Application, Advantage, and Disadvantage of Artificial Intelligence in Library Services

Moumita Saha Banerjee
Librarian
Dum Dum Motijheel College
1, Motijheel Avenue, Kolkata-700074

Abstract

We all aware of development of latest technology in every field, and the library science is not behind. This paper tries research on impact of Artificial intelligence and Expert Systems on library and information science and library system. Artificial Intelligence (AI) is the science and technology that able to create intelligent computational systems. Researchers in AI use latest techniques in computer science, logic, and mathematics. It useful in to create computers and robots that can represent the intelligent behaviour found in humans and other thinking things. The paper gives depth information regarding Artificial Intelligence and machine learning. So that information professionals can understand it better way in academic and their research. In this research paper the benefit and demerit of artificial intelligence and machine learning are given. Research from the present study showcase that AI could be use in Academic library services like Expert Systems in Reference Services, Technical, Indexing, Acquisition and its application in Natural Language Processing, Pattern Recognition and Robotics in library activities

Keywords: Artificial Intelligence, Academic Libraries, Library services

Introduction:

Intelligence is the ability to think and observe facts and skills and use them when required. The prospect of built computers or machines that observed, learn, reason, and act like human beings has mesmerize many people. Humans are born with a natural ability to recognize, reason/think and behave, which develops and better over time because of so many causes.

Intelligence in humans is mapped by the Intelligence Quotient (IQ) get through series of aptitude test centre on different angle of intellectual functioning. Similarly, growing intelligent computers that recognize, think, and act like humans is the crux of Artificial Intelligence.

As per Ex Libris (2019), intelligence in machines not only gives the devices the ability to learn but they are also configured to grow with use to perform functions finer without being explicitly programmed because they are developed to perceived and imbibe patterns correctly on much higher scales than humans. Artificial intelligence is beneficial in many areas such as medicine, military, business, education, gaming, libraries etc. The concept of built artificial intelligence systems in libraries start on 1990. These intelligent library systems provide knowledge-based assistance to both the library staff and patrons (Asemi&Asemi, 2018).

Application of artificial intelligence in library system enclosed descriptivecataloguing, subject indexing, reference services, technical services, shelf reading, collection development, information retrieval system etc. This has gone after Natural Language Processing (NLP), and knowledge-based services. With the advancement in artificial intelligence programming, building an intelligent library is not only a prospect but a matter of time. Corroborating this assertion, Croke (2013) shows that researchers and scholars in artificial intelligence are creating intelligent systems which can anticipate and act like librarians – library robots

Introduction of AI & ML has built a new era in revolutionizing both technical and user services in libraries. Self-learning and self-doing performing capability of AI and ML can be used in libraries for better interaction among machine-automated intelligent technologies for the fineness and co-creation of all library services. However, to handle the transformed scenario, librarians must alter their roles and promote the evolution of library operations and services modified with machine learning and artificially intelligent technologies. With the progress of the smart technologies, a broad range of research has been run for understanding the phenomena and creating transformation in this field. So, to trace the progress of intellectual structure of a knowledge domain, it is required to know about the current research focus and thus monitoring the future of a particular domain. Therefore, this study search to understand the current phase of the art of the AI & ML applications.

Artificial Intelligence:

