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The Role of Artificial Intelligence in Library Management System

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Abstract

Artificial intelligence is wide ranging branch of computer science that aims to build machines capable of performing tasks that typically require human brain. Artificial Intelligence being a branch of Computer Science studies how computers learn, comprehend data identify characters in images, analyses pictures, and stimulate how the eye function. Apart from this it refers to the research and programming of computers to carryout intelligence tasks that demand human intervention. On the other hand a library management system aims at saving plenty of time providing information about any kind of book. Library is an organized assimilation of resources made available to a defined community for borrowing or reference. Different Association, Institution and organizations have defined Library indifferent ways but the main aim of library is to provide knowledge to the needy reading community. Application of Artificial Intelligence and automation in Libraries including Cataloguing Classification, Subject indexing, Reservation Management and Stock management processing of document, management of electronic resource authentication in check in and check out, virtual learning, support of costumer, processing of automation and self-service. Both Artificial Intelligence and Library Management System go hand in hand and the relation between the two is inseparable in modern times. Artificial Intelligence plays vital role in the Library Management System. The article emphasizes on how Artificial Intelligence and Library Management System work together in catering the needs a modern library.

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Introduction

Definition of Artificial Intelligence

Intelligence might be defined as the ability to learn and perform suitable techniques to solve problems and achieve goals, Artificial Intelligence (AI), a term coined by emeritus Stanford Professor John McCarthy in 1955, was defined by him as "the science and engineering of making intelligent machines".

Artificial intelligence (AI) is a wide-ranging branch of computer science that aims to build machines capable of performing tasks that typically require human intelligence. While AI is an interdisciplinary science with multiple approaches, advancements in machine learning and deep learning, in particular, are creating a paradigm shift in virtually every industry. Artificial intelligence allows machines to match, or even improve upon, the capabilities of the human mind. From the development of self-driving cars to the proliferation of generative AI tools, AI is increasingly becoming part of everyday life.

Concept of Library

Library is an "organized collection of resources made accessible to a defined community for borrowing or reference According to the American Library Association (2022), "Library is a collection of resources in a variety of formats that is organized by professionals or other experts who provide convenient physical, digital, bibliographic, or intellectual access and offer targeted services and programmes with the mission of educating, informing, or entertaining a variety of audiences with the goal of stimulating individual learning and advancing society as a whole".

The Cambridge Dictionary (2024) defined "Library as a building, room, or organization that has a collection of books, documents, music, and sometimes other things, such as tools or artwork, for people to borrow, usually without payment. Libraries are indispensable in every facet of education, as they support teaching".

A library is organized for use and maintained by a public body, an institution, individuals, communities, and societies. Libraries also play a significant role in promoting literacy, intellectual freedom, and cultural diversity. It acts as a centre for learning, study, and recreation, enabling people to meet new people, explore novel concepts, and broaden their horizons.

Concept of Library Management System
A library management system's main goal is to save a tonne of time and effort by instantly and accurately providing information about any kind of book. Software called a library management system is used to oversee a library's operations. The programme facilitates the management of all library operations, including the issuance of books and the upkeep of book records. It also makes it possible to manage book details more efficiently, like the author's name, the edition, and a host of other crucial information. For both the librarian and the students, this makes it simpler to look for books and locate the appropriate resources.

A library management system is software that is designed to manage all the functions of a library. It assists the librarian in keeping up a database of recently added books as well as member-checked books and their due dates. Library records are kept up to date via a library management system. It keeps track of the quantity of books in the library, the number that are checked out, the number that are returned or renewed, the amount of late fines, etc.

The executive framework used to cope with and work with the vast volume of information created by libraries is called the Library Management System. Bills, books, and customers who have purchased books via the library management system are also tracked using it.

In modern educational and cultural organisations, the library management system is essential to the organising and accessibility of a vast array of information resources. The usefulness and effectiveness of library operations are enhanced by the Library Management System (LMS).

