

Integration of Artificial Intelligence in Institutional Libraries in Maharashtra State

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Abstract: *The rapid change in the use of AI is affecting all sectors of Education and Library Services. Institutional libraries within Maharashtra, Pune and Nagpur are now taking advantage of this latest approach to improve their information retrieval methods, speed up operations and enhance the consumer experience. AI technologies such as machine learning, natural language processing, chatbots, intelligent information retrieval systems have influenced both the traditional library and the digital information systems based on intelligent information. This paper reports the AI applications in the institutional libraries in Maharashtra, that are being integrated with AI, and the future prospects. For this study, data was obtained from journals, papers, and institutions of research on library automation and artificial intelligence (AI) for the academic research. In detail it shows that AI is able to improve functionality, and streamline information collection and processing and efficiency of librarians has improved due to AI technology. But lack of infrastructure needs to be fixed, lack of technical skills and financial limitations and ethics problems, in fact, play a very serious role in the efficient implementation of AI in the most influential institutions. The paper concludes that strategic planning, training of library professionals mostly Librarians and government support are key for incorporating AI technologies in education institutions in Maharashtra State.*

Keywords: Artificial Intelligence,(AI) Institutional Libraries, Automation of libraries, Smart Libraries, Information Retrieval

I. INTRODUCTION

Libraries are core for the storage and conservation of knowledge and its spreading. Old textbooks, journals, manuscripts and reference materials have been used for a long time. The revolution in information technology and communication that has taken place throughout the world has drastically transformed the nature of libraries and the way information is shared and controlled. And this change has shaped the institutions in the distribution and management of information as well. In the age of information and communication, library is transformed into a new information center which helps in teaching, learning and research as well as as an institutional knowledge center through physical and digital assets. Artificial intelligence refers to computer program's capacity to perform some basic kinds of work that computer system cannot do by themselves (learning, reasoning, decision-making, problem solving). AI methods -- machine learning, natural language processing, data mining etc -- are being applied for digital information management services in healthcare industry, education, business information management etc. In the Library and Information Science field machine learning is the new big thing and revolution. It is very capable in terms of digital library. Technology based on AI is enabling libraries to automate tasks and improve data for data access and service delivery. Currently such AI techniques can analyze a vast amount of information, detect patterns in what people are doing in their work and then come up with suggestions to researchers and students in terms of information resource. As a result, AI is becoming an indispensable tool to speed up the system and improve library experience of institutional libraries. The role of academic and institutional libraries (which are related to universities and colleges) can be said to be essential for education and research services. These institutions can house lots of information in the form of printed material, electronic material, digital data storage facilities and databases online. Because digital information is growing



there always seem to be a large amount of problems. AI technologies can be used to categorize library resources and catalogue them faster. Natural language processing based intelligent search technologies can help us to retrieve information quickly and efficiently using people instead of searching through difficult-to-interpret words. AI based recommendation systems can search for relevant books and articles or understand the research questions of people and users. As an application of AI to libraries, we believe in making virtual reference services for students and also we need chatbots for digital assistants. The artificial intelligence chatbots, for instance, can answer questions easily if a user requests them; they can even provide a context in which the user consults data. These tools further ease the accessibility of the library service to the user via any one place - for even at any one time and at any location. In addition to the improvements that AI technology makes on a library services, it also helps librarians in managing vast digital archives. Data gathering automation tools for metadata creation, document classification and plagiarism detection make it as easy for librarians to organize and maintain the digital library. With AI technologies in place, traditional libraries can transform into intelligent information systems capable for modern research and digital learning. Advanced research tools may be used when AI applications are supported; for example, analytic tools for university researchers and academic institutions can be used to track research patterns and citation patterns within the academic literature. Many universities and research institutions throughout the world already use AI-based technologies for information management and user experience improvement. AI in libraries, automation of the library and digital resources are an important part of this process and this will continue to evolve. In most university libraries there is an integrated library management systems like KOHA and SOUL that has been used to automate library system. This is still true for most of the research and education establishment for good applications of AI technologies such as intelligent search engine. Maharashtra State is one of those places which are major educational hubs in India and is very large with various universities, colleges and laboratories. Maharashtra has a large number of institutional libraries and many continue to look at them as the future for high quality education and research. They possess large printed and digital libraries with an excellent amount of content, are working well as student resource managers and professionals as well as they provide services for research and undergraduate students to students, teachers and students. Despite the surge in information space and new discoveries being made, in most institutional library collection facilities in Maharashtra, the problem of information management and information access to libraries are still acute. It is to this end, which Artificial intelligence technologies might find a possible answer and will more in the future for libraries to get more efficient and expand their knowledge storage and services. The use of AI technologies in institutional libraries has proven to have an impact on data management and on information retrieval process as well. AI-powered systems can be used to analyze questions provided to users and help provide them with more suitable search suggestions which can minimize the time required to discover what they are searching for. This sort of personalized recommendation system can assist a user to find out which information is right for their research interests. AI technology in institutions has difficulties too: poor financial availability of the resources available to them, poor technological capabilities, and no knowledge at all related to the ethical requirements of use of AI technologies (data privacy in AI). With that in mind AI has been used in institutional libraries but must be applied at institutional libraries with all types of libraries for decades. A better understanding of such issues will enable policy-makers, educators, library staff members to develop strategies for taking the advantage of emerging AI technologies into the field of Library of Learning. AI technology use in the institutional libraries of Maharashtra is an important topic that is relevant for a good idea of how it will help learn about them, not just as a tool of library data-sharing but also to understand what will they do with AI technology in libraries as we are moving towards a more integrated library-service. Because of the nature of the study, this research contributes to the emerging field research to address the use and impact of AI in libraries and information science research in Maharashtra.