Artificial intelligence (AI) is the ability enabled by a digital computer or computer-controlled machine or software replicating intellectual characteristics like intelligent organisms (human) in their functionality. Artificial Intelligence (AI) according to Nwakunor (2021), is the computer-controlled robots that think intelligently like human beings. These robots are controlled electronically with the aid of the computer by mimicking the competences of the human mind. Artificial Intelligence keeps records and analyses every action being made by the user. As a result of innovation in science and technology, Artificial Intelligence is used in all facets of life for human development and comfort. Artificial Intelligence (AI) is a suitable attempt to replace human power with the machine. The adoption of AI in the library will influence connectivity of information technology and actively support information usage as well as easing clients' search and immediately address their needs. The impact of artificial intelligence and advanced computer technology on the nature of future libraries will be enormous and the quality difference varies from experts (Vijayakumar & Sheshadri, 2019). According to Heath (2018), artificial intelligence is the technology that enables machines to have the abilities to plan, learn, reason, solve problems, move, and to some extent be creative. Accordingly, Liu (2016) viewed AI as intelligent machines or intelligent systems that simulate human intelligence activities and extend the science of human intelligence. AI technologies also could be used to provide innovative real-time virtual reference services through mobile and social networking environments, by combining the existing library resources and third-party contents. Additionally, some other promising areas of AI in libraries include natural language processing, indexing systems, and application of robotics in library activities.

Areas of Artificial Intelligence:

Artificial Intelligence centre on symbolic, non-algorithmic problem-solving method. Intelligence trust on capability to manipulate symbols. Artificial Intelligence though is a recent discipline, has change the society beyond one can think. The goal of its sub field i.e expert system, natural language processing, pattern recognition, and robotics is to replicate human intelligence with computers. Some of the recent computational techniques and areas that areused in enhancing fields of Artificial Intelligence are discussed below.

a) Expert System
Expert System are the skill based computerized systems which play a title role of
intelligence interface or gateway for give entry to database and to obtain appropriate
information. They span in scale from simple rule-based systems with flat data to very big
scale, integrated developments taking many people, years to develop. An expert system is a
computer program that gives expert advice, determination, or recommended solutions for a
given condition. The different module of expert systems

are Knowledge base, Inference Engine, and User Interface.

b) Natural Language Processing

One of the long-standing aims of computer science is to educate computers to understand the language we speak. The Ultimate generation of computer language is the Natural language. Artificial Intelligence scientists do well in building Natural language interface to a great extent using limited vocabulary and syntax. Natural Language Processing allows a computer to understand the main linguistic idea within a question or solution. Its aim is to make and build computer that analyse, understand, and generate language that human use naturally. (Kumar,2004) The different module of natural language processing is speech synthesis, speech identification, machine translation, linguistic approaches, information recovery and information extraction.

c) Pattern Recognition

It is the actions of establishing a nearest match between some new data and previously stored data patterns. This process is being carry out continually through the lives of all living things. Pattern identification is studied in many fields, including psychology, ethnology, cognitive science, and computer science. Pattern recognition is based on either a prior knowledge or on statistical information extracted from the patterns. The patterns to be classifieds are usually groups of measurements or observations, defining points in an appropriate multi-dimensional space. The components of pattern recognition are data acquisition, pre-processing, feature extraction, model selection and training, and evaluation.

d) Robotics:

The field robotics is often state as the sub area of AI that is carrying out with perceptual and motor tasks. Robot is a mechanical device which does automation tasks, either according to direct human supervision or a pre-defined program or a set of standard guidelines, using artificial intelligence skills.

e) Machine learning:

Arthur Samuel, an American pioneer in computer gaming and artificial intelligence, named the term 'machine learning' in 1959 and state it as "it gives computer the ability to learn without explicit programming". Depending on the behaviour of the "signal" or "responses" to the learning system, machine-learning applications which are classified into four main categories, i.e., (a) Supervised learning (b) Unsupervised learning (c) Reinforcement learning (d) Semi-supervised learning.

f) HAMLET:

The system is HAMLET (How about Machine Learning Enhanced Theses) presently a developer at the Berkman Klein Centre for Internet and Society at Harvard. HAMLET uses the doc2vec algorithm. This is a logic for manipulating the similarity in meaning between different documents, based on a widely used algorithm word2vec, which mapped the similarity between words? It explores the outcome online at the URL in the Gray box. HAMLET has three prototype interfaces: a recommendation engine, an uploaded file oracle, and a literature review buddy (Asemi&Asemi, 2018 &Mogali , 2015).