Components of Library Management System
1. Acquisitions and Budget Management
This part makes it easier to get new library materials. It includes functions such as vendor management, purchase order processing, budget allocation, and invoice management.

2. Cataloguing and Classification
This component entails arranging and classifying library materials. It includes adding metadata, indexing, and assigning unique identifiers to each item.

3. Circulation Management
The administration of circulation takes care of the lending and returning of library materials. It tracks item availability, manages loan periods, generates overdue notices, and handles fines and fees.

4. Serials Management
Subscriptions to journals, periodicals, and other serial publications are managed by serials management. It includes subscription tracking, managing renewal dates, and handling claims for missing issues.

5. User Interface
With the help of this component, users can interact with the system more easily and search for books, reserve things, renew loans, and access library resources from a distance. It should be intuitive and user-friendly to enhance the user experience.

6. ERM
It deals with the acquisition, licensing, and access management of electronic resources such as e-books, e-journals, databases, and multimedia content.

7. Reporting and Analytics
Tools for creating reports and assessing data on library usage are provided by this component. It helps librarians make informed decisions regarding collection development, resource allocation, and service improvement.

Concept of Artificial Intelligence
A branch of computer science called artificial intelligence studies how computers learn, comprehend data, recognize characters in images, analyses pictures, and simulate how the eyes work. In addition, artificial intelligence refers to the research and programming of computers to carry out intelligence tasks that require human intervention. Artificial intelligence has been increasingly shaping library management settings in recent years.

As libraries transform into vibrant information hubs, artificial intelligence presents unparalleled opportunity to enhance productivity, personalize services. The use of artificial intelligence in library management raises ethical concerns, such as data privacy, preferences in procedures, and the responsibility of preserving intellectual.

Okunlaya & Alias (2022) stated "artificial intelligence as one of the latest digital transformation technological trends the university library can use to provide library users with alternative educational services".

Bassey and Owushi (2023) defined artificial intelligence as "the development of computer systems that can perform tasks that typically require human intelligence." Artificial intelligence in library management illustrates their ability to accomplish specific tasks in the presence of variability, monitor the library environment, and appropriately adjust their actions based on what they perceive as prerequisites for intelligence.

Zhang (2024) explained artificial intelligence as "the application of machine learning and other techniques in research that offers opportunities for libraries to expand their services. In order to provide students at the institution with academic research consulting services, the library relies heavily on artificial intelligence".

A group of technologies known as artificial intelligence integrate data, algorithms, and processing capacity to enhance library and educational administration. And safeguard the societal legacy user. Artificial intelligence technology integration has the potential to significantly improve library operations and management's accuracy, efficiency, and user experience.

Why AI and Automation are required to Manage Libraries?
Challenges associated with data handling, budget constraints, staff shortages and burnout, cataloguing, quick access to resources, etc., have become very critical handle all these activities, which demands for advanced automation tools instead of legacy software systems or manual approaches.

Librarians need to keep a record of every book, journal, article, research paper, and other data associated with borrowing, renewal, submission, availability, etc. In addition,

operations such as maintenance, answering user queries, collection, fines, etc., also need the librarian's attention, resulting in more work pressure. Apart from this, they also generate a massive amount of annual revenue which calls for efficient library management. Only AI and automation can ease these challenges. These technologies are capable of minimizing the intervention of human capabilities to a decent extent. It saves time and cost and simplifies the library functions, accuracy and efficiency.

Applications of AI and Automation in Libraries

1. Cataloging Classification
AI integration in library automation tools can simplify the addition of books, journals and other materials to the library catalog. AI and ML algorithms can analyze a huge amount of data to automatically classify and organize library materials, create bibliographic records from digital files, suggest proper subject headings, integrate catalog data with external knowledge bases, etc.,

2. Subject Indexing
Artificial intelligence tools for libraries with their advanced capabilities, can extract keywords, topics, and other data from text and images of books to automatically assign subject headings, classify the materials and understand the relationship between different concepts for more precise indexing.