II. CONCEPT OF ARTIFICIAL INTELLIGENCE IN LIBRARIES

Artificial Intelligence is a branch of computer science and is focused on designing intelligent systems (computer scientists) to execute tasks that require human intelligence like learning from experience, recognizing pattern, reading



language, making decisions and so on. In the context of libraries, AI is data analytics and information technology which improve efficiency and productivity. AI technologies are used in libraries for data science and library usage and are used for catalogue automation of books, data collection and information collection, recommendation tools and virtual reference services: these work in libraries. By ingesting the information of many objects and making the data available to library staff in a more efficient manner there is a better chance of making quicker decisions taken about the library and is therefore it beneficial to the library. The previous research revealed that the AI applications in academic libraries were focused primarily on machine learning, chatbots, data mining but also in the intelligent search function. These technologies would be good for libraries to better discover information about customers' habits and data mining automation that they could easily automate and offer customer service at a different time. AI also supports high-level data analytics that will better understand the overall behavior of users and can support libraries in improving service delivery by tracking the usage of customers. That is why AI is turning libraries into intelligent information systems (smart information systems).

III. INSTITUTIONAL LIBRARIES IN MAHARASHTRA STATE

Maharashtra is one of the most educationally advanced states in India. The state also has many other good universities and institutions like

- Savitribai Phule Pune University (Mumbai)
- The Shivaji University (Kolhapur).
- Rashtrasant Tukadoji Maharaj Nagpur University (Nagpur University).
- Dr. Babasaheb Ambedkar Marathwada University.

Other than these university campuses, the state has thousands of affiliated colleges and research centres in India. This are the institutions where there is a library for faculty and scientific work - it can be used during lectures, research. Institutional libraries in Maharashtra have several functions:

- Providing access to the literature for studying and working.
- Helping the education and research of students.
- Managing print collections and digital collection.
- Provide reference and information.

Offering electronic databases and journals access of these databases and journals. Nearly every library management system has adopted Integrated Library Management Systems (ILMS) (KOHA and SOUL) in common as these systems automate the functions of cataloguing, circulation, acquisition and serial maintenance. There are more sophisticated technologies, however, with the digitization of information systems becoming greater and more complex still needing improvement because the digitization has complicated people. AI technologies can help improve library services due to improvements with information retrieval and metadata generation in the library and, the more personalized the information offered. AI is transforming academic libraries today; making them a new place of learnability in the academic library - they are a learning experience center for the whole audience to look into how information technology and knowledge sharing technologies (knowledge) works in a learner, as said by the field of library science.

IV. REVIEW OF LITERATURE

The use in library and information science of artificial intelligence has received a lot of attention. Numerous studies focus on the role of AI technologies in library services and information retrievals. Machine learning algorithms and natural language processing systems in libraries can improve the ways they process information so that tasks in libraries can flow by themselves. AI research has grown quite dramatically during the past decade according to a bibliometric study of academic libraries. Machine learning and chatbots also played a key role in recent developments of libraries. These AI chatbots are also shown to be able to provide 24 -hour virtual reference services in academic libraries that simplify the work of the librarian and enhance the consumer's access to information; also, through review of AI application in libraries the researchers found out intelligent tools were used for metadata generation, automated



classification and retrieval tools. All of this research indicates AI technologies have a huge potential to disrupt the existing library operations and enhance the user experience in libraries.

Objectives of the Study

The use of artificial intelligence in library and information science has received the attention of researchers. AI is an improving aspect of library services and information rewiring systems for data in a lot of studies. Recent literature has suggested th at this is a big picture. There are many research studies showing that in data centers libraries and information retrieval applications AI technologies like machine learning and natural language processing methods are highly beneficial tools and artificial intelligence tools can bring in efficient tools for searching information and perform repetitive processes while managing data, databases, systems and information on the internet. We want to do this according to the concepts with the development of artificial intelligence in library services in library services.

