International Journal of Advance and Applied Research
www.ijaar.co.in
ISSN – 2347-7075 Impact Factor – 8.141
Peer Reviewed Bi-Monthly
Vol. 7 No. 5 January – February - 2026

Artificial Intelligence in Research Support Services of Academic Libraries: Opportunities and challenges

Mr. Santosh Maruti Ankush[1], Dr. Yogesh Bhagwan Daphal[2], Dr. Shrikant Wasudev Ramteke[3] & Dr. Bhagwan Tukaram Chaudhari[4]

[1]Christ University, Lavasa, Pune, Maharashtra
[2]Shri Padmamani Jain Arts &Commerce College, Pabal, Pune, Maharashtra
[3]MIT World Peace University, Kothrud, Pune, Maharashtra
[4]GVS Arts College Bamkheda Tal Shahada Dist Nandurbar, Maharashtra
Corresponding Author – Mr. Santosh Maruti Ankush
DOI - 10.5281/zenodo.18898175

Abstract:

The rapid expansion of digital scholarship, interdisciplinary research, and electronic information resources has transformed academic libraries from conventional information repositories into dynamic research support centres (Breeding, 2018; Cox, Pinfield, & Rutter, 2019). In this context, Artificial Intelligence (AI) has emerged as a powerful technological enabler, reshaping the design, delivery, and effectiveness of research support services in academic libraries. This paper examines the role of AI in strengthening research support services across the research lifecycle, from information discovery and access to research evaluation and scholarly communication. The paper is based on an analytical review of existing literature, professional practices, and AI-enabled tools used in academic library environments. The analysis covers AI applications in OPACs, institutional repositories, remote access systems, online databases, plagiarism detection tools, reference management software, academic writing support platforms, research data management services, bibliometric analysis, current awareness services, virtual reference services, and library mobile applications (Breeding,2018; Salvatore & Vassilakaki,2020).

The findings indicate that AI enhances information discovery through semantic search and personalised recommendations, improves research quality and integrity, automates routine library operations, and supports data-driven decision-making. However, the challenges such as high implementation costs, infrastructure limitations, skill gaps, algorithmic bias remain significant barriers, ethical issues, data privacy concerns and algorithmic bias remain significant barriers (UNESCO, 2021; Ferguson, 2020). The paper concludes that strategic planning, ethical governance, and continuing development in the profession are essential for sustainable AI adoption in academic libraries.

Keywords: Artificial Intelligence, Academic Libraries, Research Support Services, Digital Library Technologies, Scholarly Communication

Introduction:

The incorporation of Artificial Intelligence (AI) in the academic library systems has significantly transformed the nature and scope of research support services. As research environments become increasingly digital, data-intensive, and interdisciplinary, academic libraries are required to move beyond traditional service models and adopt intelligent technologies that support researchers across the entire research lifecycle (Breeding, 2018; Cox et al., 2019). AI technologies like machine learning, natural language processing, data mining, and predictive analytics enable libraries to deliver smarter, faster, and more personalised research services (Salvatore & Vassilakaki, 2020).

AI-based research support services enhance traditional library functions through semantic information discovery, intelligent recommendation systems, automated metadata generation, and analytics-driven decision-making (Zhang & Gourley, 2020). These services are embedded in OPACs, institutional repositories, plagiarism detection tools, reference management systems, academic writing platforms, and research data management services.

Furthermore, AI enables user-centric services such as personalised current awareness services, virtual reference assistance, e-learning integration, and mobile-based research support. AI-powered chatbots and dashboards facilitate continuous engagement with researchers irrespective of time and location, strengthening libraries' roles as active research partners (Breeding, 2018; Cox et al., 2019).

Literature Review:

Various studies have highlighted the growing significance of Artificial Intelligence in transforming academic library services. **Breeding (2018)** emphasised that AI technologies like as machine learning and natural language processing are reshaping traditional library systems by enabling smarter discovery tools, automated workflows, and personalised user services. His work underscores that AI-driven OPACs and discovery platforms improve search relevance and user satisfaction, marking a shift from keyword-based retrieval to intent-based information access.