Application of AI in Library science:

AI applications provide libraries the scope to change the emphasis and attention. The way we navigate the facts is kept changing. AI provides a very useful easy way to deploy this knowledge and get better outcomes. The libraries are place themselves to take advantage of the application of cognizable computing in general and artificial intelligence for their potential utility as a tool for filtering the quality of library services. Below are the means in which Artificial Intelligent could be deployed in Academic library services

a. **Applications of Expert Systems in Reference Services**

Reference service is one of most important services rendered in any library and the Expert System must be used to replace the reference librarian in the given ways:

1. **Research:** It is a designed system that supplies clients with standard sources to search for certain question. This is a system that educate reference skills or computerized aid for rehearse reference librarians and information specialists
2. **Pointer:** It is also known as knowledge-based system but behave as computer supported reference program. It directs patrons to reference sources.
3. **Online Reference Assistance (ORA):** This system deliberates to stimulate the services of an academic reference Librarian for questions of low and medium level by using many technologies: Examples are videotext like database, computer assisted instruction component and knowledge-based system. ORA consist of directional agreement like library locations, services, and policies
4. **Answer-man:**It is skill-based system that aid users for reference questions on topics of agriculture. It has series of menus that cut down the subject of the questions and the category of tool needed. It can perform as either a consultation system or as a front end to external databases and CD-ROM reference tools.
5. **PLEXUS:** This is a benchmark tool used in Public Libraries. It incorporates knowledge about the reference procedure, Data retrieval about certain subject fields, reference origin, and library users. All the above systems are advisory systems for pinpoint reference source books and factual data.

b. **Application of Expert System in Cataloguing:**
   Cataloguing is familiar as the oldest library crafts. Current try to automate cataloguing through Expert Systems have centre on descriptive cataloguing for the reason that it is considered as rule based (AACR2). There are two approaches for putting in artificial intelligence techniques to cataloguing
   - A human-machine interface, where the intellect try is divided between the intermediary and the support system.
   - An Expert System with full cataloguing proficiency linked into electronic publishing system so that as a text is created on-line, it can be passed through skill-based systems and cataloguing steps done without any intellectual input from an intermediary.

c. **Application of Expert System in Classification:**
   Classification is the basic activity in the institute of knowledge. For this cause, it well known in all systems for organizing knowledge in libraries and information hub. Application of Expert System in classifications in libraries includes the following:
   - **Coal SORT:** It is a conceptual browser created to provide either as a search or an indexing tool. Coal SORT contains primarily of a frame-based semantic network and the software required to allow users to display part of it and to move around in the conceptual structure. The expert knowledge in the system is embodied almost completely in the semantic network.
   - **EP-X:** The Environmental Pollution Expert (EP-X) has certain point in common with coal SORT in that both are concentrating on strengthen interface using some knowledge 11 based approach. The knowledge base of EP-X consists of hierarchical frame-based semantic network of concepts and a set of templates that convey the patterns called the realistic relationship among concepts. These patterns are referred to as conceptual information.
   - **BIOSIS:** BIOSIS uses knowledge-based devices including a notable amount of procedural knowledge that automatically align documents to different categories. It is plot as an indexer aid. BIOSIS uses the information in the titles of biological documents to assign as many types as possible of those that would be assigned by human indexers. The indexing languages are arranged and practical representation of information that can be used to very good advantage of AI applications.

d. **Application of Expert System in Indexing:** Indexing of periodicals is one more area where expert systems are being grown up. Indexing a periodical article assume identification of concepts to transform these concepts into verbal descriptions by picking and assigning controlled vocabulary terms that are conceptually equal to verbal descriptions. The cause for automating the intellectual aspects of indexing is to upgrade the indexing consistency and quality. Based on the information provided by the indexer, the systems can arrive at appropriate preferred terms to automatically assign suitable subdivisions. The system can make inferences and based on those inferences; it can take appropriate action. 'Med Index' is the finest example of indexing system used in the library Indexing activity. Very few library users have interconnect with knowledge-based systems. Usually, users have had very small contact with these systems since most of them are not ideal enough to be used by the day-to-daylibrary patron.

