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Artificial Intelligence in Libraries: Transforming the Library System

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ABSTRACT :

The application of artificial intelligence in libraries has become widespread. It involves programming computers to do things that, if done by humans, would require intelligence. These include expert systems for reference services, book reading and shelf-reading robots, virtual reality for immersive learning, etc. Although the inclusion of artificial intelligence in libraries may disconnect librarians from their users, it will help libraries do more than just taking over librarians' jobs. It will enhance their service delivery. Artificial intelligence will greatly improve library operations and services and will upgrade and enhance the relevance of libraries in the constantly changing digital society. Artificial intelligence is revolutionizing library services and management. This technology is making services such as information retrieval, automatic classification, data analysis, virtual assistants, chatbots, and recommended reading materials more efficient. Researchers and readers are getting more accurate and personalized services with AI-powered tools. Apart from this, AI also has an important role in the preservation of digital archives and documents. However, it also comes with some challenges related to ethics, privacy and automation. This article highlights the possibilities and challenges of the convergence of AI and libraries.

Keywords: AI, library, technology, information, system, machine

Introduction:

Humans are born with an innate ability to perceive, reason/think and act, which develops and improves over time as a result of many factors. Intelligence in humans is measured by the intelligence quotient (IQ) obtained through a series of aptitude tests focusing on various aspects of intellectual functioning. This relationship between AI and libraries is not just about digitization but about creating smart systems that enhance research, streamline administrative tasks and personalize user experiences. As libraries integrate AI technologies, they become more adaptive, make real-time recommendations, improve information retrieval and even preserve historical archives through machine learning techniques. Artificial Intelligence already impacts many of our daily computing activities, most computer systems and mobile phones being developed today have Artificial Intelligence features and we have probably used them without knowing that they are intelligent machines. The idea of creating Artificial Intelligence systems in libraries dates back to the 1990s. These intelligent library systems provide knowledge-based services to both library staff and patrons (Asemi & Asemi, 2018). The application of artificial intelligence in library systems includes descriptive cataloging, subject indexing, reference services, technical services, shelf reading, collection development, information retrieval systems, etc. These have gone beyond natural language processing (NLP) and knowledge-based services. Confirming this statement, Cork (2013) pointed out that researchers and experts in the field of artificial intelligence are creating intelligent systems that can think and behave like librarians – library robots. With the advent of AI, libraries are experiencing transformation in the way they manage resources, interact with users, and enhance access. From automated cataloging and AI-powered search engines to virtual assistants and predictive analytics, AI is reshaping library operations to make them more efficient and user-friendly.

AI and Libraries in the Current Scenario

Artificial Intelligence (AI) is transforming libraries by enhancing library services, improving access, and streamlining operations. In today's digital age, AI plays a vital role in making information retrieval more efficient and user-friendly. Below are some of the key ways in which AI is impacting libraries in the current scenario:

1. AI-powered search and discovery

- AI-powered search engines help users find relevant books, research papers, and digital resources faster.
- Natural language processing (NLP) enables users to search in conversational language instead of using complex keywords.
- Semantic search enhances the accuracy of results by understanding context and intent.

2. Chatbots and Virtual Assistants

- AI-powered chatbots assist users by answering queries, helping with book recommendations, and guiding them through library services.
- Virtual assistants provide 24/7 support, improving accessibility for users.

3. Automated Cataloging and Metadata Generation

- AI helps automate the cataloging process by generating metadata for books and digital content.
- Machine learning algorithms categorize and organize content, reducing manual efforts and ensuring consistency.

4. Personalized Recommendations

- AI analyzes user behavior to suggest books, articles, and other resources based on individual preferences.
- Recommendation systems improve the reading experience by providing relevant content.

5. AI for Digital Libraries and Archives

- AI helps digitize and preserve historical documents through optical character recognition (OCR) and image recognition techniques.
- AI-powered tools help restore old manuscripts and make them searchable.

6. Plagiarism Detection and Research Support

- AI-powered plagiarism detection tools help maintain academic integrity by identifying copied content.
- AI helps researchers find relevant sources, create summaries of articles, and even generate citations.

7. Smart Library Management System

- AI-powered library management systems automate book check-in and check-out using RFID and facial recognition.
- AI helps manage inventory, track book usage, and predict future demands.

