



Artificial Intelligence and Its Applications in Libraries

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Abstract:

Academics, researchers, and information professionals are involved in research in this area as the concept and implementation of cutting-edge technologies such as artificial intelligence and machine learning have become relevant. The goal of this systematic review is to provide a synthesis of empirical studies investigating the use of artificial intelligence and machine learning in libraries. This paper investigates the roles envisioned for libraries and librarians, as well as their users and AI. This paper investigates the roles envisioned for libraries and librarians, as well as their users and AI. Finally, design thinking is presented as a method for addressing emerging AI issues and expanding strategic opportunities for this technology. It will also encourage library and information professionals to use artificial intelligence to supplement effective service delivery.

Keywords:

artificial intelligence, AI, machine learning, libraries, Library Management,

Introduction:

The industry is currently referring to the booming artificial intelligence (AI) technology as the fourth industrial revolution. Kumar (2004) point out the concept of artificial intelligence was formally proposed in 1956 at an academic conference in Dartmouth, New Hampshire, USA. This conference was also regarded as a forerunner of global artificial intelligence. Computer science, control science, information science, cognitive science, neuroscience, neurophysiology, psychology, linguistics, brain science, and other disciplines have collaborated to create artificial intelligence. Its essence is to investigate the creation of

intelligent machines or intelligent systems, to simulate human intelligence activities, and to advance human intelligence science. There are three types of artificial intelligence: symbolism, connectionism, and behaviourism. Symbolism is a method of intelligent simulation based on logical reasoning that is used to simulate human intelligent behaviour. The connection mechanism and learning algorithm between neural networks are the main principles of connectionism. The behaviourist theory is a cybernetic and perceptual-action control system (Nil's, 1998). Problem solving, natural language processing, artificial neural networks, genetic algorithms, expert systems, knowledge engineering, artificial life, deep learning, intelligent control, and other popular technical fields involved in artificial intelligence research are currently popular. The evolution of artificial intelligence from 1956 to the present can be divided into four stages (Vijayakumar and Sheshadri, 2019). Expert systems such as flight tracking systems and medical diagnostic systems are examples of artificial intelligence research, as are natural language processing such as speech recognition and automatic speech output, neural networks such as pattern recognition systems, face recognition, character recognition, handwriting recognition, and robots such as industrial robots and consulting robots. Some researchers divide artificial intelligence into the following disciplines: computer vision, computational linguistics, cognition and reasoning, robotics, game ethics, and machine learning (Mogali, 2015). AI in the Library: incorporating AI and machine learning technologies into day-to-day operations.

Several AI and ML applications may be able to introduce new services and functions to libraries as AI technology advances. AI and ML technologies, for example, could enable libraries to improve optical character recognition of texts or make new uses of their computer library collections (e.g. categorisation or discovery) - whether for libraries, patrons, or researchers.

Similarly, AI and ML have the potential to add new aspects and approaches to library knowledge management processes, particularly knowledge organisation, storage, and integration. When combined with robotics, AI may be able to add new dimensions to service delivery. While AI may be used to automate some existing library services in some cases. Libraries and library associations, for example, can collaborate with AI researchers and developers to create applications specifically for library use and/or in response to user needs, such as creating previously inaccessible services (Warwick, 2011).

Review of Literature:

Libraries have evolved structurally and content-wise over three generations: historic, mediaeval, and modern. Historically, clay capsules and stones were used as media for transmitting information, which was followed by the mediaeval generation of papyrus and parchments and the modern technology of paper, microform, and now virtual or electronic media (Gustavsson & Hedlund, 2011). Libraries have acquired and maintained various types of records resources over time in order to meet the information needs of their user groups. Furthermore, a library was formally defined as a feature of a physical building where books were kept for analyzing and other purposes. However, the definition of a library has evolved beyond the physical structure to include the collections and services offered, owing to the fact that digital libraries have no physical walls and can serve customers from far-flung locations. In order to meet the dynamic information

needs of its customers while maintaining its relevance in this ever-changing technological society, libraries have explored, incorporated, and metamorphosed through exceptional technological revolutions of clay pills, stones, papyrus, parchments, paper, microforms, computer systems, internet, digital libraries, library 2.0, cloud computing, and many others (Namdeo, 2021).

Surprisingly, artificial intelligence is the most recent technology that has emerged with enormous potential and promising programmes in libraries. As Corke (2013) asserted, Artificial intelligent systems (robots) may be a significant era in this century, it is necessary to further investigate this technology, its advantages and disadvantages, in order to safely maximise its rich benefits for modern and most advantageous offerings transport in libraries. In a nutshell, the crux of using artificial intelligent structures in libraries is that they are much less prone to errors than people; they can work for twenty-four hours and seven days without tiring, freeing librarians to do other tasks. In the long run, because computers can function efficiently at a scale and velocity beyond human capabilities, it will maximize speed, performance, and effectiveness in processing library materials and beautify library service transport at all levels.

