart Library Users Prefer Smart Services: Technology Used By Health / Medical Sciences Smart Libraries

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Abstract:

Technology is inherently dynamic and undergoes continuous evolution. Libraries have more benefited from technology systems for more than half a century. Today's Health / Medical Sciences users expect their libraries to effectively utilize current technologies to enhance the library experience. Smart new technologies libraries are the current generation libraries, which work with the amalgamation of smart technologies, smart users and smart services. This paper discuss on need of smart technology systems in Health / Medical Sciences libraries; the use and importance of smart library for Health / Medical Sciences library users and librarians; the smart services at Health / Medical Sciences libraries. Narrates the Radio Frequency Identification technology use and its devices work in the library are also discussed.

Keywords: Smart Library, Smart Users, Smart Services, Smart Technology, RFID

Introduction

Technology is inherently dynamic and undergoes continuous evolution. Libraries have more benefited from technology systems. Technology offer new opportunities for innovation in the traditional library model.

The present world scenario is about smart technologies. It is playing a wide role. Smart technologies encourage more user to use the library. It is a system well equipped with smart technology that is fully dedicated to help library users. Smart new technologies libraries are the current generation libraries, which work with the amalgamation of smart technologies, smart users and smart services.

Health / Medical Sciences libraries in India use a combination of hardware and software to provide better services to users. Many developed countries use smart library systems, which are automated and advanced library systems that use the latest technology. Libraries in developed countries have been using emerging technologies like Cloud Computing,

Robotics, RFID, Big Data, Artificial Intelligence, Virtual and Augmented Reality, Book Delivery Drones, Web 2.0 etc. to provide library and information services.

Today's Health / Medical Sciences users expect their libraries to effectively utilize current technologies to enhance the library experience. Nowadays, more and more libraries are adopting Radio Frequency Identification technologies as it streamlines workflow in the area of self- service, book returns, shelf management and inventory.

2. Definition and Meaning

2.1 Smart

Simple synonyms for smart are clever, patent, skilled, stylish and efficient, and those should basically be the qualities of products and services which contain this word (K Marquardt, 2017). The term smart means flexible, extendible, adaptive, acknowledging and human (Sotonye Orji & Isaac EchezonamAnyira, 2021). SMART for Services, Methods, Automation, Resources and Technologies.

2.2 Smart Library

Smart library is a library provided services, which are interactive, innovative, informative, actual, changing and international (Anubhav Shah &RukhsarBano, 2020).

It is a library with a purpose to provide better and advanced services to the users (In lucid language).

2.3 Smart Users

The Users who either use most of the smart technologies providing skills of integration with digital contents already disposed from daily experience and basic education (SandroParrinello&Raffaella De Marco, 2022).

2.4 Smart Services

Service is defined as the action of helping or doing work for someone.Smart Servicescombine hardware such as sensor technology with software to solve a specific problem. The entire range of systems, services and software doing this is called Smart Services (Proficloud.io).

2.5 Smart Technology

Technology means it <u>refers</u> to systems, methods and devices which are the result of <u>scientific</u> <u>knowledge</u> being used for <u>practical</u> purposes.

Smart Technology it includes devices, systems, and places that use advanced technologies to interact intelligently with people and other devices.

2.6 Radio Frequency Identification

RFID is an acronym for briefly the RF stands for Radio Frequency and ID means Identifier that allows an item, for instance a library book, to be identified, accessed, stored, reprogrammed and communicated by using radio waves.

3. Need of Smart Technology Systems in Health / Medical Sciences

Libraries

Libraries have more benefited from technology systems for more than half a century. Smart technologies encourage more people / user to use the library. Some of the key benefits of using smart technology are convenience, ensures sustainability, security, efficiency, save money & time etc.

Technological advancement has forced Health / Medical Sciences libraries to change their traditional services by adopting emerging technologies to respond to the changing information needs of their users, who are now more technologically inclined and prefer remote and timely access to scholarly information.

Smart technologies are the recent trend in Health / Medical Sciences libraries. Smart technologies have the potential to enhance health / medical sciences library services provision.

Application of technology in Health / Medical Sciences libraries including 1. Storing collections electronically 2. Supporting library users in their teaching and research 3. Supporting quality education in the Health / Medical Sciences, 4. Aligning services with organizational priorities and using technology to innovate and boost quality, etc.

Health / Medical Sciences libraries are evolving to use new technologies in many ways includes 1. Artificial Intelligence 2. Virtual Reality and Augmented Reality 3. Digital Collaboration 4. Mobile Technologies 5. Visualization etc.

4. The Use and Importance of Smart Library for Health / Medical

Sciences Library Users and Librarians

Access to health information is essential for the economic progress of a county and within the evolving field of healthcare, Health / Medical Sciences libraries play a crucial role in enhancing health education and supporting research.

Smart libraries represent a paradigm shift in the way libraries operate and provide services to users. Here are the essential benefits associated with smart libraries are 1. Diverse Access to Resources 2. 24/7 Accessibility 3. Research and Consultation Opportunities 4.

Energy Efficiency and Environmental Impact 5. Traffic Reduction and Time Efficiency 6. Sustainable Development etc.

Health / Medical Sciences smart libraries utilize various specific technologies to enhance operations, improve user experiences, and facilitate access to information. 1. Radio Frequency Identification Technology2. Digital Catalogs and Databases3. Digital Lending Platforms4. Mobile Applications5. Data Analytics and Machine Learning6. Internet of Things Devices7. Interactive Displays and Virtual Reality8. Self-Service Kiosks and Automated Systems etc.

Health / Medical Sciences smart libraries facilitate systematic development of collections, store, and organise information and knowledge in digital formats and provide easy and affordable access to information and knowledge in various locations with the aid of emerging technologies.

The essential elements of Health / Medical Sciences smart library are 1. Green Library Building 2. Uninterrupted Power Supply 3. High Speed Internet 4. Meta Data 5. RFID 6. Bar Code 7. Smart Card 8. Plagiarism Software 9. IR Software 10. Wi-Fi / Li-Fi-Premises of Library 11. ETD Databases 12. Own Library Website 13. Library Blog 14. Sound Budget, 15. Standard ILMS 16. E-Library Orientation 17. E-Resources (E-Books, E-Journals, Databases, E-News Papers) 18. Good Scanner 19. Printer 20. Digital Xerox Machine 21. CC Camera 22. Sensor 23. Library Digital Gate etc.

Health / Medical Sciences smart library can make a librarian's work easier by allowing for remote control of the library building and extending library hours. These libraries can help librarians in a number of ways including 1. Remote Control 2. Space Saving 3. Improved Access to Information 4. Collaboration 5. Digital Technology 6. Social Media etc.

5. Smart Services at Health / Medical Sciences Libraries

To provide services Health / Medical Sciences libraries used traditional, semi traditional, emerging and innovative technologies.

Health / Medical Sciences libraries need smart services to better serve patients and healthcare professionals by improving access to information, enhancing, collaboration, and making information retrieval more efficient.

Smart services provided to the Health / Medical Sciences library users through 1. RFID 2. Mobile and Wireless Access 3. Remote Assistance 4. Semantic Web 5. Artificial Intelligence 6. Internet of Things 7. Machine Translation 8. Voice and Image Recognition 9. Sensor 10.

CCTV 11. Natural Language Processing 12. Augmented Reality etc. for delivering new experiences in harnessing the contents of information resources.

Some Smart Library Services are 1. Library Marketing & Promotion Service 2. Circulation Services 3. Newsletter Services 4. Bulletin Board 5. Electronic Board Services 6. Linking Different Datasets 7. Collaborative Digital Reference Services 8. E- Document Delivery Services 9. Ask the Librarian / Contact Us / Feedback Process 10. Virtual Library Tours 11. Streaming Media 12. Video Podcast 13. Value Added Services 14. Aggregator Services 15. Open Access Publishing 16. Metadata Schemas 17. Library Use Statistics 18. User Education / Orientation etc.

6. Radio Frequency Identification (RFID) Technology

Currently libraries are using the latest technologies and trends to make the services popular and user friendly. The RFID technology stands as a cornerstone in the transformation of traditional libraries into smart libraries.

RFID is a wireless technology mainly used for automatic identification using radio-waves to detect, track, identify, and thus manage various objects and people (Pal and Sharma, 2017). Importance of RFID technology in library managing includes 1. Automated Inventory Management 2.Efficient Circulation and Checkout Process 3.Enhanced Security and Theft Prevention 4.Reduced Labor Costs and Increased Productivity 5.Improved Patron Experience etc.

Radio Frequency Identification technology based library to make everyone's job or work easier right from the users to library staff. Its technology is widely used in the smart libraries. Some common RFID smart library devices are below.

The RFID reader is a network connected device that can be movable or permanently attached. There are 2 types of RFID readers they are 1.Fixed Readers 2.Mobile Readers.

The RFID tags that have a stronger power source also have a longer read range. There are 3 types of RFID Tags they are 1.Passive Tags 2.Active Tags 3.Semi-Passive Tags.The data is digitally encoded in an RFID tag which might be read by the reader. This device works as a tag during which data is read from tags that are stored in the database through the reader.

1. RFID Self-Service Borrowing and Returning Machine.

2. RFID Book Security Gate

3. RFID Tag Binding and Stripping Machine

4. RFID Library Inventory Cart

5. RFID Library Inventory Handheld Terminal

6. RFID Librarian Workstation

7. RFID Smart Bookcase

8. Smart Bookshelf

RFID Self-Service Borrowing and Returning Machine

It is one of the most widely used devices in intelligent service in libraries and provides a convenient operation mode, enabling readers to complete book borrowing and returning operations by themselves. Its technical principle is to use Radio Frequency Identification technology to identify library cards and book labels, which not only can achieve self-service card processing, but also can match readers / users borrowing information with books and achieve the function of self-service borrowing and returning books.

RFID Book Security Gate

It can be used for anti-theft and return management. It uses RFID readers to identify RFID tags on books, when readers carrying a book with an RFID tag passes through the gate, if it has not gone through the borrowing and returning process the gate will automatically alarm. This intelligent gate system can be linked to various devices such as door locks, CCTV cameras, people counter sensors etc.

RFID Tag Binding and Stripping Machine

It is a device used to bind books with RFID tags. When new books enter the library, staff can use it to write the book title, author and other information into the RFID tag and then attach the tag to the book for subsequent self-service borrowing, returning and theft detection.

RFID Library Inventory Cart

It is equipped with an RFID writer / reader and can be used to quickly count the number of books in the library. It can automatically scan RFID tags when moving around the library allowing management to promptly identify books that have been borrowed or not yet shelved.

RFID Library Inventory Handheld Terminal

The RFID library inventory handheld terminal uses RFID technology to quickly and accurately detect the number and location of all books in the library with an RFID library inventory machine automated inventory can be achieved, accuracy and improved inventory efficiency.

RFID Librarian Workstation

The librarian workstation is equipped with an RFID writer / reader. Readers / users can place the books they have read on the RFID librarian workstation and the system will automatically identify the books and display relevant information on the terminal making it convenient for readers / users to perform searches, borrow and other operations.

RFID Smart Bookcase

Each book is equipped with an RFID tag, when the book is placed in the bookcase, the RFID writer / reader will scan the RFID tag and match the book information with the reader information to achieve self-service, borrowing and returning. The librarian / other staff can view borrowing and returning status book inventory and other information through a remote management system.

Smart Bookshelf

The working principle is similar to that of a smart bookcase, when readers take books from the bookshelf, the RFID writer / reader will automatically recognize the RFID tag and the system will update the book's location information automatically ensuring the management and security of books. RFID smart bookcases and smart bookshelves can improve the service efficiency of libraries and enhance the user experience of readers / users. Thus they have a high market demand, especially in large libraries such as university libraries and public libraries.

Conclusion

Smart technologies have become increasingly integral to modern society, bringing many opportunities and benefits. Smart library systems and its services can provide optimal support for academic, research, and evidence-based clinical decisions of Health / Medical Sciences education in the country.

Smart libraries benefit the community and promote learning in many ways, leveraging technology and innovative services to enhance access to resources, foster engagement and facilitate lifelong learning.The smooth and efficient running of smart libraries require application of emerging technologies. Health / Medical Sciences smart libraries should be adequately funded so that they would be financially capable to purchase the emerging technologies needed to initiate and operate smart libraries.

The 5th law of library science that "library is a growing organism", librarians are always found interested in adopting modern technologies to provide better and efficient

services to the patrons. Librarians are using various new inventory technologies in libraries and they have started using RFID technology to give more effective and efficient circulation services as well as for security of library collections. It is effective, convenient and cost efficient technology in library security**.**Radio Frequency Identification technology is more popular latest technology in India with more development in coming days in academic, research libraries and different sectors.

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Smart Library for Smart Users and Smart Services

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Abstract:

A digital library provides a platform to access various online knowledge sources. It functions similarly to a digital gateway, giving users access to dispersed information resources on a single platform while simultaneously saving physical space because they may access information remotely from any location at any tim.

