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ARTIFICIAL INTELLIGENCE (AI) IN LIBRARIES: ITS APPLICATIONS AND EFFECTS ON LIBRARY OPERATIONS

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Abstarct :

A subfield of computational science called artificial intelligence (AI) seeks to provide machines the ability to solve difficult and complicated issues in a manner that is comparable to that of humans. To do this, computer-understandable algorithms are created by modelling and incorporating human cognitive traits. Through the provision of creative solutions to the problems encountered by librarians and users, artificial intelligence (AI) holds the potential to revolutionize the library services sector. AI can completely transform library operations, from user recommendation engines to cataloguing and indexing. Users can receive more relevant and accurate search results from AI-powered search engines. AI systems are able to evaluate user data and offer users tailored recommendations. The process of indexing and cataloguing library items can be automated with AI. The article also examines the potential benefits and challenges of using AI in library services, and discusses future directions for research in this area .

Keywords: Artificial Intelligence, Library services, Library Operations, Expert Systems, Robotics, chatbots, Machine Learning, Data Science

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Introduction :

Artificial Intelligence (AI) is a branch of computational science that aims to enable machines to solve complex and challenging problems in a way that is similar to humans. To achieve this, human cognitive characteristics are modelled and integrated into algorithms that computers can understand and process to produce an output or result. It collectively generates informed decisions as they pass from one to the other.

In the past decade, smart libraries have leveraged new technologies such as the Internet of Things, big data, cloud computing, RFID, artificial intelligence, and virtual reality to achieve physical space intelligence, information resource organization intelligence, service mode intelligence, and management method intelligence. The goal of smart libraries is to provide users with more efficient and high-quality services, build an attractive information interconnection environment, and create a diversified information sharing space. Some mature application scenarios of smart libraries include 24-hour self-borrowing and returning systems, mobile phone/network self-renewal systems, intelligent inventory/positioning systems, intelligent seat reservation systems, and 3D/AR/VR navigation systems [14].

However, libraries need to introduce modern scientific and technological means to enhance readers' experience and services. Relying solely on the Internet of Things, RFID, and other technologies has been insufficient to meet the technical requirements of smart libraries. Artificial intelligence is a new driving force for the development of smart libraries [2].

Libraries can benefit from cutting-edge technologies thanks to artificial intelligence, which is a collection of methods that allow robots to recognize, comprehend, act, learn, and carry out administrative tasks. The field of librarianship is renowned for using cutting-edge technologies for purposes other than the simple distribution of information.

This paper will analyze the application of artificial intelligence technology in smart libraries, summarize the application status of library artificial intelligence, identify existing problems, and explore the potential of artificial intelligence in smart libraries. Finally, the article discusses future directions for research in this area.

Review of Literature :

The field of study on the relationship between libraries and artificial intelligence (AI) is still very young. Not all of the information sciences have seen the issue grow at an exponential rate, even though it has in other fields. There have been some encouraging advancements in this field, nevertheless. To increase search and recall precision, for example, machine learning technologies are being utilized to improve classification methods. Use data visualization tools like Springer Nature SciGraph Explorer to find previously undiscovered relationships between ideas, scholars, and organizations. Furthermore, artificial intelligence has already made its way into libraries with chatbots that can answer basic informational queries, notify users when a book is due, route them to pertinent library resources, and handle directional inquiries on a website.

AI will have much more fascinating effects on how information is retrieved and connected in the future. Librarians may actively promote the development since they have knowledge of how their consumers look for and use information. This could entail using a text and data mining tool on an internal dataset or assisting a project team in deriving fresh conclusions from pre-existing information [11].

According to certain research, libraries ought to approach AI from the viewpoint of its stakeholders through active learning [13]. Others are actively attempting to include AI into the virtual reference process by means of automated chatbots and a culture of participation that enables users to actively participate in the technology-facilitated learning process [5].