8. Language Translation and Access

- AI-powered translation tools break language barriers, allowing users to access global knowledge.
- Speech-to-text and text-to-speech technologies help visually impaired users interact with library resources.

9. AI in Information Security

- AI enhances cybersecurity in libraries by detecting and preventing cyber threats.
- AI-powered authentication systems improve data privacy and access control.

10. Future of AI in Libraries

- AI will continue to evolve, leading to fully automated, intelligent libraries with virtual librarians.
- Integration with the Internet of Things (IoT) and Augmented Reality (AR) will further enhance the user experience.

Rationale of Applying Artificial Intelligence in Libraries :

In ancient times, clay tablets and stones were used as media to transmit information. Libraries have acquired and maintained various forms of information resources over these ages to meet the information needs of their user communities. Libraries were formally defined as a function of a physical building where books were kept for reading and other purposes. Today the definition of a library has moved beyond the physical building and is now focused on the collections and services offered, as virtual libraries have no physical walls and can provide services to users from remote locations. As a result, in an effort to meet the dynamic information needs of their clientele, libraries have explored, incorporated and transformed through various technological revolutions of clay tablets, stones, papyrus, parchment, paper, microform, computers, Internet, virtual libraries, Library 2.0, cloud computing, etc. Artificial Intelligence is the current technology that has evolved with huge potential and promising applications in libraries. There is also a need to explore its advantages and disadvantages, so that its rich benefits can be adequately maximized for the delivery of innovative and optimal services in libraries. The essence of implementing Artificial Intelligent Systems in libraries is that they are less prone to errors unlike humans; they can work 24 hours/7 days without getting tired leaving librarians free to do other work. As Cork (2013) stressed that Artificial Intelligent Systems (Robots) will be a key technology in this century. It will maximize speed, efficiency and effectiveness in processing library materials and enhance library service delivery at all levels.

Application of Artificial Intelligence in Libraries :

The ultimate promise of artificial intelligence is to develop computer systems or machines that think, behave and actually compete with human intelligence, and this clearly has a huge impact on librarianship. Artificial intelligence in libraries should not be mistaken with library automation. While the latter refers to the degree of mechanization for routine library operations. According to Sridevi and Shanmugam (2017), artificial intelligence is the modern technology used to manage digital libraries. Artificial intelligent systems can replicate and thus replace a human being in the library, although Lee, Huang, Kurniawan, and Ho (2015) believed that this invention would never replace a librarian but would instead focus on trivial and time-consuming library operations such as shelf reading and leave the librarian to engage with patrons. In libraries, NLP can be used to design intelligent expert reference systems or information retrieval systems where users can directly interact with the system using natural languages. Murphy (2015) stated that the use of robots in libraries will bring librarians and users closer to each other, while the notion that robots will separate librarians from their users is wrong. The computer takes natural language as input, analyzes and processes it, then responds accordingly with the required information. Some of the areas of artificial intelligence used in library management systems include: natural language processing (NLP), expert systems (ES), pattern recognition, robotics, etc. (Sridevi & Shanmugam, 2017). Subject indexing can be used as a practical application of artificial intelligence in libraries. This task requires the technical expertise of the librarian or indexer and their intellectual judgment to read, analyze, and suggest appropriate words to be used as indexing terms or keywords for a given document and also as an expert system designed to handle subject indexing or reference services. Moreover, expert systems are computer programs that simulate human decision making. Information retrieval is another aspect of library science that has felt the touch of artificial intelligence. Library information retrieval deals with the recall of information or resources from a file or database, it deals with the structuring, analysis, organization, storage, searching and retrieval of information stored in a library's collection, information centre or the Internet (Croft, Metzler & Strohman,

2015). As the information held in libraries grew, a variety of information retrieval tools were invented to deal with the vast amount of information contained therein and make them accessible to users. Artificial intelligence has found tremendous application in library information services, these include:

- Automated cataloguing and classification using Optical Character Recognition (OCR)
- Automated translation of foreign language materials using Natural Language Processing (NLP)
- Automated indexing using expert systems
- Retrieval of audio-visual materials using Optical Character Recognition and Speech Recognition.
- Music and pictures in a library's collection can be summoned as quickly as printed records - a new dimension to knowledge storage and management.
- Interactive bibliographic instruction using various media
- Intelligent gateways to online sources
- User-structured information environments
- Portable computer reader services for the disabled
- Intelligent document delivery services (DDS)