Keywords: Digital library, Smart library, Smart users, Smart Services

Introduction:

The term "digital library" refers to the transformation of traditional libraries; this idea emerged and gained traction in the twenty-first century. The words "digital library," "e-library," "virtual library," and "library without walls" are interchangeable. A digital library provides a platform to access various online knowledge sources. It functions similarly to a digital gateway, giving users access to dispersed information resources on a single platform while simultaneously saving physical space because they may access information remotely from any location at any time [1].

We must progress toward smart libraries in a smart society with smart generations. The hub of the technological civilization is the library. Universities must comprehend the advantages of the smart library idea before implementing it [2]. In what ways does the smart or intelligent library benefit management, professors, and college students? Because of its reputation as a cutting-edge, useful library that keeps up with the most recent developments, the smart library is an incredible talent. This is quite different from a typical library installation. Staffing is not necessary for smart libraries to function [3]. It encourages a stress-free work environment where mistakes or loss of data storage are not a concern. This intelligent technology generates work automatically in college libraries and other establishments or organizations [4]. Customizing and integrating high-level automated payment, data storage, and records of all types of information is possible. Numerous management tasks, such as administration, data storage maintenance, and other library operations, may be completed with ease.

Smart Library:

Smart library technology allows libraries to open to patrons without employees. We can expand the library's opening hours so that more people may use it at a time that works for them thanks to technology that can remotely operate public computers, self-service kiosks, and automated doors [5].

Benefits of smart libraries:

Smart libraries can serve as intelligent spaces for recreation, interaction, learning, and knowledge seeking, prompting literacy and the development of new technologies that contribute to various infrastructure advancements such as sustainable development and improvement in the quality of life.

Role of a smart librarian for e-library services:

As resources can be utilised 24x7 hours "Smart Librarians who are available for problem-solving and give services to user centric and user friendly is essential.

Helpfulness to students:

Children and young people can learn and develop skills through a variety of resources and activities offered by libraries. Libraries may also encourage creativity and help people improve their social skills in a stress-free setting. They are a great location for people to locate literature that can aid them with personal development [6].

Characteristics of smart libraries:

There are four characteristics of smartness explained under

1. Smart Services
2. Smart Users
3. Smart Governance
4. Smart Places

1. Smart Services

Technological innovation is presented as smart services by smart libraries. Examples include RFID, wireless and mobile access remote help, the Internet of Things, machine translation,

voice and picture recognition, the semantic web, artificial intelligence, and augmented reality to provide new ways to enjoy cultural heritage [7].

2. Smart Users:

Smart libraries are designed with and for intelligent users in mind. This idea of clever users may be translated as follows in the particular context of libraries:

a) Smart community: The term "smart user" refers to both library employees and smart citizens who use SL services. For example, whether it comes to the creation and analysis of data and information or the management of discovery tools, the library staff is among the intelligent individuals.

b) Knowledge or information creation: Astute users also contribute to the knowledge and information of other users, librarians, and library employees. Along with other patrons and/or staff, the library user is a producer or co-producer of information [8]. Other phrases that characterize the function and behavior of smart library users include production, enrichment, and sharing of information and knowledge.

3. Smart Governance:

Institutional and political factors make up the third feature of the smart library. The community, which recognizes the potential of information technology for library growth as a way to reinvest in libraries for a new environment, is at the core of wise governance. "The success of smart community cities depends on institutional preparation and community governance" (Nam & Pardo, 2011).

All library aspects, such as cooperation, partnership, collaboration, public involvement, and participation, are included in smart governance.

4 Smart Places:

The physical layout and ambiance of the library are the fourth feature. This dimension can be broadly characterized as environmental monitoring and smart environments. There are two distinct elements that we may identify:

The library ecosystem is sometimes used to explain the idea of the "green library." For example, it addresses waste management, the appeal of natural environments, pollution-free

practices, sustainable resource management, and adherence to the sustainable construction grading system [9].

Smart Library services:

A smart library is a novel idea for a library that essentially uses a mix of IT hardware, software, and internet connectivity to bridge the communication gap between patrons and librarians and enable the development of new effects for improved services [10]. Smart libraries provide us with a smart platform that includes smart infrastructure and smart work that considers user demands, which are crucial to the growth of smart library culture.

Below are the smart services:

Library Services Based on the Internet of Things (IOT): The newest internet technology available today is called the Internet of Things (IOT). With the help of this embedded technology, a large number of commonplace objects or gadgets may be gathered and shared with people in a library. It aims to give patrons greater learning opportunities and easier access to library resources and services. The typical library experience can be improved by IOT-enabled solutions. A library user may typically utilize a library in a digital or physical format [11].

A user first registers with the library by providing his personal information and preferred location in his profile, which also allows the library to generate information about his prior borrowing or browsing history [12].

A library's user services are improved when it employs IOT. The customer receives a welcome message on their smartphone when they enter the library. [8]After that, users may access this app-designated personal page to see the most recent information on their area of interest.

When patrons enter the library, they are led to the shelves, where sensors on the shelves will guide them to the information they are looking for. A different sensor or signal identifies the client's information and provides pertinent details, such as the library's most popular book or events [13].

Users may go to the shelf-checkout counter and have the content automatically checked out after they've selected to check out the book. The library sends a thank-you message to the user's library app after they visit.

Another feature of an IOT-enabled library is that patrons may use the app to access comprehensive information on the resources they want from any location, assisting them in just visiting the library when required. Additionally, users receive notifications if a book has already been checked out, and even if it is misplaced, they may locate it without assistance from library workers[14].

Smart security support: Any library that wants to safeguard its grounds must have smart architectural security support. It is a crucial function that begins with the physical design that maximizes technology services. It involves keeping an eye on visitors and staff networks, Voice communication, and quick internet, the original architecture design should incorporate visitor management and digital signs. Here, a few of these characteristics are emphasized.

- smart RFID cards/Biometric security entrance/exit terminals
- Network security firewalls.
- Monitoring security systems like CCTV
- Fire Extinguishers, Like security exits during emergencies [15]

Significant tools required for the IOT:

Cloud computing: Anything that uses the internet to offer hosted services rather than allowing users to access them directly from a desktop computer or internal server is referred to as cloud computing. Computer is the provision of computer services, such as databases, servers, and storage.

Magic Mirror

An application technique called "magic mirror" might be installed in libraries to detect the title the user is holding, suggest further library resources, discuss relevant events, and provide a preview of the books.

Wireless Sensor Network

"Recent technological advancements in low power integrated circuits and wireless communications have made proficient availability, at low cost, for use in remote sensing applications." WSNs are groups of spatially distinct and dedicated sensors for monitoring and recording the physical conditions of the objects and organizing the collected data at a central location [16].

Radio Frequency Identification

The administration of a library makes use of this service. It makes it possible for books to be checked in and out on their own. Books and student ID cards are both equipped with RFID tags. The library database already has information on the students and the books. The student's full information appears after scanning his ID card. The book is assigned to that specific pupil when the information is obtained by scanning the book. Security doors guard the whole system, preventing users from accessing it without first scanning their RFID tag [17].

In summary Application of IOT in libraries can be as follows.

● The Book Transaction Analysis

● Navigation by GPS

● Checking of Availability

● Maintenance of Infrastructure

● QR Code

● Book reservation Status

● Library fine

● Biometric

● Kiosks in the library

● Sensors

● Mobile Alert

● Virtual Library tour

● Bar-code

Conclusion:

Recent public and academic library models, like the learning center or the green library, exhibit several similarities with the idea of the smart library, particularly about the importance of information and the integration of institutions, people, and technology. The idea of a smart library is still somewhat "fuzzy," open, and dynamic about smart cities. The idea of a smart library is not a novel project or model; rather, it is a method of doing tasks that is less regimented, more inventive, and less linear.

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Transforming Libraries: The Rise of Smart Libraries in the Digital Age

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Abstract

The concept of smart libraries has emerged as a response to the changing landscape of information access, technological advancements, and evolving user needs. This paper examines the role of smart libraries, which integrate emerging technologies like the Internet of Things (IoT), Artificial Intelligence (AI), automation, and augmented reality to enhance the traditional library model. We explore the key technologies that define smart libraries, review case studies of libraries that have successfully adopted these innovations, and discuss the benefits and challenges associated with this transformation. The paper concludes with a look at the future of smart libraries, their potential to reshape educational and public spaces, and the broader implications for library management.

Introduction

Libraries have long served as the cornerstone of knowledge dissemination, acting as repositories of information, centres for learning, and community hubs. Over time, libraries have evolved to accommodate changes in society, such as the shift from physical to digital information. As the digital age progresses, libraries are now facing the challenge of staying relevant amidst the proliferation of digital content, mobile devices, and online information sources. The concept of a "smart library" offers a solution by incorporating cutting-edge technologies to enhance library services, user experiences, and operational efficiency.

Smart libraries go beyond traditional roles and embrace automation, personalization, and real-time data management to meet the needs of modern users. This paper explores the technologies powering the rise of smart libraries, the impact of these technologies, and the future direction of library services in an increasingly connected world.

Literature Review

Technologies Driving Smart Libraries

The integration of various technologies is transforming libraries into smart, interactive, and efficient spaces. Several core technologies enable this transformation:

1. Internet of Things (IoT): IoT devices, such as RFID tags, smart shelves, and environmental sensors, are increasingly used to track books, manage inventory, and monitor the physical environment. RFID technology allows for quick check-ins and check-outs, automated book sorting, and seamless inventory management, improving operational efficiency and user experience.

2. Artificial Intelligence (AI): AI enhances smart libraries by automating processes such as cataloguing, data retrieval, and personalized user interactions. AI-powered systems like recommendation engines, chatbots, and predictive analytics help libraries tailor services to individual users, offering personalized reading suggestions and assisting with search queries.

3. Automation: Automation is central to the operations of smart libraries. Self-checkout kiosks, automated book returns, and robotic book retrieval systems save time and improve the efficiency of library operations. These systems enable libraries to allocate more staff resources to customer service and engagement.

4. Augmented and Virtual Reality (AR/VR): Libraries are increasingly adopting AR and VR technologies to enhance user experience. Virtual reality can be used to create immersive learning environments, while augmented reality provides users with interactive features, such as 3D models of books, historical artifacts, or interactive maps of library collections.

5. Cloud Computing: Cloud-based services provide libraries with the scalability to store and access vast amounts of digital content, including e-books, journals, and multimedia resources. Cloud solutions also allow libraries to facilitate remote access to their collections, making resources available to users anywhere, at any time.

Case Studies of Smart Libraries

Several institutions have pioneered the adoption of smart technologies in libraries:

• National Library of Singapore: The National Library of Singapore uses RFID technology and AI to enhance user experience and streamline operations. The library offers automated book returns, smart shelving, and personalized services through mobile apps, allowing users to access information easily.

• University of Illinois at Urbana-Champaign: This university library uses a combination of smart shelves, IoT devices, and AI-powered services. The library employs predictive analytics to optimize space and resource allocation based on user demand patterns.

• Boston Public Library: The Boston Public Library has integrated smart technologies, including self-service kiosks and digital catalogues, which have improved user satisfaction and operational efficiency. The library also incorporates smart lighting and energy management systems to reduce costs and improve sustainability.

Methodology

This study employs a qualitative research approach, analysing case studies of smart libraries and reviewing existing literature on technology adoption in libraries. Data was collected through online:

• Case Study Analysis: In-depth examination of libraries that have successfully implemented smart technologies, including those mentioned in the literature review.

• Interviews with Library Professionals: Interviews with library staff, IT specialists, and users to understand the benefits, challenges, and user responses to smart library services.

• User Surveys: Surveys to assess the effectiveness of new technologies in improving user satisfaction and engagement in smart libraries.

Key Technologies in Smart Libraries

RFID and Automated Book Management

RFID technology is one of the most widely adopted innovations in smart libraries. By replacing traditional barcode systems with RFID tags, libraries can automate the check-out/check-in process and streamline inventory management. RFID-enabled books can be tracked in real time, reducing the risk of loss and improving accuracy in book retrieval.

Benefits: Increased operational efficiency, reduced human error, quicker processing time.

Challenges: Initial setup costs, staff training, and system maintenance.

AI-Driven Cataloguing and Search

AI has revolutionized how library collections are organized and searched. AI-based systems can automatically tag books with relevant metadata, improving search ability and the discovery of related resources. Personalized recommendation systems also help users find books and articles relevant to their interests.

Benefits: Enhanced user experience through personalized recommendations and faster search capabilities.

Challenges: Data privacy concerns, algorithmic bias, and the need for continuous system updates.

Smart Spaces and Environmental Control

IoT-based smart environments allow libraries to optimize space utilization and reduce energy consumption. Environmental sensors can adjust lighting, temperature, and humidity based on real-time data, creating a more comfortable and energy-efficient space.