Associations and organizations that have already begun to acknowledge the role AI will play in the future of librarianship including the International Federation of Library Associations and Institutions (IFLA), the American Library Association (ALA), and the Canadian Federation of Library Associations (CFLA), to name a few. An IFLA Trend Report highlights the advances of AI and its connections to the semantic web and search, as well as improvements to translation and cloud-based computing [12]. AI initiatives with the potential to affect libraries have been mentioned in the ALA's Center for the Future of Libraries. These projects include chatbots, neural networks, education, and more [3]. While a CFLA panel cautioned about the risks that AI poses to libraries, they also emphasized that more librarians need to be included in this conversation, especially when it comes to positioning, policy, and standard-setting [4].

In the 1980s, microforms were considered revolutionary, almost two decades after libraries began purchasing them in earnest. However, user adoption was initially slow, prompting libraries to adapt their outreach approach. Innovative approaches to microform acceptance revealed that users preferred immediate access to documents, which the medium provided [16].

Microform and database-centric computers at the library eventually were replaced by the Internet and, of course, the Google search engine. Similarly, librarians were concerned that these new digital developments would make their jobs obsolete, much like the fear and paranoia surrounding AI today. This fear of being dispensable is further tracked in the literature regarding libraries and digital technology. A study on the librarians at Tehran University found that ambiguity was a major source of resistance to technological change, combined with an uncertainty toward institutional change derived from said technology [15].

According to research, technological innovations can be successfully adopted when the approach establishes clear connections to the intended benefits and receives positive influence from the society surrounding the technology [18].

When perception about AI is loss of job, dominance of machine etc, it is natural for people to be reluctant to include the technology. To overcome this resistance, new technologies should be linked to strategic plans and goals for the organization, and new change efforts should be communicated frequently. Staff should also be engaged frequently with the new technology [6].

Artificial Intelligence :

In contrast to the natural intelligence exhibited by humans and animals, artificial intelligence (AI) is the intelligence exhibited by robots.Artificial Intelligence (AI) is a branch of computer science that seeks to build intelligent machines that are capable of activities like speech recognition, decision-making, visual perception, and language translation that normally need human intelligence.

Nwakunor (2021)[17] defines artificial intelligence (AI) as computer-controlled robots that possess human-like intelligence.These robots mirror the abilities of the human mind and are controlled electronically with the help of a computer.

In1951Christopher Strachey's checkers program at the University of Manchester's Ferranti Mark I computer finished a whole game, AI has advanced significantly.Since then, artificial intelligence (AI) has helped with the sequencing of RNA for vaccines and the modeling of human voice.These applications of AI rely on machine learning based on models and algorithms and increasingly emphasize observation, reasoning, and generalization.AI has reclaimed the spotlight like never before thanks to advancements like these, and it has no intention of letting up anytime soon.

Artificial Intelligence has begun to change our world and will do so in the future. AI is transforming the planet incessantly. In addition to generative AI, which is gaining popularity because to tools like ChatGPT and AI art generators, it is already the primary force behind developing technologies like big data, robots, and the Internet of Things. And for the foreseeable future, it will keep innovating in the field of technology.Approximately 44% of firms want to incorporate AI into their operations and make major investments in the technology.Furthermore, AI accounted for 2,300 of the 9,130 patents that IBM inventors were awarded in 2021. AI is probably going to change the world and keep changing it.

Artificial Intelligence has the potential to positively affect our lives and transform the way we live today. AI is extensively utilized in the e-commerce industry since it facilitates positive user-company interactions. Using the user's search history and preferred views as a guide, artificial intelligence assists in providing relevant suggestions and recommendations.

Additionally, AI chatbots are employed to offer prompt customer service and significantly lessen the number of complaints and inquiries. AI is also utilized in the healthcare industry to help with medication research, forecast disease outbreaks, and evaluate medical information. AI is also utilized in education to enhance student results and tailor instruction. AI is also utilized in banking to automate financial procedures and detect fraud. AI is being utilized in the transportation industry to streamline routes and lessen gridlock. AI is also utilized in the entertainment industry to enhance user experience and produce personalized content.

The future of AI is bright with continued advancements in technology. Investment in artificial intelligence reached $93.5 billion in 2021, according to Statista. The current trend for neural networks to grow larger will likely continue into the near future as more functionality is required. AI and ML are poised to transform the scientific method, the foreign policy, the consumer experiences, the climate crisis, and the healthcare. AI will enable next-gen consumer experiences, address the climate crisis, enable personalized medicine, and more.