According to the McGraw-Hill Encyclopedia of Science and Generation (2007) the four foundations of artificial intelligence are illustration, seek, reasoning, and learning. These four pillars are basic requirements for any artificial intelligence machine.

RFID tags are being embedded in library collections. These barcode-shaped tags contain unique identifying labels for each book in the library and are used to quickly test the library's collection using wireless, handheld RFID scanners/readers. According to Li et al. (2015), smart cabinets with multiple RFID antennas can routinely sign up while books are removed from their stacks or lower back. This can be used to automatically shelve books and generate reviews for books that are not shelved or are missing. Furthermore, robots are being developed to navigate through library cabinets in order to test and retrieve substances, such as the robot developed by Li and Ho (2015) at the business enterprise for science, technology, and research (Acelebrity) Institute for Infocomm research. Although they are more accurate than humans, these intelligent systems are more expensive to design and maintain. The technicalities will include creating a specific map of the entire library for robotic movement, computing and processing the distance between the robotic and an impediment (shelf, books, tables, customers) to assume course changes.

Objectives:

- Artificial Intelligence and its applications in Libraries
- AI and machine learning technologies in the libraries
- Use of Robotics in the libraries.
- Using AI Library Management System

Research Methodology:

A qualitative content analysis is used in this study to investigate existing literature on how AI adoption fosters innovative services in various organisations. In addition, content analysis was used in the study to generate potential solutions to aid AI service innovation and delivery in university libraries.

Result and discussion:

Artificial Intelligence and its applications in Libraries

Okunlaya (2022) and American Library association (2019) identify some fields of AI that are used in library management systems to process digital information are as follows

- Expert system
- Reference Service
- Natural Language Processing
- Pattern Recognition
- Robotics

Expert system: An expert system works with databases and serves as a gateway for gaining access to them. Badhe (2024) state that expert system simulates the decision-making aspect of the human brain. It has two subsystems: a knowledge base and a subsystem. The knowledge base contains both structured and unstructured data. The interface engine is the other subsystem; this component is used to apply logical rules to the knowledge base in order to iteratively infer new information. These can be used in a library system to record dependencies in a knowledge base, which is known as truth maintenance. The expert system's hypothetical reasoning can be used to investigate the implications of an assertion. To assert, a fuzzy logic expert system is used. An expert system is used in cataloguing to provide reference services. Cataloguing is the most ancient skill in the library system. The content is organised using an expert system. Acquisition and indexing are two other applications of expert systems.

Natural Language Processing: This component of AI is used to break down the barrier of making the computer understand the language we speak. This AI concept can be applied to documents queried in different languages to provide relevant information for the query. It could be used for text comprehension and generation. The natural language processor is used in morphological analysis; it analyses words from various languages. The natural language processor will have a set of rules that can be applied to user-lingual input, which is then converted to neutral language. The search is performed using the available input, and the content is presented to the user in the lingual it is queried in.

Pattern Recognition: This is widely used to identify patterns in knowledge bases, and the match between enquired content and available content is made, and the id match found is displayed to the user.

Robotics: An AI subsystem that uses a motor to automate a task with or without supervision. A robot is a multi-purpose machine that can be used to print online library content on demand. Comprehensive Access to Printed Material (CAPM) will be used in conjunction with a robot to retrieve the request. Badhe (2021) said Robotics very useful in library during Covid-19 to maintained social distance. These devices/ robots arranged books on shelves and circulate the books to users.

The Benefits of Using AI in Library Management Systems

- AI is capable of doing the job faster than a human
- Using AI will reduce error and defects
- It will be able to do complex work without much difficulty
- Can explore things in outer space

The disadvantage of utilising AI

- Will replace human jobs
- Will lack or have no human touch
- Will mislead or lead to destruction
- Chances of malfunction due to technical issues

Conclusion:

An intelligent library management system needs a expensive tool and an experienced professional. Unfortunately, there is very little experience with library automation using AI; this may be because librarians in the field have not received enough formal and informal training. Library officials tend to invest in innovative projects with limited resources, expecting to succeed and, if possible, succeed quickly. Unfortunately, the closer a project is to the cutting edge, the more likely it is to fail to produce a fully functional system; playing it safe often results in systems designed for "success," rather than sophisticated functionality. However, a difficult evaluation library expert system is required, as is more risk in developing an expert system.

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