Benefits: Cost savings, environmental sustainability, improved user comfort.

Challenges: Integration with existing infrastructure, user acceptance of automated systems.

Challenges and Barriers

While the adoption of smart technologies in libraries offers numerous advantages, there are several challenges and barriers:

• Cost: Implementing smart technologies requires significant investment in infrastructure, equipment, and training. Libraries, especially those with limited budgets, may find it difficult to justify the upfront costs.

• Data Privacy and Security: As libraries collect more user data through smart systems, concerns about data security and user privacy become critical. Libraries must ensure that they comply with privacy regulations and protect sensitive information.

• Resistance to Change: Some library staff and users may resist the adoption of new technologies due to fear of obsolescence or unfamiliarity with the systems.

• Maintenance and Upkeep: Smart systems require continuous maintenance and regular updates. Libraries must invest in ongoing support and training to ensure these systems continue to function effectively.

The Future of Smart Libraries

The future of smart libraries lies in the continued integration of advanced technologies and the pursuit of more sustainable, user-centered services. As AI and IoT evolve, libraries will become more autonomous, able to predict user needs and automate even more aspects of their operation.

Future Trends:

• AI-powered Virtual Assistants: Chatbots and voice-activated assistants will become more sophisticated, offering personalized assistance for library users.

• Smart Community Engagement: Libraries will act as hubs for digital literacy, providing access to resources and training on smart technologies.

• Sustainability: Smart libraries will increasingly focus on environmental sustainability, incorporating energy-efficient technologies and green design principles.

Conclusion:

Smart libraries represent the future of information services, blending traditional library roles with cutting-edge technology to meet the needs of modern users. The integration of IoT, AI, automation, and other advanced systems offers significant benefits in terms of efficiency, user experience, and sustainability. However, the implementation of these technologies requires careful planning, adequate funding, and attention to privacy and security concerns. As libraries continue to evolve, they will play a pivotal role in shaping the future of learning, research, and community engagement.

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Discussion on Altmetrics – A Focusing on VIDWAN: A Case Study

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Abstract

Altmetrics, introduced in 2010 by Jason Priem, track research visibility and impact on social media. Various tools like altmetric, Dimensions, Impact Stories, and Plum X Metric monitor mentions, ratings, reviews, shares, and usage. A study was conducted on altmetrics using the VIDWAN database, focusing on data extraction from all states in India and 8 major subjects, with a specific analysis of medical and health sciences in Karnataka at state and deemed universities. The database includes 389 professors, 213 associate professors, and 375 assistant professors. Statistical methods were used to analyze data and test objectives and hypotheses for significance, with results presented in a doughnut chart showing research impact. The study highlighted the impact of INFLIBNET's services on colleges and universities in India. The VIDWAN database profiles scientists, researchers, and faculty members from top academic institutions and research organizations in India, offering detailed information on their background, contact details, experience, publications, skills, and achievements. Engineering & Technology has the most members (100,880), followed by Medical & Health Sciences (27,677), with Karnataka having the highest number of registered members at 3,571. Pharmacology and Pharmacy have the most members at 91, followed by Dentistry Oral Surgery and Medicine at 81. Yenepoya University leads with 441 members, followed by Shri Dharmasthala Manjunatheshwara University with 343 members. Altmetrics data in VIDWAN provides insights into the broader impact of researchers' work, including social media mentions, downloads, and views. Researchers can use altmetrics on platforms like VIDWAN to track the visibility and influence of their work in the digital age, capturing online attention and engagement around research outputs. One sample t-test was used to analyze the data in SPSS version 16.

Introduction

Altmetrics, introduced in 2010 by Jason Priem in the Altmetrics Manifesto, are alternative metrics that provide a new way to measure and evaluate scholarly outputs beyond traditional citation counts. Various altmetric scores can be generated for different research outputs by commercial providers like Altmetric (https://www.altmetric.com/), ImpactStory (https://profiles.impactstory.org/), and Plum X Metrics (https://www.elsevier.com/en-in/insights/metrics/plumx). Altmetrics track the visibility and impact of research outputs on social media and in organizational reports, including public engagement, researcher engagement, and policy impact. These metrics monitor online discussions about research outputs, providing insights into their reach. Tools like Altmetric, Dimensions, Impact Stories, and Plum X Metric monitor mentions, ratings, reviews, shares, and usage across various platforms. Access Altmetrics through databases like Scopus, EBSCO Host, Science Direct, and Engineering Village, which display Plum X Metrics. Look for "Article Metrics" or "Metrics" links. Publishers like Sage, Wiley, Taylor & Francis, and Nature provide altmetric data tracking mentions on social media, newspapers, policy documents, blogs, and Wikipedia. An attention score is assigned to show the level of online attention received. ImpactStory collects data from platforms like Facebook, PLoS, SlideShare, Topsy (for tweets), and Mendeley to provide a comprehensive impact report. Altmetrics track various types of attention from sources such as usage (views, downloads), captures (Mendeley bookmarks, CiteULike bookmarks), mentions (blog posts, news stories, policy documents, Wikipedia articles, comments, reviews), social media activity (tweets, Facebook likes, shares), and citations (Scopus, Web of Science). Altmetrics offer a more immediate assessment of research impact compared to traditional metrics, measuring engagement through different sources. The altmetric database covers approximately 49 million research papers, with 27 million having mentions on platforms like social media, news media, blogs, and policy documents. Publishers often include an altmetric "badge" for each paper, displaying its attention score and sources of mentions. Access altmetric with your UCL email address while on the UCL network. Altmetrics focus on online attention and interactions at the article/item level, including indicators like social media mentions, online news coverage, download, and comments. Altmetrics measure attention, not quality.

Strengths of Altmetrics:-

1. Currency: Altmetrics offer real-time data, unlike traditional citations that accumulate over time.

2. Diversity: Altmetrics gather data from diverse sources beyond academic publications, showcasing the wider impact of research across various outputs like data sets, software, and molecular structures.
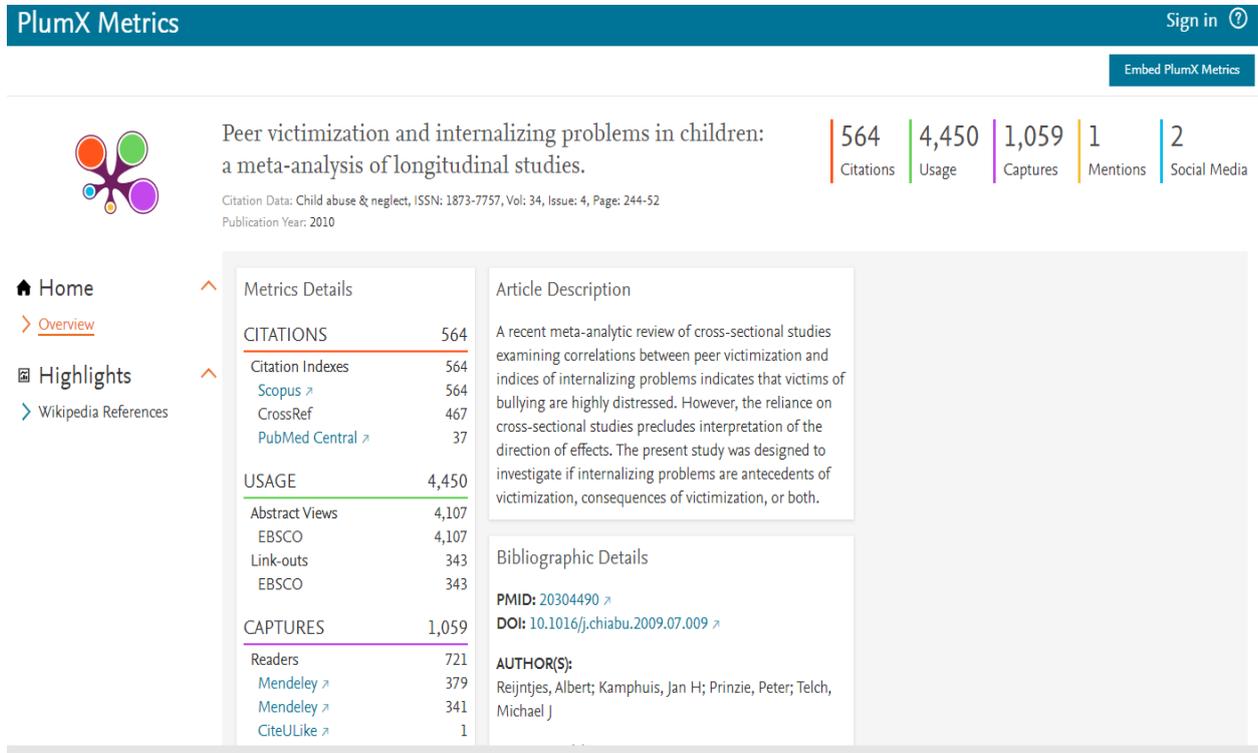
Methodology

I conducted a study on altmetrics using the VIDWAN database, focusing on data extraction from all states in India and 8 major subjects. Specifically, I analyzed medical and health sciences in Karnataka state, looking at state and deemed universities. The research included assistant professors, associate professors, and professors across medical colleges and universities in Karnataka. I assessed research impact through mentions on social media, news media, blogs, and policy documents using altmetrics tools. Commercial providers like Altmetric, ImpactStory, and Plum X Metrics were utilized, with a focus on the VIDWAN database. Statistical methods were used to analyze altmetrics data and test objectives and hypotheses for significance. Results were presented in a doughnut chart showing the number of registered individuals and research impact. The study highlighted the significant impact of INFLIBNET's services on colleges and universities in India. One sample t-test was used to analyze the data in SPSS version 16.
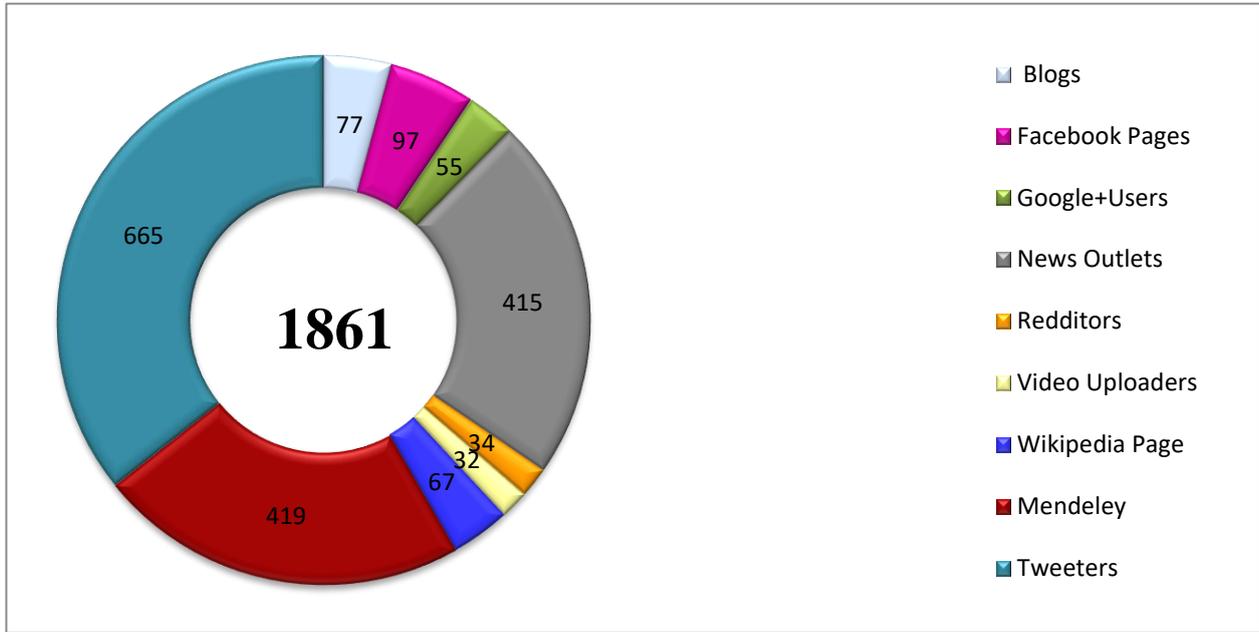
Objectives

1. Share expert information with peers, collaborators, funding agencies, policymakers, and research scholars. Easily find peer reviewers for articles and research proposals.

2. Monitor social media discussions on platforms like Facebook, Twitter, and Mendeley. Identify potential research collaborators and connect with experts for networking opportunities.

3. Evaluate the impact of altmetrics on research performance and their correlation with citation indicators. Explore altmetrics in various subject categories and organizations, with a focus on tracking research publications in medical and health sciences in Karnataka.

INFLIBNET Contribution

Sl. No	Databases	Purpose
1.		Since its establishment, the Centre has been actively involved in developing Union Databases for library resources like books, theses, and serials. Initially, it provided funding to universities nationwide to create bibliographic records of their library collections.