In conclusion, AI is a rapidly evolving field that has the potential to transform our world in many ways. AI has already started to change the way we live, work, and interact with each other, and it will continue to do so in the future. AI has the potential to improve our lives in many ways, from personalized healthcare to more efficient transportation. However, AI also poses many challenges, such as the potential loss of jobs due to automation and the ethical implications of creating intelligent machines. It is important to continue to explore the potential of AI while also being mindful of its potential risks and limitations AI is a vast field that encompasses many different areas. Here are some of the major areas of AI:

Machine learning :

Machine Learning: Machine learning is a subset of AI that involves training machines to learn from data and make predictions or decisions based on that data. Machine learning algorithms can be supervised, unsupervised, or semi-supervised, and they can be used for tasks such as image recognition, speech recognition, and natural language processing.

Deep learning :

Deep Learning: Training artificial neural networks to learn from data is the basis of this subset of machine learning. Natural language processing, audio recognition, and image recognition are among the applications for deep learning techniques.

Robotics :

Robotics: Robotics is a field of AI that involves designing and building robots that can perform tasks autonomously or with minimal human intervention. Robotics is used in a variety of applications, including manufacturing, healthcare, and space exploration.

Expert system :

Expert Systems: Expert systems are AI systems that are designed to mimic the decision-making abilities of a human expert in a particular domain. Expert systems are used in a variety of applications, including medical diagnosis, financial analysis, and legal decision-making.

Natural language processing :

Natural Language Processing: Natural language processing is a field of AI that involves teaching machines to understand and interpret human language. Natural language processing

is used in a variety of applications, including chatbots, virtual assistants, and language translation.

Fuzzy logic :

Fuzzy Logic: This area of artificial intelligence deals with imprecision and ambiguity. Numerous applications, such as pattern recognition, decision-making, and control systems, use fuzzy logic.

Computer vision :

Computer Vision: Computer vision is a field of AI that involves teaching machines to interpret and understand visual data from the world around them. Computer vision is used in a variety of applications, including self-driving cars, facial recognition, and object detection.

These are just a few of the many areas of AI. As AI continues to evolve, we can expect to see new areas emerge and existing areas become more sophisticated and powerful.

Libraries and Artificial Intelligence :

Artificial Intelligence (AI) and machine learning technologies are becoming more and more integrated in the library industry. Artificial intelligence (AI) technologies have the potential to be extremely transformational, and they can be used to further innovation and the general good. Libraries can ethically use AI technology to further their social mission if they take the required precautions, take ethical considerations into account, and stay mindful of existing constraints [10].

Applications for artificial intelligence (AI) and machine learning (ML) might be able to add new features and services to libraries. AI and ML technologies, for instance, could help libraries recognize text characters more accurately through optical character recognition. They could also enable libraries to use their machine-readable collections for new purposes (such categorization or discovery), benefiting patrons, researchers, and libraries themselves. Similarly, knowledge organization, storage, and integration procedures in libraries may benefit from fresh perspectives and methods brought about by AI and ML. When combined with robotics, AI might be able to provide new perspectives on the supply of services. Even though there are situations in which artificial intelligence (AI) could be utilized to automate some of the current library services (in AI applications like chatbots or search and discovery tools), care should be taken to prevent negative impacts on quality of service and staffing [10].

Several machine learning approaches, such as logistic regression, KNN, and AdaBoost, have been widely employed for book acquisition, resource discovery, and metadata production in library collection management. On the other hand, association rules, SVM, and recommender systems have been used for circulation (book recommendations, user ratings, bibliographic data, etc.).

In order to develop applications especially for library usage and/or in response to user needs, libraries and library organizations can collaborate with AI researchers and developers. This includes making previously unattainable services accessible. Clear ethical guidelines, such as those outlined in the IFLA Code of Ethics for Librarians and Other Information Workers, should govern the use of AI technologies in libraries. For example, AI systems that depend on large-scale data collection—like behaviour analytics software for performance

assessment—must not take precedence over user privacy preferences or equitable considerations [10].