Cox, Pinfield, and Rutter (2019) explored the perceptions of library professionals regarding the impact of Artificial Intelligence on academic libraries. Their study revealed that AI has strong potential to enhance research support services, particularly in research data management, institutional repositories, and bibliometric analysis. However, the authors also cautioned that ethical concerns, transparency of algorithms, and staff skill gaps remain critical challenges that libraries needed to address for sustainable AI adoption.

Salvatore and Vassilakaki (2020) conducted a systematic literature review examining AI applications in libraries and identified key areas, including plagiarism detection, reference management, virtual reference services, and current awareness systems. Their findings suggest that AI improves efficiency and accuracy while reducing routine manual tasks. The study concludes that AI-driven services enable librarians to focus more on high-value research consultation and user engagement activities.

Kumar and Ramesh Babu (2020) analyzed the application of AI in academic libraries with a particular focus on developing countries. They observed that AI tools in grammar checking, citation management, and online databases significantly support researchers, especially non-native English speakers. The authors emphasised the need for institutional support, infrastructure development, and professional training to maximise the benefits of AI-based research support services.

Sinha and Basu (2021) examined the use of AI tools for research support services in academic libraries and found that AI increases research productivity, scholarly communication, and research visibility. Their paper highlighted the role of AI in citation analysis, plagiarism detection, and current awareness services. The authors concluded that AI positions academic libraries as strategic partners in the research ecosystem, provided issues of data privacy, ethical use, and policy compliance are adequately addressed.

Selected AI based Research Support Services of Academic Libraries:

AI in OPAC / Web-OPAC:

AI enhances OPACs through natural language processing (NLP), semantic search, and recommendation algorithms. Instead of exact keyword matching, AI-enabled OPACs understand user intent, synonyms, and context. Features such as auto-suggest, voice-based search, relevance ranking, and personalised book recommendations improve search accuracy and retrieval efficiency.

AI in Institutional Repositories (IR):

AI supports institutional repositories by automating the generation of metadata, content classification, and plagiarism screening. Machine learning algorithms aid in identifying duplicate records, linking related research outputs, and enhancing the discoverability of theses, dissertations, and publications. AI also assists in copyright compliance and open-access recommendations.

AI in Remote Access to E-Resources:

AI enhances remote access systems (EZproxy, Shibboleth, VPN) by identifying unusual access patterns, preventing misuse, and strengthening authentication security. AI-driven analytics help libraries understand user behaviour and optimise access pathways for seamless 24/7 availability.

AI in Online Databases & E-Journals:

Major academic databases, such as Web of Science, Scopus, Springer, and IEEE, utilise AI for advanced discovery tools, citation mapping, research trend analysis, and article recommendations. AI enables topic clustering, predictive citation impact analysis, and the identification of literature gaps, significantly supporting researchers.

AI in Plagiarism & AI Detection Software:

Tools like Turnitin, iThenticate, and Urkund employ AI and deep learning to detect text similarity, paraphrasing, contract cheating, and AI-generated content. These tools enhance academic integrity by providing detailed similarity reports and originality insights.

AI in Reference Management Tools:

AI-enabled reference managers (Mendeley, Zotero, EndNote) automate citation extraction, PDF annotation, reference suggestions, and duplicate removal. AI also recommends relevant literature based on the researcher's library and writing context.

AI in Grammar & Academic Writing Support Tools:

Tools such as Grammarly, ProWritingAid, and QuillBot use NLP and AI models to improve grammar, clarity, tone, coherence, and academic style. AI also assists in paraphrasing, summarisation, and plagiarism avoidance, supporting non-native English researchers.

AI in Digital Repositories & Open Access Platforms:

Platforms like Shodhganga, DOAJ, and NDL use AI for content indexing, language translation, subject classification, and recommendation services. AI improves accessibility and visibility of open-access scholarly content.