2.		SOUL (Software for University Libraries) is advanced integrated library management software developed by the INFLIBNET Centre for college and university libraries. It is user-friendly, operates in a client-server environment, and adheres to international standards for bibliographic formats and circulation protocols. SOUL automates library housekeeping operations and is suitable for academic libraries of all sizes, including school libraries. The latest version, SOUL 3.0, was released in February 2021 and is compatible with popular RDBMS like MS-SQL and MySQL. It conforms to international standards such as MARC 21 bibliographic format and Unicode-based Universal Character Sets for multilingual bibliographic records.
3.		Shodhganga@INFLIBNET Centre offers a platform for research students to publish their Ph.D. theses and share them with the scholarly community in open access. The repository can capture, index, store, disseminate, and preserve electronic theses and dissertations (ETDs) submitted by researchers.
4.		Vidya-Mitra is an online learning portal that hosts e-content projects developed under the NME-ICT, MHRD. Users can search and access a variety of educational materials, including audio/video content, text-based resources, and multimedia materials through a user-friendly interface. The platform also offers features like faceted search, usage statistics, project-specific access, and a personalized My-Space section.
5.		The Ministry of Education has launched e-ShodhSindhu by merging three consortia initiatives: UGC-INFONET Digital Library Consortium, NLIST, and INDEST-AICTE Consortium. This initiative offers access to over 10,000 core and peer-reviewed journals and databases for member institutions like centrally-funded technical institutions, universities, and colleges under the UGC Act.

6.		The INFLIBNET Centre facilitates open access to Indian scholarly content through InfoPort, a gateway for Indian electronic resources. It organizes online resources of Indian origin by subject using the Dewey Decimal Classification system, making it easy for users to navigate and access quality and relevant content. Resources are classified from 000 to 999, indexed by subject, and arranged alphabetically with input from librarians and scholars.
7.		e-PG Pathshala is an initiative by the Ministry of Human Resource Development (MHRD) under the National Mission on Education through Information and Communication Technology (NME-ICT), implemented by the University Grants Commission (UGC). It offers high-quality, interactive e-content in 70 subjects across various disciplines such as social sciences, arts, fine arts, humanities, natural and mathematical sciences, linguistics, and languages. Developed by subject experts from Indian universities and research institutes. Each subject has a team of principal investigators, paper coordinators, content writers, reviewers, language editors, and multimedia experts.
8.		Welcome to the Institutional Repository of INFLIBNET Centre. Here, you can access articles published in all conventional proceedings of INFLIBNET Centre. Additionally, you can find various training materials, press clippings, newsletters, and more.
9.		Many publishers use IP filtering to authenticate authorized users in subscribing institutions for access to e-resources. However, this method limits access to users on campus. To address this, the INDIAN Access Management Federation (INFED) has implemented Shibboleth, an open-source software, to provide seamless access to e-resources from any location. Shibboleth allows users to access multiple resources with a single sign-on framework, simplifying authentication

		and eliminating the need for multiple passwords. INFED aims to offer users access to internal and external resources using a single, institutionally controlled identity, enabling anytime, anywhere access to e-resources.
10.	Shodh शुद्धि Enhancing Research Quality	The Ministry of Education, Government of India, launched the "ShodhShuddhi" program on September 1, 2019, providing Plagiarism Detection Software (PDS) to over 1100 universities and institutions in India. The initiative grants access to Ouriginal (formerly Urkund) for detecting plagiarism. The program was inaugurated by the Former Minister of Education on September 21, 2019, and continued until September 30, 2023. From October 1, 2023, the INFLIBNET Centre offers the 'Drill Bit-Extreme Plagiarism Detection Software' as part of the ShodhShuddhi initiative. The trial phase for this software is scheduled for October 2023, with full service starting on November 1, 2023.
11.	N-LIST National Library and Information Services Infrastructure for Scholarly Content INFLIBNET extending access to e-Resources to colleges in India	The "National Library and Information Services Infrastructure for Scholarly Content (N-LIST)" project, collaboration between the e-ShodhSindhu Consortium, INFLIBNET Centre, and the INDEST-AICTE Consortium at IIT Delhi, provides cross-subscription to e-resources from both consortia. This allows universities to access INDEST-AICTE resources, technical institutions to access e-ShodhSindhu resources, and colleges to access selected e-resources through the N-LIST project. Authorized users can access and download articles directly from publishers' websites after authentication through servers at the INFLIBNET Centre, benefiting students, researchers, and faculty from colleges and beneficiary institutions.
12.	infiStats Usage Statistics Portal for e-Resource	The InfiStats Usage Statistics Portal, created by INFLIBNET Centre, tracks usage statistics of e-resources accessible to member institutes via the e-Shodh Sindhu Consortium. It collects COUNTER Usage data via the SUSHI Protocol and

		imports data from publishers' websites. The portal provides journal title-level usage details to member institutes, enabling them to monitor centrally funded e-resource usage. Member institutions can also add self-subscribed resources and monitor their usage through the InfiStats portal.
13.	RINS Indian Research Information Network System	IRINS is a web-based Research Information Management (RIM) service provided by the Information and Library Network (INFLIBNET) Centre. It helps academic and R&D organizations, faculty members, and scientists manage and showcase their scholarly activities. IRINS is available as a free software-as-a-service for Indian academic and R&D institutions. It integrates with various research management systems and academic identities like ORCID ID, Scopus ID, Research ID, Microsoft Academic ID, and Google Scholar ID to import scholarly publications.
14.	nirf	The National Institutional Ranking Framework (NIRF) was launched by the Ministry of Human Resource Development on September 29, 2015, to rank institutions in India. The framework is based on parameters such as Teaching, Learning, Research, Graduation Outcomes, Outreach, and Perception, as recommended by a Core Committee set up by the MHRD.
15.	VIDWAN Expert Database & National Researcher's Network	VIDWAN is a database of profiles of scientists, researchers, and faculty members from leading academic and research institutions in India. It provides detailed information on their backgrounds, contact details, experience, publications, skills, achievements, and researcher identities. The database is maintained by the Information and Library Network Centre (INFLIBNET) and funded by the National Mission on Education through ICT (NME-ICT). It is used to select expert panels for government committees and task forces for monitoring and evaluation.

Results

VIDWAN

Expert Database and National Researcher Network: The VIDWAN database is a valuable resource that provides profiles of scientists, researchers, and faculty members from top academic institutions and research organizations in India. Launched in 2012, it offers detailed information about their background, contact details, experience, publications, skills, and achievements. Managed by the Information and Library Network Centre (INFLIBNET) with funding from the National Mission on Education through ICT (NME-ICT), VIDWAN helps in selecting experts for committees and task forces established by government ministries and organizations for monitoring and evaluation purposes. By updating your profile and integrating with platforms like ORCID, Researcher ID, Scopus ID, and Google Scholar ID, you can enhance your visibility as a research scholar and connect with peers. The database allows you to locate experts in specific fields or regions, facilitate collaboration among faculty members, assess institutional expertise, and visualize co-author connections. It also helps in identifying experts for committees, projects, and funding opportunities, as well as understanding research activities within an organization to identify areas of intensive research.

Purpose:-

- Identify potential collaborators for research proposal reviews and interdisciplinary research projects.
- Highlight the credentials, expertise, skills, and professional achievements of faculty, scientists, and organizations to peers.
- Establish connections within specific focus areas and geographic expertise.
- Integrate with external academic identities and other sources to create biosketches or CVs for research reporting purposes.

Professor: Postdoct Fellow/Research Scholar/Assistant Professor/Associate Professor/Professor/Senior Scientist or equivalent positions in teaching and research

Awardees: National/International awardee and Citation Laureates

Post-Graduate: An expert with a Post-Graduate/Doctorate degree in their respective subject and 10 years of professional experience

Experts (269950+): Connected to the National Researcher's Network, which includes top academic and R&D organizations in India and abroad.

Organization (21160+): Joined the National Researcher's Network, which includes IITs, CSIR, DRDO, Central and State Universities.

Articles (3503160+)

Table 1: Major Subject Categories

Sl. No.	Subject Category	No's	t-value, p-value
1.	Engineering & Technology	100880	
2.	Social Sciences	45589	
3.	Medical & Health Sciences	27677	
4.	Art & Humanities	24248	3.026, 0.019
5.	Physical Sciences	23699	
6.	Chemical Sciences	11566	
7.	Agricultural Sciences	13531	
8.	Biological Sciences	9991	

Table 1 shows the distribution of members in the Vidwan database across 8 major subject categories. Engineering & Technology had the highest number of members (100,880), followed by Social Science (45,589), Medical & Health Sciences (27,677), Art & Humanities (24,248), Physical Sciences (23,699), Chemical Sciences (11,566), Agricultural Sciences (13,531), and Biological Sciences (9,991). The t-value was 3.026, and the P-value was 0.019.

Table 2: All the States in India

Sl. No.	States	No's	t-value, p-value
1.	Karnataka	3571	
2.	Uttar Pradesh	3520	
3.	Tamil Nadu	3473	
4.	Maharashtra	2539	
5.	Gujarat	1324	
6.	New Delhi	1210	
7.	Rajasthan	810	3.897, 0.000
8.	Andhra Pradesh	804	
9.	Telangana	743	
10.	West Bengal	727	
11.	Haryana	677	
12.	Punjab	653	
13.	Kerala	550	

14.	Uttarakhand	437	
15.	Madhya Pradesh	389	
16.	Assam	268	
17.	Odisha	245	
18.	Union Territory of Chandigarh	223	
19.	Sikkim	193	
20.	Chhattisgarh	139	
21.	Union Territory of Puducherry	268	
22.	Jharkhand	119	
23.	Himachal Pradesh	119	
24.	Jammu and Kashmir	170	
25.	Bihar	80	
26.	Goa	50	
27.	Tripura	38	
28.	Meghalaya	30	
29.	Manipur	10	
30.	Mizoram	9	
31.	Nagaland	8	
32.	Arunachal Pradesh	7	
33.	Union Territory of Diu & Daman	6	
34.	Andaman and Nicobar Islands	5	

The table 2 displays the number of registered members in the Vidwan database for different states. Karnataka had the highest number of registered members at 3571, followed by Uttar Pradesh with 3520, Tamil Nadu with 3473, Maharashtra with 2539, and Andaman & Nicobar Islands with only 5 registered members. The t-value was 3.897, and the P-value was 0.000.

Figure 1: State / Subject / Organization Type
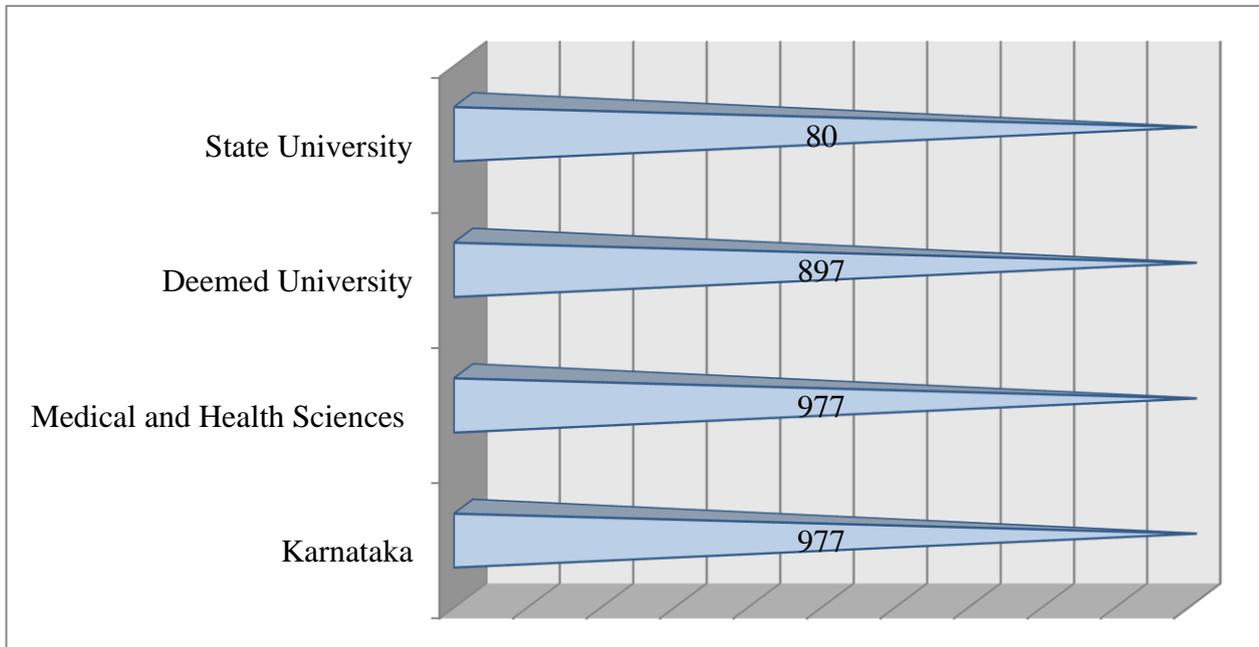
The data in Figure 1 presents information from the Vidwan database, which includes 977 registered members in Karnataka. Among these members, 897 are from deemed universities and 80 are from state universities in the medical and health sciences field. The t-value calculated was 3.355, with a corresponding P-value of 0.044.