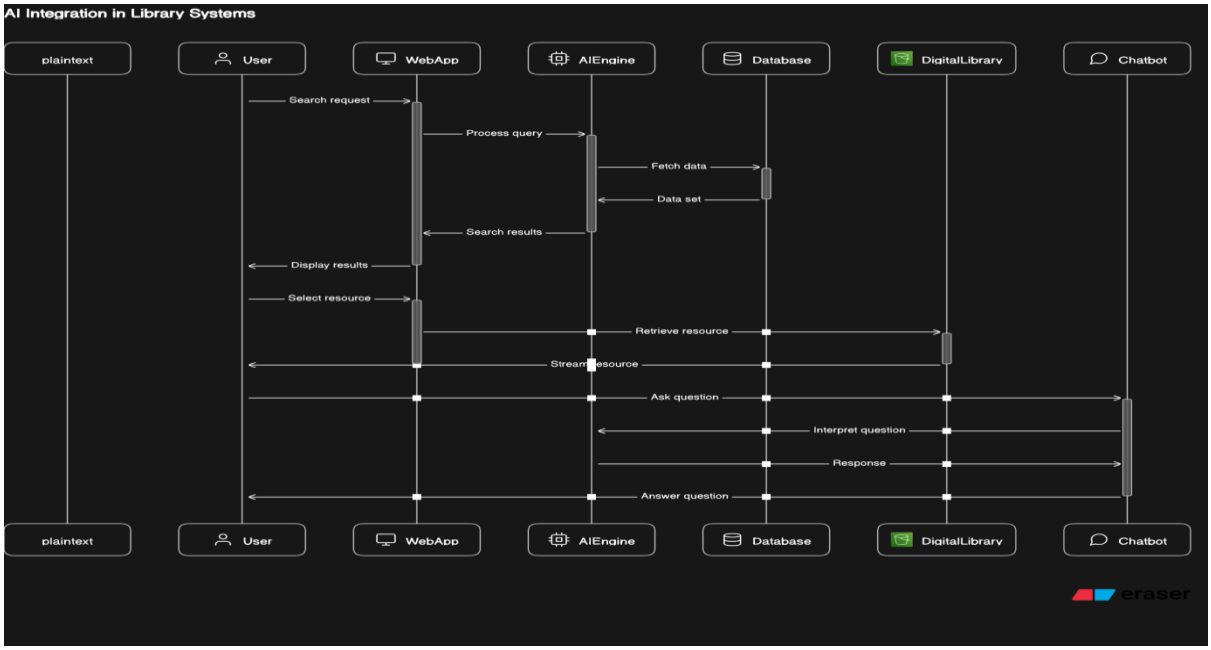
AI in libraries can be thought of as an assortment of methods that allow machines to recognize, comprehend, act, learn, and carry out administrative tasks, giving libraries access to state-of-the-art technology. AI is revolutionizing libraries by improving their capacity to handle enormous volumes of data effectively and to offer tailored services. AI technology have made it easier to create digital libraries that provide access to a variety of resources at any time and from any location [8].

AI is also utilized in library search functionality in addition to the aforementioned uses. Examples in particular are the connections between Expert.ai and EBSCO and DynaMed and Micromedex and Watson. Additional ways AI is used in libraries include research, chatbots, and teaching others about its possibilities [7, 9].

In summary, artificial intelligence (AI) has the potential to completely change the library industry by bringing new features and capabilities, streamlining knowledge management procedures, and boosting the capacity to handle enormous volumes of data effectively and personally. However, there should be explicit ethical guidelines governing the use of AI technology in libraries, such as those outlined in the IFLA Code of Ethics for Librarians and Other Information Workers. In order to produce applications expressly for library usage and/or in response to user demands, libraries and library organizations can collaborate with AI researchers and developers. This includes making previously unattainable services accessible [9].

Artificial Intelligence (AI) has been transforming the library services industry by providing innovative solutions to the challenges faced by librarians and patrons. AI has the potential to revolutionize the way libraries operate, from cataloguing and indexing to providing personalized recommendations to users.