e. **Application of Expert System in Acquisition:** The collection development area is another integral segment of the library. The librarian or the information officer is the key person in this venture Library users have a important role to play in developing electronic collections and that their help and advice should be request in the process. Several systems have been included. Monograph Selection Advisor, a pioneering attempt in applying this booming technology in another area of library science i.e., building library collection. Specifically, the task modelled is the item-by-item conclusion that a subject bibliographer makes in selecting monographic details. The knowledge base must be broad enough and the interfacing side must be easy enough for the library to get the required information from the machine.

f. **Applications of Natural Language Processing in Library Activities:** When we think of the title NLPL, the first thought one might have been of being able to speak or write in a total sentence and have a machine to action the request and speak. NLPL can be put into many directions. This could be applied to the area of library and information science and more categorically in finding database such as Online Public Access Catalogues (OPAC). Indexing is the basis for document recovary. "The aim of indexing is to increase precision, the portion of the retrieved documents that are relevant; and recall, the proportion of relevant documents that are retrieved"

g. **Application of Pattern Recognition in Library Activities:** In this age of the Internet and distribution of information, multimedia computing, new and emerging classes of information systems' applications have wipe into the lives of office workers. New applications extend from digital libraries, multimedia systems, geographic information system and collaborative computing to electronic commerce have built huge opportunities for information researchers and practitioners

h. **Applications of Robotics in the Library Activities:** Robot is "an automatically controlled, reprogrammable, multi-purpose manipulator programmable in three or more axes which may be either fixed in place or mobile for use in automation applications. The aim of the Comprehensive Access to Printed Material (CAPM) is to build a robotic on demand and batch scanning system that will permit for real-time browsing of printed material through a web interface. The user will hold the CAPM system that, in turn, will begin a robot that will get the requested item. The robot will carry this item to another robotic system that will open the item and will automatically roll the pages

Challenges of Implementing Artificial Intelligence in Libraries:

Artificial intelligence systems are generally not in functional use in most libraries today. The limitations to implementing artificial intelligence systems in libraries include the following:
1.Absence of technical know-how to use and run artificial intelligence systems among the library staff.
2. Deficiency of adequate funding to expand or procure artificial intelligence systems in libraries. Since the budgets for hardware and software are frequently low, there's always constrain to the kind of system the library can purchase or develop.

3. Huge system development and maintenance cost of artificial intelligence systems in libraries.

4. Inconsistent power supply to power artificial intelligence systems in libraries especially in developing countries.

5. Inherent complexities of expert/artificial intelligence systems' development.

6. Bounded natural language capabilities.

7. Intelligent systems lack that common base of human knowledge, severely constraining the types of functions that they can perform.

8. Level of effort and technical expertise needed to create artificial intelligence systems in libraries. The level and nature of effort that must be invested to develop an intelligent library system is directly proportional to the power and complexity of the system. This suggest that, the more intelligent the system is, the more the effort that must be fund therein. Presently, the desired skilled personnel with high cost development tools or techniques, needed to develop sophisticated intelligent system in libraries are lacking or costly, hence, the lack of such systems in libraries.

ADVANTAGES AND DISADVANTAGES OF ARTIFICIAL INTELLIGENCE (AI):

One of the major benefits of artificial intelligence is that its conclusion is based on data rather than emotions. Even after our best efforts, it is a known fact that human decisions are always biased in a negative way by our emotions.

- ### Advantages of Artificial Intelligence (AI)

  The advantages of artificial intelligence are incredible, what this field can offer us, is to evolve definitively and move on to the history of artificial robots. Below are the main advantages of Artificial Intelligence (AI).
  - Finished task quicker than a human,
  - Stressful and tough work completed easily,
  - Complex assignment done in limited period,
  - Multiple functions can do at a time,
  - Success ratio is great,
  - Less defects in task and error also,
  - More efficiency in short time,
  - Low space, less size,
  - Manipulation of long term and complex situations,
  - Discover unexplored things. i.e. outer space.