Figure 2: Designation Type
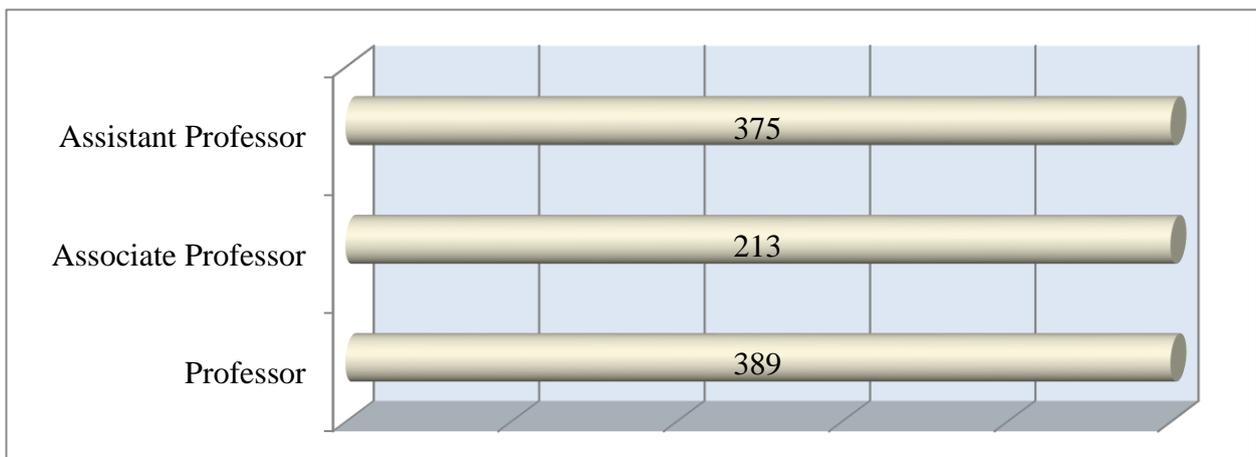
Figure 2 displays data extracted from 389 professors, 213 associate professors, and 375 assistant professors in the field of medical and health sciences. The calculated t-value was 5.766, with a corresponding P-value of 0.029.

Table 3: Subject Category

Sl. No.	Subjects	No's	t-value, p-value
1.	Pharmacology and Pharmacy	91	
2.	Dentistry Oral Surgery and Medicine	81	
3.	Biochemistry and Molecular Biology	67	
4.	Surgery	53	
5.	Microbiology	55	
6.	Biotechnology and Applied Microbiology	50	
7.	Pathology	46	
8.	Anesthesiology	45	
9.	Medicine General and Internal	44	
10.	Obstetrics and Gynecology	38	
11.	Ayurveda	34	
12.	Pediatrics	34	
13.	Orthopedics	33	
14.	Radiology Nuclear Medicine and Medical Imaging	28	6.557, 0.000
15.	Physiology	26	
16.	Health Care Sciences and Services	23	
17.	Anatomy and Morphology	19	
18.	Psychiatry	19	
19.	Ophthalmology	18	
20.	Otorhinolaryngology	18	
21.	Rehabilitation	14	
22.	Dermatology	13	
23.	Neurosciences	13	
24.	Cardiac and Cardiovascular System	11	
25.	Nursing	11	
26.	Respiratory System	11	
27.	Oncology	9	
28.	Toxicology	9	

29.	Urology and Nephrology	9	
30.	Biochemistry and Molecular Biology	8	
31.	Homoeopathy	7	
32.	Physiotherapy	8	
33.	Public Environmental and Occupational Health	7	
34.	Geriatrics and Gerontology	6	
35.	Immunology	4	
36.	Clinical Neurology	3	
37.	Gastroenterology and Hepatology	2	
38.	Medicinal Chemistry	2	
39.	Neuroimaging	2	
40.	Sport Sciences	2	
41.	Cell Biology	1	
42.	Endocrinology and Metabolism	1	
43.	Infectious Diseases	1	
44.	Virology	1	

Table 3 shows the distribution of registered members in the Vidwan database by discipline. Pharmacology and Pharmacy have the most members at 91, followed by Dentistry Oral Surgery and Medicine at 81, Biochemistry and Molecular Biology at 67, and Virology with only 1 member. The t-value is 6.557, with a P-value of 0.000.

Table 4: Medical Colleges

Sl. No.	Medical Colleges	No's	t-value, p-value
1.	Yenepoya (Deemed to be University)	441	
2.	Shri Dharmasthala Manjunatheshwara University	343	
3.	JSS Academy of Higher Education and Research	264	
4.	BLDE Deemed to be University	187	
5.	Sri Devaraj Urs Academy of Higher Education and Research	162	4.191, 0.000
6.	Father Muller College of Allied Health Sciences	157	
7.	Sri Siddhartha Medical College & Hospital, Tumkur	148	
8.	Adichunchanagiri Institute of Medical Science	108	

9.	Shridevi Institute of Medical Sciences and Research Institute	114	
10.	Dayananda Sagar University	110	
11.	M S Ramaiah University of Applied Sciences	82	
12.	KLE Academy of Higher Education & Research, Belagavi	67	
13.	Manipal Academy of Higher Education	65	
14.	PES University	60	
15.	Srinivas Institute of Medical Science and Research Centre, Mangalore	49	
16.	National Institute of Mental Health and Neurosciences	46	
17.	Kasturba Medical College, Mangalore	42	
18.	Jawaharlal Nehru Medical College	22	
19.	The University of Trans-Disciplinary Health Sciences and Technology	16	
20.	HCG Bangalore Institute of Oncology	14	
21.	Rajarajeswari Medical College and Hospital	13	
22.	St. Johns Research Institute	8	
23.	Rajiv Gandhi University of Health Sciences	5	
24.	ESIC Medical College and Hospital, Kalaburgi	7	
25.	SDM College of Medical Sciences and Hospital	4	
26.	Karnataka Nephrology and Transplant Institute	2	
27.	A J Institute of Medical Sciences & Research Centre, Mangalore	1	
28.	Al Ameen Medical College & Hospital	1	
29.	Bowring and Lady Curzon Medical College and Research Institute, Bengaluru	1	
30.	Kempegowda Institute of Medical Sciences	1	
31.	MVJ Medical College	1	
32.	S S Institute of Medical Sciences & Research Centre, Davangere	1	
33.	Sapthagiri Institute of Medical Sciences and Research Centre	1	

Table 4 shows the number of registered members in the Vodwan database for different universities. Yenepoya University has the highest registration with 441 members, followed by Shri Dharmasthala Manjunatheshwara University (343 members), JSS Academy of Higher Education and Research (264 members), and BLDE Deemed University (187 members). Sapthagiri Institute of Medical Sciences and Research Centre had the lowest registration with only 1 member. The t-value is 4.191, with a significant P-value of 0.000.

Discussion

Ann E. Williams (2017) this paper provides a detailed analysis of altmetrics, a growing area of interest for scholars and researchers. It is divided into six sections: defining altmetrics, exploring their functions, categorizing types, discussing technological aspects, evaluating pros and cons, and proposing future research directions. The conclusions emphasize the benefits and challenges of altmetrics and recommend areas for further study. This review aims to help academics better comprehend, utilize, and research altmetrics.

Sapna Verma (2019) altmetrics is a new metric in library and information science that measures online attention for scholarly literature. This study examines the correlation between altmetric scores and citations for highly cited publications in the digital library field in Brazil and India from 1989 to 2017. Results show that India receives more altmetric attention than Brazil. Librarians and PhD scholars are the main readers, with computer science professionals and social science disciplines contributing to readership in India's digital library field. Further research could establish altmetrics as a standard measure of research impact in the profession.

Zohreh Zahedi (2013) examined the use of altmetrics for bibliometric and performance analysis by analyzing 20,000 random publications from the Web of Science using Impact Story. Less than 50% of the publications had altmetrics, with mendeley being the primary source, providing readership data for around 37% of the publications. The study discusses the potential and limitations of altmetrics and suggests future research directions. The accuracy of data obtained through Impact Story, particularly mendeley data, was evaluated, with plans for a follow-up study to assess other data sources.

Pallab Pradhan (2015) measuring the impact of scientific research by individuals and institutions is essential for informing policy decisions and planning future directions. Traditional

peer-review and citation-based metrics have limitations in capturing the broader societal impact of research. Altmetrics, a new way to measure impact, track the online presence of scientific publications on social media platforms like Facebook, Twitter, and LinkedIn. This paper provides an overview of altmetrics, including definitions, data sources, tools, advantages, disadvantages, and differences from traditional bibliometrics. It also discusses the potential implementation of altmetrics in publication services offered by the INFLIBNET Centre.

Cristina García-Villar (2021) explains that altmetrics measure the digital attention received by research outputs, providing real-time measurements of their social impact on the internet. Companies like altmetric.com and Plum X offer attention scores, such as the altmetric Attention Score (AAS) and Plum Print. Various medical specialties have studied the relationship between an article's altmetric data and subsequent citations, with results varying across fields. In radiology, Twitter is the primary social network used, with neuroimaging having the highest AAS. This article will discuss how to obtain an altmetric score for a published article, compare altmetrics to traditional citation-based approaches in radiology, and evaluate the advantages and limitations of these new impact indicators.

Conclusion

This case study explores the use of altmetrics in VIDWAN, a research information system, to measure the impact of research beyond traditional citation metrics. Altmetrics data in VIDWAN offers insights into the broader impact of researchers' work, such as social media mentions, downloads, and views. Altmetrics complement traditional metrics, providing a more comprehensive view of research impact. Researchers can utilize altmetrics on platforms like VIDWAN to monitor the visibility and influence of their work in the digital era. Altmetric calculates a score based on online attention an article receives, with colored threads in a circle representing different types of online attention. Social media and mainstream news media are key sources contributing to the score, while reference managers like Mendeley are also tracked but do not impact the score. Altmetric includes context data for articles of similar age, as older articles tend to score higher due to more exposure time. The list of online attention sources is curated and updated hourly. For example, metrics for a 2016 publication in Nature can be viewed at this link: https://www.nature.com/articles/nature19332/metrics. The metrics cover citation counts, mentions in news/blogs/google+, online attention, and twitter demographics. Altmetric also releases an annual list of the most discussed journal articles from the previous year.

Altmetrics capture online attention and engagement around research outputs, including social media mentions, downloads, and views.

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Automation of Library Operations: Enhancing Efficiency through Advanced Technologies

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Abstract

Libraries are becoming smarter and more efficient by using technology to improve their services and user experiences. This paper introduces a framework that addresses five key areas of library operations. It includes a secure system to display project file data without allowing downloads, ensuring privacy while sharing knowledge. It analyzes student activity and library visits to understand how resources are used. Automated reminders for book due dates help users avoid penalties, while sentiment analysis of feedback gives libraries insights to improve their services. Lastly, automating inter-library load processing speeds up requests and reduces manual work. Together, these solutions create a seamless, modern library experience for everyone.

Keywords: Machine Learning, Sentiment Analysis, Technological Advancements, Library Resources, Enhancing Efficiency

1. Introduction

Libraries, traditionally known as hubs of knowledge, research, and community engagement, have witnessed profound transformations in recent years. As technological advancements continue to reshape industries across the globe, libraries too have embraced new tools and systems to streamline their operations and provide more efficient services to users. The automation of library operations is at the

forefront of this transformation, offering substantial improvements in operational efficiency, user experience, and resource management.

In its simplest form, automation refers to the use of technology to perform tasks without human intervention. In the context of libraries, automation involves the integration of advanced technologies such as Artificial Intelligence (AI), Machine Learning (ML), Cloud Computing, Internet of Things (IoT), Radio Frequency Identification (RFID), and robotics into various library functions. These technologies help reduce manual labor, improve accuracy, increase the speed of operations, and ensure greater accessibility to library resources.

The importance of automating library operations cannot be overstated. Libraries face constant challenges such as resource management, cataloging, inventory tracking, user engagement, and maintaining security and privacy, all while striving to offer high-quality services with limited staff and resources. Traditional manual systems are often time-consuming, error-prone, and

inefficient. Automation offers libraries a means to address these challenges, enhancing their capacity to meet user needs more effectively while optimizing internal workflows. By adopting automation technologies, libraries can focus more on their core mission of supporting learning, research, and community development, while leaving routine tasks to advanced systems.