AI in Research Data Management Services:

AI supports research data management by automating data classification, metadata creation, anomaly detection, and data preservation strategies. AI tools assist researchers in data reuse, visualisation, and compliance with data management policies.

AI in Citation Analysis & Bibliometric Services:

AI enhances bibliometric analysis by providing real-time citation tracking, author profiling, research impact prediction, and altmetric analysis. Tools powered by AI help libraries support researchers with metrics such as

h-index, journal impact factor, collaboration networks, and research visibility.

AI in Current Awareness Services (CAS) & SDI:

AI-driven CAS and SDI systems deliver personalised alerts, automated newsletters, and topic-based updates. Machine learning models analyse user preferences to push relevant articles, calls for papers, and research news.

AI in E-Learning Platforms & MOOCs Integration:

AI personalises learning through adaptive content delivery, learning analytics, recommendation systems, and progress tracking on platforms like NPTEL, SWAYAM, Coursera, and edX. Libraries integrate these platforms to support lifelong learning and the development of research skills.

AI in Digital Reference / Virtual Help Desk:

AI-powered chatbots and virtual assistants provide 24/7 reference services, answering FAQs, guiding database searches, and resolving access issues. AI reduces routine workload, enhances response time, and improves user satisfaction.

AI in Research Consultation & Orientation Workshops:

AI supports research consultations by offering interactive tutorials, smart search demonstrations, and data-driven training modules. AI-based tools assist librarians in delivering ICT-enabled research literacy and publishing ethics programs.

AI in Electronic Document Delivery Service (EDDS):

AI automates request processing, copyright verification, document matching, and delivery optimisation. Intelligent systems improve turnaround time and manage inter-library loan workflows efficiently.

AI in Video Conferencing & Webinar Support:

AI enhances virtual research interactions through speech-to-text transcription, automated recording, language translation, noise cancellation, and meeting analytics. This supports global research collaboration and training programs.

AI in Digital & Information Literacy Programs:

AI enables personalised learning paths, skill assessment, interactive tutorials, and performance analytics for information literacy programs. These tools help libraries build critical thinking, data literacy, and AI literacy skills among researchers.

AI in Library Mobile Applications:

AI-enabled library apps provide personalised dashboards, smart notifications, chatbot assistance, and voice-based access to resources. Mobile AI provides seamless access to research services anytime, anywhere.

Opportunities of AI-Based Research Support Services in Academic Libraries:

The application of Artificial Intelligence (AI) in the academic libraries presents numerous opportunities to enhance research support services, redefine librarian roles, and improve the overall research ecosystem. AI-driven innovations enable libraries to move beyond traditional service models and function as intelligent, data-driven research partners. (Breeding, 2018; Zhang & Gourley, 2020)

Enhanced Information Discovery and Retrieval:

AI enables natural language processing, intelligent recommendation systems, semantic search, and allowing researchers to discover relevant information more accurately and efficiently. AI-powered OPACs, databases, and repositories enhance search precision, mitigate

information overload, and facilitate interdisciplinary research.

Personalised Research Support Services:

AI enables libraries to deliver highly personalised services, such as tailored current awareness alerts, selective dissemination of information (SDI), custom reading recommendations, and user-specific dashboards. This personalisation enhances researcher engagement and satisfaction.

Improved Research Productivity and Quality:

AI-based tools for plagiarism detection, grammar correction, reference management, and academic writing support help researchers improve the originality, clarity, and scholarly quality of their work. At the stage of early-career researchers and non-native English speakers these tools are very usefool.

Automation of Routine Library Operations:

AI automates repetitive and time-consuming tasks such as metadata creation, content classification, document delivery processing, and user query handling through chatbots. This allows library professionals to focus on advanced research consultation, data services, and scholarly communication support.

Strengthening Institutional Repositories and Open Access

AI enhances institutional repositories by improving content visibility, discoverability, copyright compliance, and usage analytics. Intelligent indexing and recommendation systems promote open-access research and increase institutional research impact.