The use of robots in library activities is one of the current trend in the use of artificial intelligence in libraries. Access to the vast collection of information available on the web is the hallmark of the digital age. However, a lot of knowledge in the world still resides between the pages of printed books. First, the user will identify the material he wants to retrieve/read, then a sequence of operations will be initiated that will ultimately trigger the robot to retrieve the requested item. Next, another robotic system will open the item and turn the pages automatically through the use of a scanner, optical character recognition, and automated indexing software, allowing the user to browse through the material, search and analyze the full-text generated from the scanned images of the item. Advanced robotic library system for off-site shelving designed by Chirikjian (2002), which gains comprehensive access to printed material on the shelves, and retrieves the books from the shelves to an off-site scanning station.

Benefits of Artificial Intelligence in Libraries

Artificial intelligence facilitates human work with greater speed, efficiency and effectiveness in work environments such as libraries. According to Vijayakumar and Vijayan (2011), artificial intelligence and expert systems are used in classification, cataloguing and indexing of library materials. Through the use of optical character recognition and neural networks, the system is able to obtain bibliographic records of books and classify them accordingly. Artificial intelligence and expert systems will improve the performance of library services and reduce the rate of human errors and defects and can perform tasks more quickly than humans (Shohana, 2016). The use of artificial intelligence can also help library customers who are doing research by connecting library databases instantly. Thus artificial intelligence holds great potential for library and information service.

Advantages of Artificial Intelligence in Libraries

According to Ex Libris (2019), artificial intelligence in libraries can make research more discoverable, thereby boosting research productivity among faculty members. Bridges in Time: Timely access to information resources and services round the clock. Store and retrieve books from compact off-site storage locations. Maximization of Efficiency: It refers to efficiency in library operations. Maximizing effectiveness in the form of improving service delivery and elimination of human errors in library operations. The use of artificial intelligence systems in libraries can reduce the effort put in by librarians in technical services, reference services, etc.

Drawbacks of Artificial Intelligence in Libraries

Artificial intelligence is a promising innovative idea, but it also has some drawbacks.
Artificial intelligence systems have the potential to replace human jobs, thereby increasing the rate of unemployment in society. This has been a matter of concern among librarians for decades. The fear is that intelligent machines with the ability to shelve books, retrieve information, answer reference questions and assist users may replace librarians, rendering them unemployed. Intelligent machines in libraries can read digital resources, analyse and provide customised information, answers and services better than librarians, so AI is likely to be a 'threat' to librarians. Machines with AI systems will still not be able to fully understand what a library user wants. Artificial intelligence systems can go haywire and do things they were not programmed to do. Artificial intelligence systems can be misused leading to large scale destruction. It lacks the 'human touch'. Some users would prefer to interact and express their feelings directly to humans rather than machines. Excessive reliance on artificial intelligence systems may be detrimental to library operations.

Conclusions :

If libraries are to succeed in the new knowledge economy, they must innovate their services and re-examine their practices, a real means of achieving this is the application of artificial intelligence in libraries. Libraries will greatly benefit from the development of artificial intelligence systems for technical services, reference services, circulation services, resource management and information retrieval/dissemination. Although there is speculation that this technology will render librarians unemployed, artificial intelligence will greatly enhance library operations and service delivery, and increase the relevance of libraries in the constantly changing digital society. Moreover, as is the case with many emerging technologies, artificial intelligence is also seen as a thread for librarians and as a liaison to humans in libraries, the eventual acceptance and inclusion of artificial intelligence in library services will undoubtedly unleash its many potential promises in librarianship. Artificial intelligence will not reduce the human touch in libraries, nor will it end

the library's relationship with its patrons anytime soon. AI is revolutionizing libraries by making information more accessible, improving user experience and increasing operational efficiency. While AI cannot replace human librarians, it complements their work, allowing them to focus on more important tasks such as research support and community engagement. The future of libraries lies in the seamless integration of AI with traditional library services, ensuring that knowledge remains accessible to all.

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