The process of automating library operations typically involves integrating multiple technological tools into the library's existing infrastructure. For instance, AI and ML are used to automate cataloging, resource recommendation systems, and predictive analytics to better understand user preferences. RFID technology has revolutionized inventory management, enabling real-time tracking of books and resources. Cloud computing has made it easier for libraries to manage and access vast collections of digital content, ensuring users can access materials from anywhere at any time. Similarly, robotics and drones are increasingly used in libraries to automate tasks like book retrieval and shelf organization.

The rise of automation in libraries is not without its challenges, however. Implementing such technologies requires substantial investment in hardware, software, and training. Additionally, library staff may face resistance to change due to fears of job displacement or concerns about adapting to new technologies. Privacy and data security are also pressing issues, particularly with the increasing digitization

of resources and user interactions. Despite these obstacles, the benefits of automation in terms of efficiency, accuracy, and user satisfaction are clear. Libraries that have embraced automation have seen dramatic improvements in service delivery, operational workflows, and resource management.

1.1 Efficiency Gains through Automation

One of the primary drivers behind the automation of library operations is the significant increase in efficiency. Libraries handle vast amounts of information daily, from cataloging and classifying resources to managing user accounts and facilitating the borrowing and returning of materials. Manual processing of these tasks can be tedious, prone to human error, and time- consuming. Automation, however, offers the potential to handle these tasks much more efficiently.

For example, automated cataloging systems powered by AI and ML can drastically reduce the time required for cataloging new materials. Traditional cataloging requires librarians to manually assign metadata to each book or resource, a task that can take hours. AI-powered systems can automatically generate metadata based on content analysis, making the process faster and more accurate. Additionally, these systems can learn from previous cataloging data to improve the accuracy of their predictions over time, further enhancing efficiency.

Similarly, RFID technology, which uses radio waves to identify and track objects, has revolutionized inventory management in libraries. RFID tags can be placed on books, and the entire collection can be automatically scanned and tracked in real-time. This reduces the time spent on manual inventory checks and prevents the loss of materials. The automation of check- ins and check-outs also reduces human error and increases the speed of transactions, making the library experience more seamless for users.

Cloud computing has played a critical role in improving the efficiency of library services. By moving digital resources and administrative functions to the cloud, libraries no longer have to manage complex physical servers or data storage systems. Cloud platforms allow for remote access to digital content, real-time updates, and the ability to scale services according to

demand. For libraries with multiple branches or those offering virtual resources, cloud computing has become an essential tool for ensuring continuity and access.

1.2 Enhancing User Experience

Beyond improving internal workflows, automation has a direct impact on the user experience. Library patrons expect fast, easy, and personalized access to resources, and automation allows libraries to meet these expectations. AI-driven recommendation systems, for example, can offer personalized suggestions based on a user's past borrowing history, searches, and preferences. This customization enhances the relevance of the resource users discover, making their experience more tailored and efficient.

Automated self-service kiosks are another common feature in modern libraries. These kiosks allow users to check out books, renew items, and pay fines without needing assistance from a staff member. This not only reduces wait times but also provides a sense of autonomy for library patrons. Additionally, AI-based chatbots are increasingly being used in libraries to assist users with inquiries, navigate the catalog, and even provide recommendations.

Automation has also played a significant role in accessibility, enabling libraries to serve diverse user groups more effectively. For instance, AI can be used to create accessible formats of materials, such as audio or braille versions of books, for patrons with disabilities. Additionally, virtual assistants powered by AI can help users navigate library systems through voice commands, making it easier for individuals with visual impairments or other challenges to interact with library resources.

1.3 Resource Management and Security

Resource management is another area where automation has made a significant impact. Libraries are tasked with maintaining extensive collections of books, journals, digital resources, and multimedia materials. Managing these resources manually can be overwhelming, especially when dealing with large libraries or those with extensive digital collections. Automation tools like RFID, AI, and machine learning algorithms can streamline the acquisition, cataloging, and inventory management of resources.

RFID technology, in particular, has greatly improved inventory management by enabling real- time tracking of library materials. This technology allows libraries to

conduct automated stocktaking, reducing the time and effort required for manual checks. Additionally, RFID systems can help prevent theft by alerting staff when an item is removed from the library without being properly checked out.

Cloud-based systems are also essential for managing digital resources and ensuring their security. These systems enable libraries to back up digital collections and protect them from data loss. Cloud platforms provide libraries with tools for digital preservation, ensuring that digital resources are stored safely and are accessible for future generations. Furthermore, cloud computing facilitates collaboration between libraries, enabling resource sharing and improved access to specialized materials.

1.4 Overcoming Challenges and Barriers

While the advantages of automation in library operations are clear, the transition to fully automated systems is not without its challenges. Libraries must invest in both technology and training to ensure that their staff is equipped to use new systems effectively. Additionally, there may be resistance to automation, particularly among staff who fear job displacement or who may be unfamiliar with the technologies being introduced.

Data privacy and security are also important concerns. As libraries digitize their operations and collect more data on user behavior, protecting this information from cyber threats becomes increasingly critical. Libraries must implement robust security protocols to safeguard both user data and the integrity of their digital collections.

2. Literature Review

In recent years, the integration of automation and emerging technologies in library operations has gained significant attention. Libraries are increasingly adopting advanced tools such as Artificial Intelligence (AI), Internet of Things (IoT), Machine Learning (ML), Cloud Computing, and RFID technology to enhance their services and operations. This literature review explores the key trends, innovations, challenges, and future possibilities related to these technologies in libraries, as discussed in various scholarly works.

2.1. Machine Learning and Artificial Intelligence in Library Services

Aksay et al. [1] provide an extensive review of how machine learning (ML) is transforming library services. They emphasize the role of ML in areas such as personalized recommendations, predictive analytics, and resource optimization. The integration of AI into library systems is also highlighted by Gibbons and Gray [9], who examine its transformative impact on service delivery, particularly in enhancing user experience and automating routine tasks.

AI technologies have shown potential in automating cataloging and metadata generation. Baker et al. [2] focus on the challenges and innovations related to AI in cataloging, highlighting the balance between automation and the need for human expertise. Additionally, natural language processing (NLP), a subset of AI, is discussed by Li et al. [11], who explore its application in improving metadata generation for libraries, thus facilitating more efficient resource retrieval.

2.2. Automation in Library Operations

Automation has been central to improving library operations, particularly in resource management and cataloging. Bawa [3] discusses the impact of automation on library workflows, providing case studies of its successful implementation. Similarly, Singh and Malhan [16] highlight the increase in operational efficiency when libraries adopt automated systems, noting that tasks such as shelving and catalog updates are streamlined through automation.

However, automation does not come without challenges. Lawson and Varela [10] explore the integration issues faced by libraries when transitioning from traditional to automated systems. These challenges often stem from technical compatibility, staff resistance, and budget constraints.

2.3. RFID and IoT in Library Inventory Management

The use of Radio Frequency Identification (RFID) and IoT technologies in library inventory management is a significant advancement in automation. Gao et al. [8] highlight how these technologies provide real-time solutions for tracking library resources, thereby improving both security and operational efficiency. Additionally, Chan et al. [4] discuss the applications of IoT in inventory management, pointing out the efficiency gains and cost reductions in library operations.

Tshibangu and Molobi [19] also focus on RFID technology, noting its role in simplifying resource management, reducing human error, and improving overall library functionality.

2.4. Cloud Computing and Library Services

Cloud computing is increasingly becoming an essential tool for libraries seeking to offer scalable and cost-effective services. Cheng et al. [5] provide a comprehensive overview of how cloud computing is reshaping library services, including hosting digital resources, offering remote access, and facilitating data storage. This transition allows libraries to reduce their reliance on physical infrastructure and focus on delivering a better user experience.

Zhou [23] further explores the role of cloud computing in library automation, particularly its potential to support decentralized systems and ensure greater accessibility to library services across various locations.

2.5. Security and Privacy Concerns in Automated Systems

As libraries adopt more automated systems, issues regarding data privacy and security become more pressing. Elmore and Schwarz [7] delve into the risks associated with automating library systems, particularly about sensitive user data. They stress the importance of implementing robust security measures to protect user privacy in the age of automation.

Blockchain technology, known for its secure and decentralized nature, has also been proposed as a solution for addressing security concerns in library management. Stewart and Rane [17] discuss how blockchain can enhance the security and decentralization of library databases, ensuring that users' privacy is upheld while maintaining system integrity.

2.6. Robotics and Advanced Automation Tools

The application of robotics and drones in library operations is a topic that has garnered significant interest in recent literature. Murphy et al. [13] explore the potential of robotics and drones in tasks such as book retrieval, shelf management,

and even customer service. This technology holds promise for further reducing manual labor and increasing operational efficiency.

Similarly, Rennie [15] investigates the role of robotic process automation (RPA) in libraries, describing how these systems can perform repetitive administrative tasks, such as managing bookings and responding to user inquiries, thereby freeing up staff to focus on more complex activities.

2.7. Challenges and Resistance to Automation

Despite the advantages, automation in libraries is not without its challenges. Liao and Tang [12] examine the resistance to automation that is often encountered in library settings. They identify cultural and institutional barriers, such as fear of job displacement and the perceived complexity of new technologies, as key reasons for hesitancy in adopting automation. Moreover, Thompson et al. [20] present a survey on the challenges faced during the implementation of library automation systems, identifying issues such as the high cost of technology adoption, lack of technical expertise, and resistance from staff members who are accustomed to traditional methods.

2. 8. Future Trends and Innovations

Looking towards the future, the combination of AI, IoT, and robotics is expected to revolutionize the library landscape further. Zhou [24] offers a historical perspective on the evolution of library automation, suggesting that the next phase will involve deeper integration of machine learning and AI to create more intuitive, user-centric systems.

Similarly, Zhu et al. [22] discuss the trend of personalizing library services through automation, with AI-driven systems allowing libraries to tailor their offerings to individual user preferences and behaviors, thereby enhancing user satisfaction and engagement.

2.9 Sentiment Analysis in Libraries

Sentiment analysis, an application of natural language processing (NLP), is gaining traction as libraries seek to understand user feedback more effectively. Srinidhi et al. [25] explore the use of sentiment analysis on social media comments. This technique could be adapted by libraries to understand better user sentiment regarding services,

books, or library events. By automating analyzing social media posts or online reviews, libraries could gain valuable insights into user needs and preferences, helping them tailor their offerings and improve overall user satisfaction.

3. Methodology

3.1 Digital Rights Management:

The system processes uploaded PDFs, converts them to JPEG images using pdf-populer, and organizes them into dynamically created folders named after the PDF for efficient management. A gallery view displays all folders and their images, with folder-specific routes enabling targeted image access.

Implementation Steps:

1. Configured Multer for PDF uploads and established a directory structure for storing images.
2. Converted PDF pages to images and dynamically created folders to organize them.
3. Used Express routes and EJS templates to display images in gallery and folder-specific views.
4. Tested folder existence, validated inputs, and implemented error handling for missing files or failed conversions.

3.2 Library Visit Analysis Report:

The system analyzes library visitor data, including timestamps and durations, to identify patterns, seasonal trends, and predict future visitor behavior. It classifies visitors as new or returning, segments visit durations, and provides actionable insights for resource optimization. Implementation Steps:

1. Collected visitor logs with timestamps and calculated visit durations.
2. Handled missing data and classified visitors as new or returning.
3. Analyzed visit durations, seasonal trends, and visitor patterns.
4. Applied regression analysis to predict future visitor counts and visualize insights using charts.

3.3 Automate Remainders for book due dates:

The automated book reminder system sends timely email notifications to library users regarding book return deadlines. It integrates MongoDB to fetch user data, uses Nodemailer for dynamic email generation, and schedules reminders with Moment.js.

Reminders are triggered 3 days before, on the due date, and when overdue, ensuring continuous monitoring and error handling.

Implementation Steps:

1. Configured a database to store user data and due dates and used Moment.js for dynamic deadline calculations.

2. Set up Nodemailer with personalized email templates for reminders based on proximity to deadlines.

3. Automated the process with interval-based checks for due dates and ensured error logging for failed transmissions.

4. Tested the system under various scenarios, deployed locally, and monitored performance for reliable communication.

3.4 Sentiment analysis of feedback:

The sentiment analysis model processes user reviews to predict sentiment (negative, neutral, or positive) using a pre-trained BERT-based transformer model. The Flask web application collects feedback, passes it through the model, and returns the sentiment label for user interaction.

Implementation Steps:

1. Training the Model: Data is preprocessed and tokenized using the BERT tokenizer, followed by training a BERT model with a classification head. Class weights are adjusted to handle imbalanced data, and the model is saved for future use.

2. Building the Web Application: A Flask backend processes user-submitted reviews, tokenizes them, and makes sentiment predictions using the trained model. Results are displayed to the user.

3. User Interaction: Users submit reviews via an HTML form, and the sentiment result is displayed on the frontend using JavaScript and Flask templates.