- ### Disadvantages of Artificial Intelligence (AI)

  Some of the main disadvantages of Artificial Intelligence (AI) in our regular lives are as follows.
  - Some time it can be misused leading to mass scale demolition,
  - Programme discrepancy sometime done opposite to the command,
  - Human jobs affected,
  - Unemployment case increase,
  - Quality of the AI is dependent upon programmer,
  - Absence of the human touch,
  - New generation becomes lazy,
  - Need a lot of time and money, and
  - Technological dominancy increased

Conclusion

In the future AI will sanction new ability to address library user's information Requirement. Libraries can use AI tools to give not just information but extensive intelligence offering Insight as A Service (IAAS). It is needed to recognize the advantages and disadvantages of Artificial Intelligence and machine learning for better user and its application in Libraries and Information Centres. AI is hitting the way information is processed and searched for and information professionals will be capable to use these exciting, updated technologies to increase their services and help users find and access particular information more easily and

quickly. Library and Information hubs will get benefits by the development of the efficient expert system for technical services as well as Information processing and management.

References:

Adejo,A. A. & Misau, A. Y. (2021).Application of artificial intelligence in academic libraries in Nigeria.Library philosophy and practice (ejournal) retrieved from http://digitalcommons.unl.edu/libphilprac

Asemi, A., & Asemi, A. (2018). Artificial intelligence (AI) application in library systems in Iran: A taxonomy study. *Library Philosophy and Practice (e-journal).* retrived from: http://digitalcommons.unl.edu/libphilprac/1840/

Corke, P. (2013). Robotics, vision and control: Fundamental algorithms in MATLAP. Berlin: Springer.

Ex Libris. (2019). How AI can enhance the value of research libraries. Retrieved from: www.libraryjournal.com/?detailStory=how-ai-can-enhancethe-value-of-research-libraries

Heath, N. (2018). What is AI? Everything you need to know about artificial intelligence. Retrieved from: www.zdnet.com/article/what-is-aieverything-you-need to-know-about-artificial-intelligence/

Khanzode, K.C.A. & Saroda, R. D. (2020). Advantages and disadvantages of artificial intelligence and machine learning : a literature review. *International journal of library and information science(IJLIS), 9(1*), 30-36

Kumar, P.S.G. (2004) Information Technology: Applications. New Delhi: BRPC. 401-425

Liu, H. (2016). Artificial Intelligence and Its Evolution. Beijing: Science Press,5-8.

Mogali, S. S. (2015). Artificial intelligence and it's applications in libraries. University of Agricultural Science. *Krishinagar Journal*, 3 (1), 1–11.

Nil's, J.Nilson. (1998) Artificial Intelligence. New Delhi: Harcourt , 280-281

Nwakunor, J. A (2021). Leveraging artificial intelligence to enhance brand management. *The Guardian Newspaper.*

Omame, I.M. & Alex-Nmecha, J. C. (2020). Artificial intelligence in libraries. Retrieved from https://www.researchgate.net/publication/338337072 DOI: 10.4018/978-1-7998-1116-9.ch008

Patrick Henry Winston. (1999) Artificial Intelligence, Addison Wesley, New Delhi:10-12.

Vijayakumar, S. & Sheshadri, K. (2019). Applications of Artificial Intelligence in Academic Libraries. *International journal of Computer Science and Engineering (e-journal)*, Available: DOI: 10.26438/ijcse/v7si16.136140.

www. aaai.Org /AITOPICS

www. sstramel.blogspot.in/2009/09/artificial-intelligence-advantages

www.wiki.org/Pattern Recognition

www.wikipedia.org/Robotics