Advanced Research Impact and Bibliometric Analysis:

AI-powered bibliometric and altmetric tools provide real-time citation tracking, author profiling, collaboration network analysis, and research impact prediction. Libraries can offer value-added services supporting faculty evaluation, funding proposals, and research visibility.

Assistance with Research Data Management:

AI facilitates efficient research data management through automated data classification, metadata generation, anomaly detection, visualisation, and compliance monitoring. This supports data reuse, preservation, and adherence to data management policies.

Expansion of Virtual and Remote Research Services:

AI-driven chatbots, virtual help desks, and smart authentication systems ensure uninterrupted 24/7 research support, especially for remote users. This expands the library's reach beyond physical boundaries.

Capacity Building and Skill Development:

The adoption of AI creates opportunities for librarians to upskill in areas such as data analytics, digital scholarship, AI literacy, and research analytics. This professional transformation enhances the relevance and strategic role of librarians in academia.

Data-Driven Decision Making and Resource Optimisation:

AI analytics enable libraries to assess usage patterns, research trends, and service performance. These insights support evidence-based decision-making, optimised collection development, and efficient allocation of resources (Sinha & Basu, 2021).

Difficulties and Challenges in Providing AI-Based Research Support Services in Academic Libraries:

Despite the Artificial intelligence's (AI) transformational potential in enhancing research support services, academic libraries face several difficulties and challenges in implementing and sustaining it effectively. These challenges are

technological, organisational, ethical, financial, and human-resource oriented. (Ferguson, 2020)

High Cost of AI Technologies:

The acquisition, implementation, and maintenance of AI-based tools such as intelligent discovery systems, plagiarism detection software, analytics platforms, and chatbot services involve significant financial investment. Subscription-based AI tools, licensing fees, infrastructure upgrades, and recurring maintenance costs pose major challenges, particularly for publicly funded and resource-constrained academic libraries.

Inadequate Technical Infrastructure:

AI applications require robust ICT infrastructure, including high-speed internet connectivity, cloud computing facilities, secure servers, and data storage systems. Many academic libraries, especially in developing regions, lack the necessary infrastructure to support advanced AI-driven research services, resulting in limited or uneven adoption.

Lack of Skilled Human Resources:

Effective deployment of AI-based research support services requires library professionals with expertise in data analytics, machine learning concepts, system configuration, and digital scholarship. A shortage of trained staff, limited opportunities for professional development, and resistance to learning new technologies hinder the effective use of AI to library operations.

Data Security and Privacy Issues:

AI systems rely heavily on user data to provide personalised and predictive services. Ensuring the privacy, confidentiality, and security of sensitive user information is a significant challenge. Libraries must comply with data protection regulations and institutional policies, and any data breach or misuse potentially erode user confidence.

Algorithms and Ethical Concerns Discrimination:

AI algorithms may reflect biases present in training data, leading to skewed search results, unfair recommendations, or exclusion of certain scholarly voices. Ethical concerns related to Fairness, accountability, and transparency in AI decision-making pose challenges for libraries committed to equitable access to information.

Integration with Existing Library Systems:

Integrating AI tools with existing Integrated Library Management Systems (ILMS), OPACs, institutional repositories, and authentication platforms can be a complex process. Compatibility issues, lack of standardisation, and dependence on vendor-specific solutions can limit seamless interoperability and system efficiency.

Reliability and Accuracy of AI Outputs:

Although AI tools enhance efficiency, they are not free from errors. Inaccurate recommendations, false positives in plagiarism detection, or incorrect metadata generation may affect research quality and credibility. Continuous monitoring and human oversight are necessary, which increases the workload for library staff.

Limited Awareness and User Acceptance:

Researchers and students may lack awareness or understanding of AI-based library services, leading to underutilization. Additionally, skepticism about AI-generated results, fear of surveillance, or discomfort with automated systems can affect user acceptance and trust.