AI Integration in Library Systems



Benefits of AI in Library Services :

a. Enhancement of the efficacy and efficiency of library operations:

AI can improve the efficiency and effectiveness of library operations by increasing the availability of information resources and service efficacy while reducing operational costs through automation, digital asset management, and optimal research data governance. This can help libraries assess and improve the organizational effectiveness and efficiency of library services.

b. Opportunity to Engage User:

AI can help libraries engage with a wider audience by incorporating chatbots and location-based services into search engine results. Additionally, ML algorithms can instantly process content from thousands of sources in place of the typical analysis of only a small portion of those resources.

c. Aids Library Employees in Reaching Their New Goals:

AI can help library staff achieve their new objectives by reducing human inaccuracy and inefficiencies through the application of AI techniques. This can free up library staff to work on more worthwhile projects like helping patrons create reading lists, instructing patrons on how to conduct better scientific research, creating library information resources, and other activities. Using intelligent technologies to deliver library information resources and services can foster creativity or innovation, which will increase operational effectiveness and efficiency.

d. Establish libraries at the center of the new scholarly communication:

AI technologies can help establish libraries at the center of the new scholarly communication by identifying relationships that were previously missed in huge datasets. By connecting with open publishing organizations and developing research tools that collaborate with other organizations, libraries can contribute to the continuous flow of data and study across all fields and subjects. This can make their collections easier to browse, explore, and analyze, eventually assisting a vast, high-quality universal resource network.

e. Enhanced security at the Library:

AI can help improve the security of library materials. For example, AI algorithms can monitor library materials for signs of damage or theft. This can help librarians identify potential security threats and take appropriate action.

Challenges of AI in Library Services :

1. **Cost**: Implementing AI in library services can be expensive. AI requires specialized hardware and software, as well as trained personnel to develop and maintain the systems. This can be a significant financial burden for libraries, especially those with limited budgets.

2. **Privacy concerns**: AI requires access to user data in order to provide personalized recommendations and other services. This can raise privacy concerns among library patrons. Libraries must ensure that they are collecting and using user data in a responsible and ethical manner.

3. **Bias**: AI algorithms can be biased, which can lead to unfair or inaccurate recommendations. For example, an AI algorithm that recommends books based on a user's reading history may not recommend books by authors from underrepresented groups. Libraries must ensure that their AI systems are designed to be fair and unbiased.

4. **Technical challenges**: Implementing AI in library services can be technically challenging. AI systems require specialized hardware and software, as well as trained personnel to develop and maintain the systems. Libraries must ensure that they have the technical expertise to implement and maintain AI systems.

5. **Resistance to change**: Some librarians and patrons may be resistant to the use of AI in library services. They may be concerned that AI will replace human librarians or that it will lead to a loss of privacy. Libraries must ensure that they communicate the benefits of AI to their staff and patrons and address any concerns they may have.

Conclusion:

If libraries are to thrive in the new knowledge economy, they must innovate their services and re-examine their practices.Artificial intelligence (AI) is a veritable means to achieve this.AI has the potential to transform library services by providing innovative solutions to the challenges faced by librarians and patrons.It can greatly benefit from the development of AI systems for technical services, reference services, circulation services, resource management, and information retrieval/dissemination.Although there are speculations that this technology will render librarians jobless, AI will greatly enhance library operations and service delivery and will uphold the relevance of libraries in an ever-changing digital society. In addition, as with many emerging technologies, AI is also viewed as a threat to librarians and the human touch in libraries.However, the eventual acceptance and incorporation of AI into library services will no doubt reveal the many potential promises it has in librarianship.AI will not diminish the human touch in libraries, nor will it erode the library's connection with its patrons any time soon.However, implementing AI in library services can be expensive and technically challenging, and it can raise privacy and bias concerns.Libraries must ensure that they are using AI responsibly and ethically and that they are communicating the benefits of AI to their staff and patrons.By doing so, libraries can leverage the benefits of AI to provide better services to their patrons and improve the overall user experience.

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