The main objectives of the study are

1. To understand the concept of Artificial Intelligence in library services.
2. To analyze the integration of AI technology in institutional libraries of Maharashtra state
3. To identify the applications of AI in academic libraries.
4. To identify challenges faced by institutional libraries in implementing AI technologies.
5. .To investigate some challenges that institutional libraries are facing in using AI technologies.
6. To suggest strategies for effective integration of AI in institutional libraries.

V. RESEARCH METHODOLOGY

The research design in this paper is descriptive and analytical

• DATA collection

The research is largely based upon secondary data which came from:-

1. Research journals.
2. Academic publications.
3. Conference proceedings.
4. Government and institutional reports.
5. Online scholarly databases.

• Data Analysis.

The data gathered are analyzed qualitatively to make sense of the potential of AI for institutional libraries.

Applications of Artificial Intelligence Technologies to Institutional Libraries

AI technologies can be applied in many important areas of library management and data collection at the organizations or libraries.

- **Automated Cataloguing and Classification of Documents**
AI systems can automatically form metadata and headings on documents with subject headings according to human readers, and it will lessen labor for librarians.
- **Intelligent Search System**
AI-based search engines can understand natural language questions and obtain more accurate results for the search.
- **Chatbots and Virtual Reference Services**
AI chatbots can address user questions in an intelligent way, and assist users in finding library resources. AI systems assess user behaviour and recommend books, journals and articles according to the user interests with algorithms they have.



- **Digital Library Management**

AI algorithms automate workflow and streamline the information network among our websites and helps digital libraries to look as though they could be organized into a single place and be served up quicker.

- **Research Support Tools**

AI tools assist researchers in literature reviews, citation analysis, and plagiarism detection.

Benefits of AI Integration in Institutional Libraries

- **Improved Efficiency**

Automation cuts the amount of manual work and makes the work more intelligent.

- **Improved search operations**

Armed AI-based search systems lead to better resolution with faster results.

- **Personalized User Recommendations**

AI-designed recommendations can be customized for the users based on user preferences.

- **Better Resource Management**

AI technologies can manage huge digital collections effectively.

- **Support for Research**

AI tools assist researchers in accessing the literature and studying research trends.

Challenges in Implementing AI in Institutional Libraries

Despite its benefits, AI integration faces several challenges.

- **Money Problem.**

AI technologies need enormous capital investment.

- **Lack of Technical Skills**

Considerable number of Librarians lack of AI technology training.

- **Infrastructure Limitations.**

Some libraries do not have an adequate digital infrastructure.

- **Ethical Concerns**

Privacy, bias, intellectual property, or others will be an issue with AI systems.

Status of Institutional Libraries in Maharashtra: Statistical Overview

Maharashtra is one of the leading states in India in terms of higher education infrastructure. The state has a numerous universities, colleges, and research institutions that maintain institutional libraries.

According to recent higher education statistics, Maharashtra has more than 45 universities and over 4000 colleges.

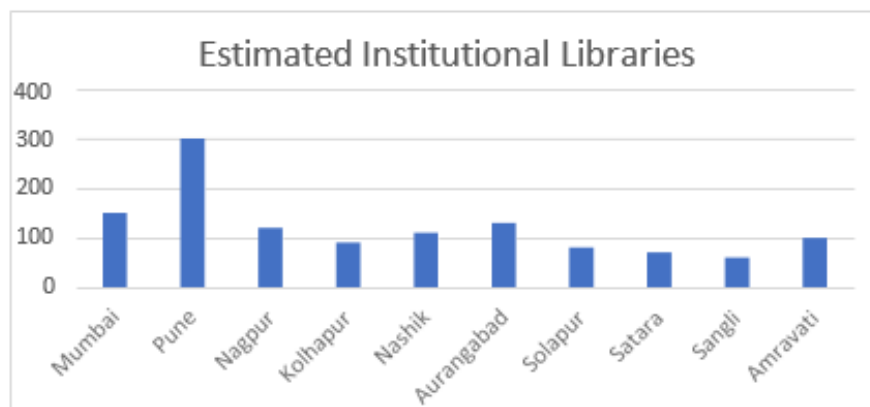
Each institution operates a library that supports teaching, learning, and research activities.