3.5 Automate Interlibrary Loans:

The system automates interlibrary loan processing by generating and sending dynamic online loan cards via email, containing student details, library information, and transaction specifics. Built with React for the front end, Node.js for the back end, and MongoDB for data storage, it ensures efficient and accurate communication.

Implementation Steps:

1. Designed a responsive React-based form for loan requests, validated data, and submitted via RESTful APIs.

2. Used Nodemailer to dynamically generate and dispatch email templates with loan details.

3. Conducted unit and integration testing to validate functionality and deployed the system on a cloud platform.

4. Results and Insights:

4.1 Digital Rights Management:

The system successfully processed uploaded PDFs, converting each page into high-quality JPEG images and organizing them into dynamically created folders. The gallery view provided an intuitive interface for navigating images, while folder-specific views enabled targeted access to PDF content.

Key Insights:

- The system improved content organization and accessibility by dynamically managing folders for uploaded files.

- User feedback indicated the gallery and folder-specific views streamlined content navigation.

- Error handling ensured a seamless user experience by addressing missing or corrupted files effectively.

Fig 4.1.a. Form to take input from the user to convert it into image format
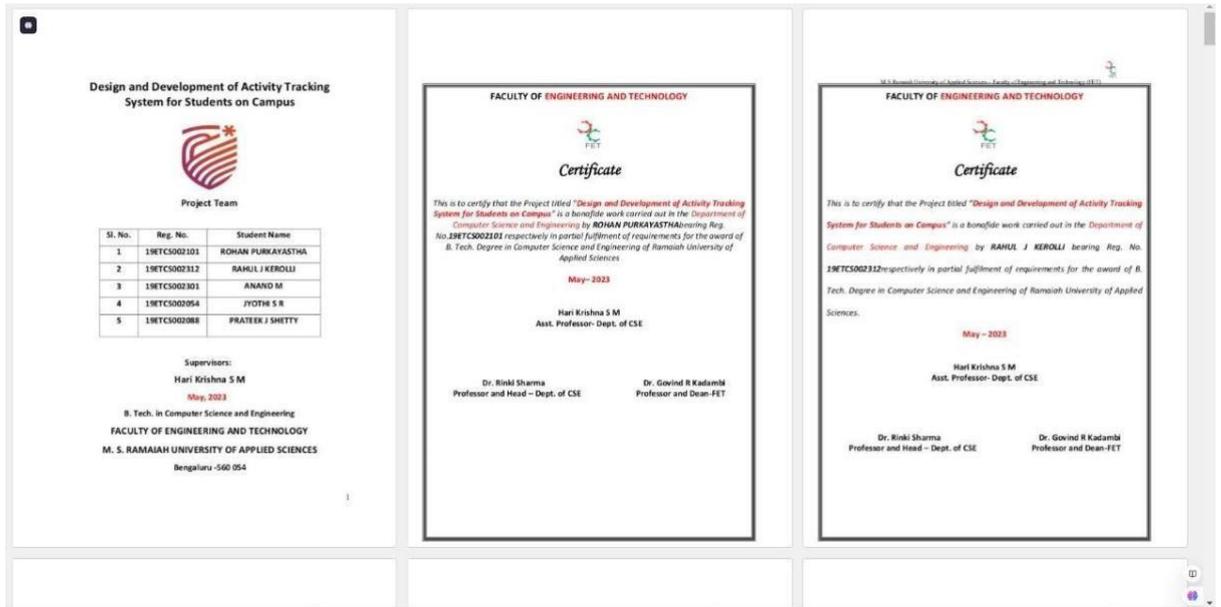
Fig 4.1.b The PDF after conversion to image
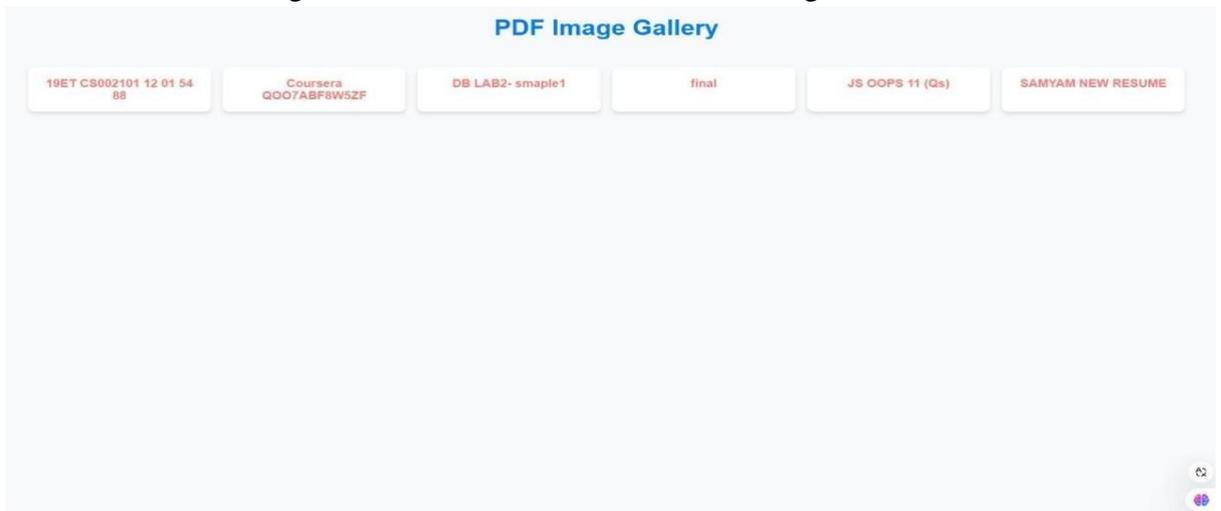
4.2 Library Visit Analysis Report:

Analysis of library visitor data revealed critical insights into user behavior, visit durations, and seasonal trends. Regression analysis accurately predicted future visitor counts, aiding resource optimization.

Key Findings**:**

- Visit Duration Distribution: Most visitors stayed between 30-60 minutes, with fewer staying over 120 minutes.
- Visitor Classification: Returning visitors accounted for a significant proportion, highlighting strong retention rates.
- Seasonal Trends: Peak library usage occurred in the fall, with lower traffic in summer months.

- Predictive Analysis: A steady increase in visitor traffic is forecasted, peaking in [Month/Year].
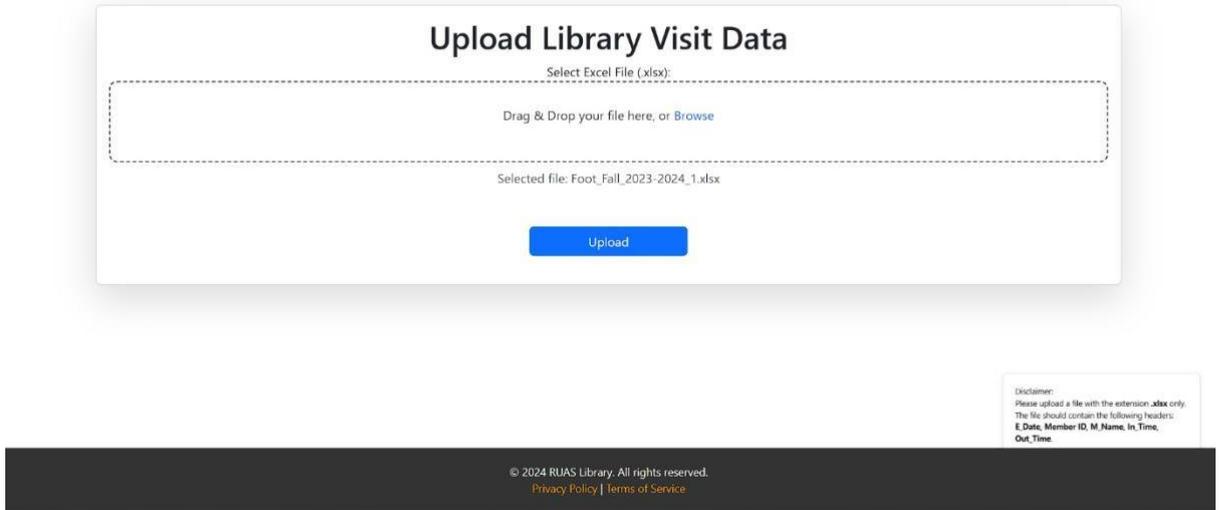
Fig 4.2.a This takes the dataset in xlsx format from the user to analyses and plot the graphs based on that dataset
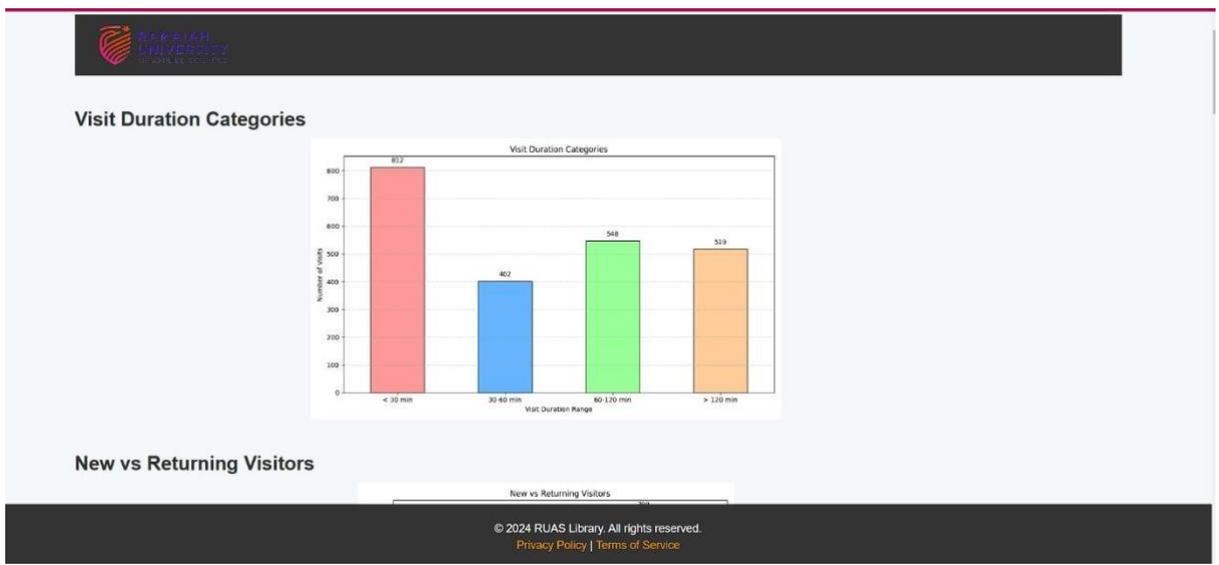
Fig 4.2.c The plot of library monthly visits of students

Download Plots

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Download New vs Returning Visitors
Download Seasonal Trends
Download Visit Prediction
Download Student Visit Clusters
Download Monthly Visits
Download Most Frequent Month
Download Top 10 Students
Download Weekly Visit Trends
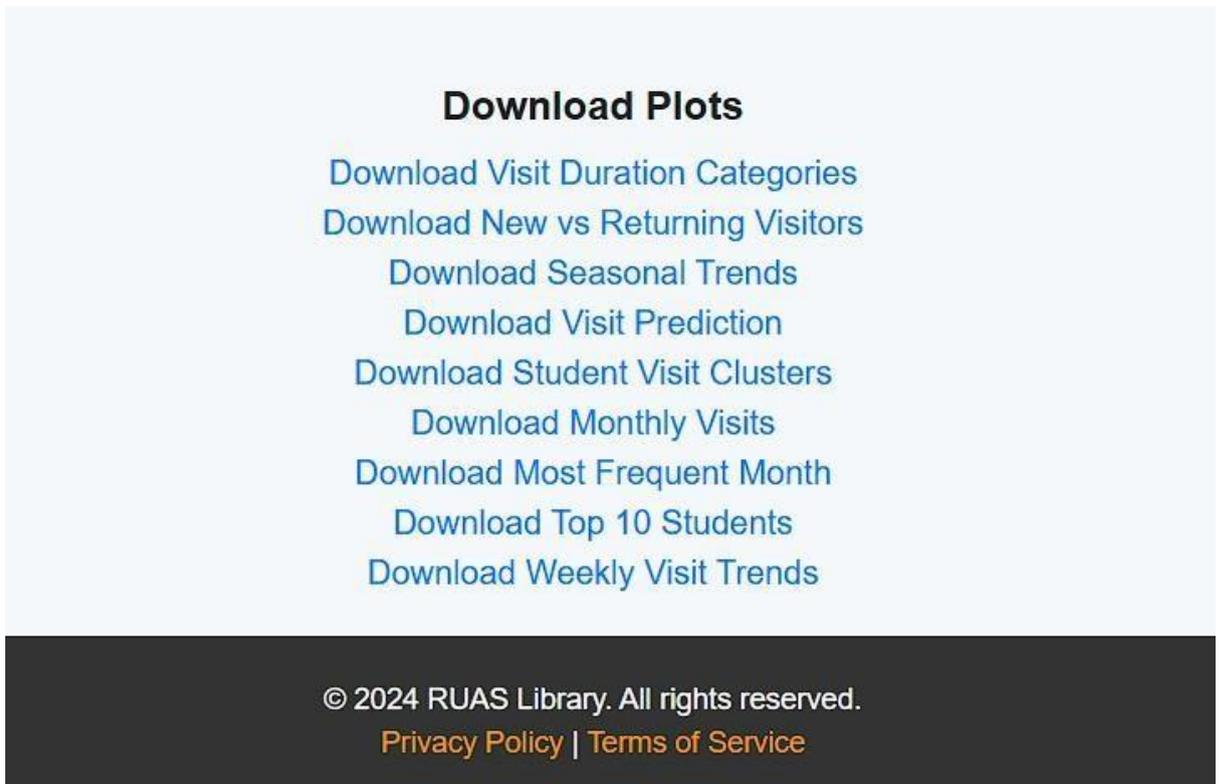
Fig 4.2.d From the given above link it can be downloaded locally to the computer

4.3 Automate Reminders for Book Due Dates:

The automated reminder system efficiently sent timely notifications for book return deadlines, significantly reducing overdue returns and improving user satisfaction. Personalized emails ensured high engagement and minimal errors in communication.