Legal and Copyright Challenges:

AI-driven document delivery, text mining, and content analysis raise legal concerns related to copyright, licensing agreements, and the fair use doctrine. Libraries must navigate complex legal frameworks to ensure compliance while offering AI-enabled research support services.

Conclusion:

This paper clearly sees Artificial Intelligence's rise as a revolutionary catalyst in changing the face of research support services in academic libraries. With the evolving dynamics of libraries from being static information warehouses to dynamic research partners, AI-powered technologies have come to play a major role in enhancing efficiency, accuracy, personalization, and accessibility of research activities at different levels. The implantation of AI technologies in OPACs, Institutional repositories, Remote access systems, Online databases, Plagiarism detection tools, Reference management tools, Bibliometric analysis applications, Virtual reference services, and Mobile applications has greatly helped in engendering information exploration and research activities.

The results again reveal that AI enables academic libraries to offer user-centric and data-informed research assistance support services such as semantic and intelligent searching, recommendation and alerting, current awareness, research analytics, and workflow management. These technological developments, apart from assisting in increased research productivity and user satisfaction, again reshape the role of librarians as research facilitators, data experts, and gatekeepers to digital scholarship. The use of AI technology again enhances open access endeavors, research data management, and evidence-supported decision-making, thereby raising the profile and impact of research outputs at an institution.

Conclusively, while Artificial Intelligence has great potential for improving services in the support in research needs of academic libraries, its success depends on implementation strategies that are inclusive, well thought out, and morally responsible. Capacity building through infrastructure improvement and partnerships would go a long way in helping academic libraries utilize all of the possibilities of AI. With proper planning and responsible deployment, AI can empower academic libraries to develop into intelligent, innovative, and indispensable contributors within today's research ecosystem.

References:

1. Akerkar, R. (2019). *Artificial intelligence for information management: A healthcare perspective*. Springer.
2. Breeding, M. (2018). Artificial intelligence for library services. *Library Technology Reports*, 54(8), 5–13.
3. Cox, A. M., Pinfield, S., & Rutter, S. (2019). The intelligent library: Thought leaders' views on the likely impact of artificial intelligence on academic libraries. *Library Hi Tech*, 37(3), 418–435. https://doi.org/10.1108/LHT-08-2018-0105
4. Ferguson, S. (2020). How artificial intelligence is changing the future of libraries. *Journal of Library Administration*, 60(4), 413–423.
5. Jantz, R. (2017). Managing creativity: The innovative research library. *Library Administration & Management*, 31(2), 1–10.
6. Kumar, K., & Ramesh Babu, B. (2020). Application of artificial intelligence in academic libraries: An overview. *International Journal of Library and Information Studies*, 10(2), 1–8.
7. Mulla, K. R., & Chandrashekara, M. (2019). Artificial intelligence applications in academic libraries. *National Conference on Emerging Trends in Library and Information Science*, 1–6.
8. OCLC. (2018). *Artificial intelligence and machine learning in libraries*. OCLC Research Report.

9. Salvatore, A., & Vassilakaki, E. (2020). Artificial intelligence in libraries: A systematic literature review. *Information Research*, 25(3).
10. Sinha, M. K., & Basu, S. (2021). Use of artificial intelligence tools for research support services in academic libraries. *DESIDOC Journal of Library & Information Technology*, 41(4), 241–248.
11. Tripathi, S., & Kumar, S. (2020). Role of artificial intelligence in library services: A conceptual study. *Library Philosophy and Practice (e-journal)*, Article 4290.
12. Turnitin. (2023). *AI writing detection and academic integrity*. Turnitin White Paper.
13. Zhang, Y., & Gourley, D. (2020). AI-driven discovery services and their impact on research behavior. *College & Research Libraries*, 81(6), 964–980.
14. Association of College and Research Libraries (ACRL). (2020). *Research support services in academic libraries*. ACRL Publications.
15. UNESCO. (2021). *Ethics of artificial intelligence*. UNESCO Publishing.