Table 1: District-wise Distribution of Selected Higher Education Institutions in Maharashtra

District	Universities	Colleges	Estimated Institutional Libraries
Mumbai	3	150+	150
Pune	2	300+	300
Nagpur	1	120+	120
Kolhapur	1	90+	90
Nashik	1	110+	110
Aurangabad	1	130+	130
Solapur	0	80+	80
Satara	0	70+	70
Sangli	0	60+	60



Amravati	1	100+	100
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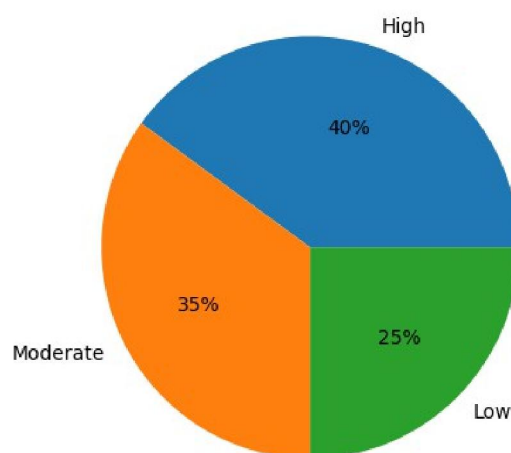
These institutional libraries maintain large collections including:

- Books
- Journal
- Digital repositories
- E-books
- Online databases

With the increasing availability of digital resources, libraries require advanced technologies such as Artificial Intelligence for efficient information management.

V. AI AWARENESS

AI Awareness Among Librarians



AI Tools and Technologies Used in Libraries

Artificial Intelligence can be applied in various library functions to enhance efficiency and service quality.



AI Technologies and Their Library Applications

AI Technology	Application in Libraries
Machine Learning	Predictive analytics, recommendation systems
Natural Language Processing	Intelligent search systems
Chatbots	Virtual reference services
Data Mining	User behavior analysis
Image Recognition	Digitization and archival management
Expert Systems	Decision support for librarians

These technologies help libraries transform into smart libraries capable of delivering advanced information services.

Case Studies of AI Adoption in Maharashtra Institutional Libraries

Where is AI adoption in Maharashtra institutional libraries?

- **Savitribai Phule Pune University Library**

The university library has adopted advanced digital library technologies and provides access to diverse electronic research databases. AI-based search tools are used to find research databases to improve information retrieval. The library also offers digital reference services and remote access to electronic resources.

- **University of Mumbai Library**

The universities in Mumbai have one of the largest number of affiliated colleges. The system is very active with online library platforms and automated catalogues. AI-based search engines in electronic databases enable research to find relevant information.

- **Shivaji University Kolhapur Library**

Shivaji University Library is one of the prominent academic libraries in Maharashtra. Recently, the organization has implemented digital repository systems and access to many databases. It is worth mentioning how AI based information retrieval systems have improved students' and researchers' ability to find scholarly material.

Role of Librarians in the AI Era

The integration of Artificial Intelligence in libraries is changing the role of librarians. Traditionally, librarians were primarily responsible for managing physical collections and aiding users in locating information. However, in the AI-driven digital environment, librarians are becoming information managers and technology facilitators.

Key roles of modern librarians include:

- Managing digital knowledge systems
- Supporting research data management
- Training users in digital information literacy
- Implementing AI-based information retrieval tools
- Evaluating digital resources and databases

Thus, AI does not replace librarians but enhances their ability to provide advanced information services.



Future Prospects of AI in Institutional Libraries

The future of AI in institutional libraries appears promising. Several emerging technologies are expected to influence library services in the coming years:

- **Intelligent Digital Libraries**
AI will enable fully automated digital libraries capable of managing large collections with minimal human intervention.
- **Voice-Based Search Systems**
Users will be able to search library databases using voice commands.
- **Predictive Information Services**
AI systems will analyze user research interests and automatically recommend relevant resources.
- **Smart Library Spaces**
AI technologies will help libraries optimize space management and resource allocation.
- **Research Analytics**
AI tools will assist researchers in analyzing research trends and identifying research gaps. These developments will transform institutional libraries into intelligent knowledge centers supporting research and innovation.

Recommendations

To promote effective integration of AI in institutional libraries, the following measures are suggested:

1. Government funding for AI infrastructure in libraries.
2. Training programs for library professionals.
3. Inclusion of AI-related subjects in library science curricula.
4. Development of collaborative digital library networks.
5. Establishment of ethical guidelines for AI use.

VI. CONCLUSION

Artificial Intelligence is one of the most influential technologies in the library and information science. And institutional libraries have the potential to improve and provide user services and research services using AI technologies at their core. Libraries in Maharashtra are gigantic players in higher education and for research as well. And due to the exponential growth in data they need a comprehensive AI system to look into resources or acquire data at the right place. Machine learning, natural language processing, chatbots and intelligent search technologies enhance library operations. And with AI technology, libraries can automate the various tasks that are needed to be carry out, enable professional training and establish digital connection to the library with support from the staff that work there. However, it cannot only be done in top-level institutions or those that are well equipped and have the support of the people— you must do things carefully and at the appropriate level. Shortage of funds or lack of skills for using AI and ethical issues can be hurdles to such digital integration. So first, libraries and software developers should collaborate to create sustainable AI solutions. By adopting these approaches, AI infrastructure development in Maharashtra's institutional libraries can foster innovation in research and digital learning.

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