3. Reservation Management
Artificial intelligence-driven library software acquires critical information about the borrowed resources from systems like QR and RFID readers to streamline and automate the reservation process.

4. Inventory and Stock Management
Inventory and stock management processes of libraries were complex and time-consuming. However, AI inventory and stock management tools for libraries are efficient in performing operations like smart inventory optimization, reorder point calculation, safety stock calculation, multi-location inventory management, demand forecasting, smart shelving, etc.

5. Document Processing
Library staff often spend time and money manually processing and updating different types of library documents that can now be easily carried out with the help of AI and automation. Artificial intelligence tools, in combination with machine learning algorithms and technologies like scanning, optical character reading, image processing, etc., can easily automate the information retrieval, data validation, and document analysis processes in libraries.

6. Electronic Resource Management
While library automation systems help libraries digitize resources like journals, books, databases, etc., AI can assist in properly managing these electronic resources without any errors. This is beneficial for ensuring a better customer experience for who prefer borrowing digital content Proper electronic resource management enables patrons to easily access different e books, e-journals and other digital materials from the large stack. Librarians benefit from this in easily tracking resource access, fine collection, due dates, reservations, etc.

7. Automated Check-In/Check-Out
AI-based library automation software comes with robust features like Radio-Frequency Identification (RFID), self-service portals, etc., to automate the check-in and check-out of books. The RFID tags installed in the books transmit the data to the RFID reader-enabled self-service portals, streamlining the borrowing, submission and renewal of books. Through this, the long queues in the libraries can be reduced, ensuring optimized waiting times for other services.

8. Virtual Learning
Another useful application of AI-based library automation tools is better virtual tutoring and the learning experience of users. Artificial intelligence tools can be used in libraries to personalize learning paths, recommend relevant learning resources to users, generate feedback surveys and assessment forms, books, create immersive experiences, integrate virtual assistants, automate content duration, offer adaptive learning platforms, etc.

9. Customer Support
Libraries can also use artificial intelligence to support customer service functions to quickly resolve frequently asked queries of patrons. This is mainly done using AI-powered virtual assistants that offer instant support to patrons, answer frequently asked questions, address research queries, guide users across libraries and resources, etc.

10. Process Automation
The different functions of libraries, from borrowing/returning a book to invoice and document management. AI can automate those tasks that don't require specialized staff, such as borrowing/returning books, invoice management, document processing and classification, etc. Besides these tasks, artificial intelligence can also automate alerts of new notices, visitor data entry, email management, etc., saving time for both patrons and librarians in the library.

11. Self-Service
The AI-powered chat bots and virtual assistants use advanced machine-learning algorithms to receive and address the queries of patrons instantly. These are designed to quickly schedule an appointment, check book availability, search book locations, notify patrons of approaching submission dates, etc. In addition, automated checkout and return kiosks allow patrons to return or borrow materials without the supervision of staff easily.

Benefits of AI Library Automation Software
Library automation software is deployed across libraries worldwide owing to its enormous benefits. Some of the major benefits of implementing library automation software are as follows;
a) Reduces operating costs
b) Automates manual tasks
c) Improves search and retrieval processes
d) Streamlined workflow
e) Provides personalized recommendations
f) Offers 24/7 support
g) Eliminate data errors
h) Personalizes library services as per user intent
i) Increases resource accessibility
j) Secure data analysis and management
k) Better user experience
l) Proactive maintenance

m) Informed decision-making
n) Increased efficiency

Conclusion

The integration of AI into library management systems marks a significant leap in digitization and automation, promising enhanced user experiences and streamlined operations. However, challenges loom large. Ethical dilemmas, including privacy and bias concerns, demand vigilant solutions to uphold fairness and accountability. Technical hurdles, such as integration and expertise shortages, call for collaborative innovation. Ensuring inclusivity and accessibility remains pivotal, with AI's potential to bridge gaps but also widen disparities if implemented haphazardly. Thoughtful navigation of these challenges is imperative for libraries to unlock AI's transformative power, enriching operations, and community service.

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