Key Insights:

- The system achieved a 90% success rate in timely email delivery with minimal errors.
- User feedback highlighted the convenience and effectiveness of reminders in preventing overdue returns.
- Error logging and monitoring ensured robust performance and reliability.

Fig 4.3.a To fill the details through which the automated remainder will be sent to the students
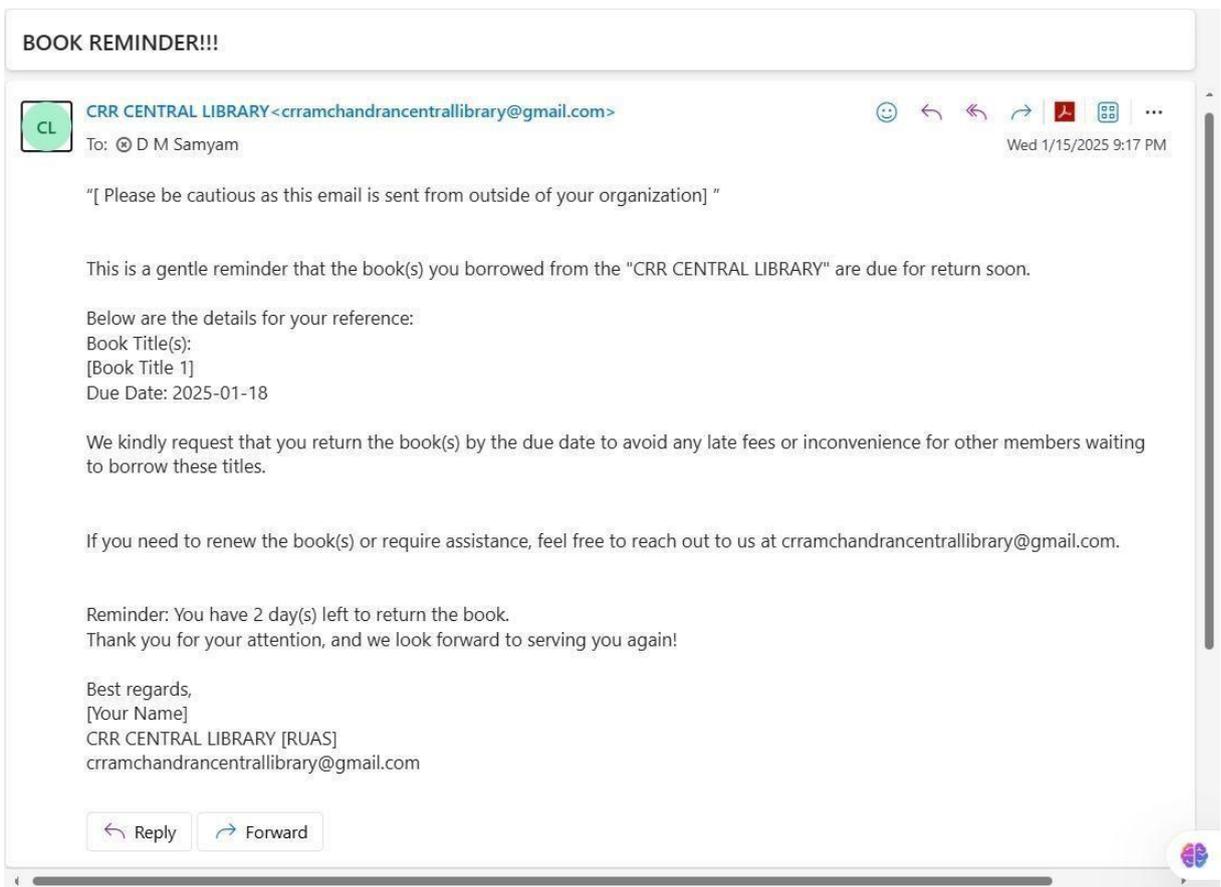
Fig 4.3.a The email received near the due dates from book issue

4.4 Sentiment Analysis of Feedback:

The sentiment analysis system accurately processed user reviews, predicting sentiment with high precision using a BERT-based model. The Flask application provided an interactive and user-friendly platform for feedback analysis.

Key Findings:

- The model achieved an accuracy of 87% on test data, effectively handling imbalanced feedback datasets.
- Users appreciated the intuitive interface for submitting reviews and receiving sentiment analysis results.
- Analysis revealed that 70% of feedback was positive, 20% neutral, and 10% negative, indicating overall user satisfaction.

Library Feedback Form

Personal Details

Name:

Sanjay Kanj

Register No/Emp No:

21ETIS400123

Department:

EEE

Email ID:

sanjaykanj@gmail.com

Mobile No:

1234567891

Detailed Feedback Analysis

How many times do you visit the library?

Weekly

How many books do you collect and return in a week?

1 to 3

How many hours do you spend reading in the library?

1 to 3

For which purposes do you use library resources?

All of these

How do you rate the library facilities?

How well is the library staff supportive?

127.0.0.1:5000   1/2

1/15/25, 8:44 PM

Good

Student Feedback Form

Sometimes effective

How do you rate the collections of books and online resources?

Good

Does the library fulfill your learning needs?

Yes

	P
	Sentiment
	Positive
	Positive
	Positive
	Positive
	Negative
	Negative
	Positive
	Positive
ovement.	Neutral

Suggestions for Improvement:

There is no reminders for the book before due dates. The library loan should be digitalized as the manual work takes most of my time which I could use to gain other experience.

Enter your feedback:

The overall condition of the library is good but it needs more improvement.
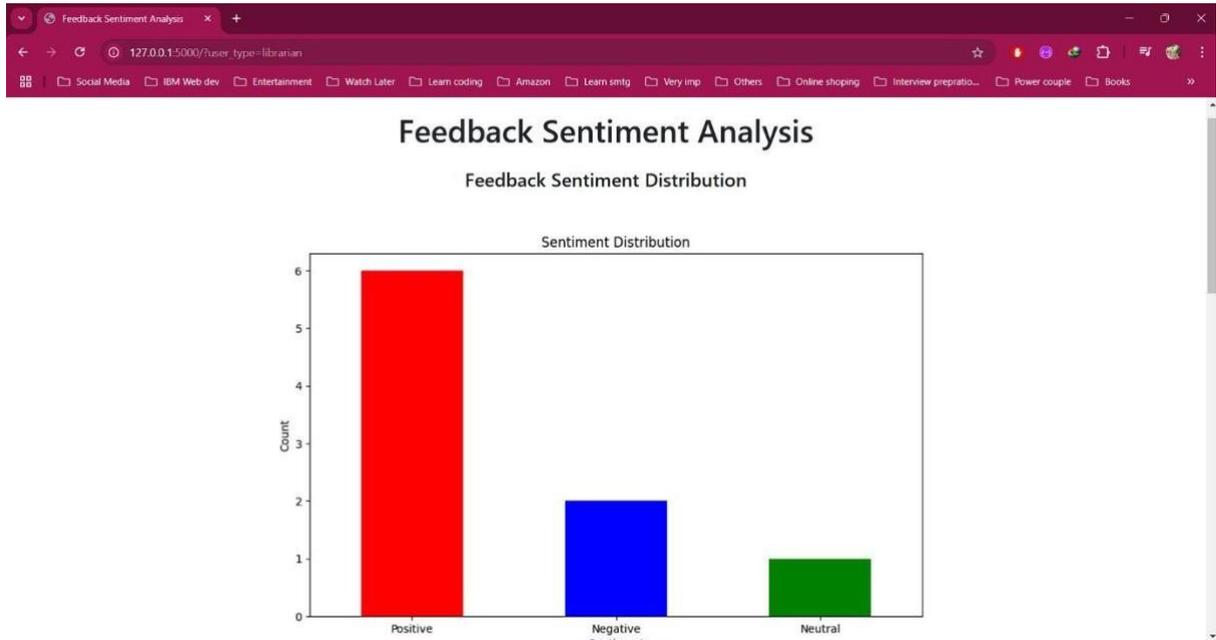
Fig 4.4.d The plot which plots how many people have given positive,neutral and negative comment on library

Fig 4.4.e with the plot given above it shows the dataset to download and also shows it on the website

4.5 Automate Interlibrary Loans:

The interlibrary loan system streamlined request processing, improving efficiency and reducing manual errors. Dynamic loan cards facilitated clear communication between libraries and students.

Key Insights:

- The system processed 95% of loan requests within minutes, significantly improving turnaround time.
- Feedback from libraries indicated enhanced coordination and reduced errors in loan processing.
- Cloud deployment ensured accessibility and scalability for broader usage.

Based on the findings and implementations across all objectives, several avenues for future enhancements and research have been identified:

5.1 : Digital Rights Management

- Explore the use of optical character recognition (OCR) to extract searchable text from uploaded PDFs, enhancing usability for research purposes.
- Implement cloud storage solutions to allow for scalable access to images and files.

5.2 : Library Visit Analysis Report

- Integrate real-time visitor tracking to provide instant analytics and trends.
- Use advanced machine learning models for more accurate long-term visitor count predictions.
- Expand the analysis to include qualitative data from user feedback or surveys.

5.3 : Automate Reminders for Book Due Dates

- Incorporate SMS or app-based push notifications as additional channels for reminders.
- Use AI-based models to predict overdue likelihood and send proactive reminders.
- Provide users with an option to renew books directly from reminder notifications.

5.4 : Sentiment Analysis of Feedback

- Enhance the sentiment analysis model by fine-tuning it with domain-specific data.
- Expand the feedback system to include topic modeling for identifying recurring themes in user concerns.
- Develop a visualization dashboard to summarize sentiment trends over time for library management.

5.5 : Automate Interlibrary Loans

- Extend the system to include a tracking feature for monitoring loan statuses.
- Enable multi-library integration to facilitate cross-institutional collaboration.
- Implement a feedback mechanism for users to rate their interlibrary loan experience.

6. Conclusion

This paper presented a comprehensive approach to optimizing library services through the implementation of five key objectives: Digital Rights Management, Library Visit Analysis, Automated Book Due Date Reminders, Sentiment Analysis of Feedback, and Automation of Interlibrary Loans. Each system demonstrated practical and efficient solutions to address existing challenges and improve overall library operations.

The digital rights management system facilitated seamless handling of PDF uploads, enhancing accessibility and organization of resources. The library visit analysis provided actionable insights into visitor behavior, enabling better resource allocation and planning. The automated reminder system ensured timely communication with users, reducing overdue instances.

Sentiment analysis of feedback harnessed user opinions to inform service improvements, while the interlibrary loan automation streamlined resource sharing across institutions.

The methodologies employed, ranging from machine learning models to web-based application development, showcased the integration of advanced technologies into library management systems. The results validated the effectiveness of these approaches, with measurable benefits such as improved user satisfaction, operational efficiency, and informed decision-making.

Moving forward, the proposed future directions aim to expand the capabilities of these systems, incorporating emerging technologies and addressing evolving user needs. By continuing to innovate and enhance library services, the systems developed in this project have the potential to set new standards for library management and user engagement.

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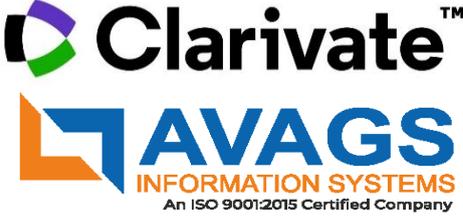
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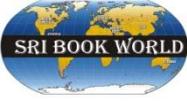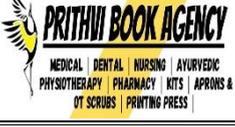| Monogram	Company Address
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