The Intelligent Libraries: Imposing Artificial Intelligence to Enhance Activities and Services

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ABSTRACT-

We are in an advanced technological era of Artificial Intelligence which is influencing all the areas of global world. Also, the libraries are not unaffected by artificial intelligence. The present paper gives an overview of Artificial intelligence with its historical background and components. Moreover, the paper gives an emphasis on possible areas of libraries where the applications of this technology can be implemented and trying to compare traditional library with intelligent library. Further, the benefits of Artificial intelligence with some challenges and hurdles also discuss.

Keywords: Artificial Intelligence, Turing test, AI History, Libraries, AI in Libraries, Intelligent Library.

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INTRODUCTION

Can we think that a machine can act and behaves like human? Yes it is possible due to the fifth generation of computer and information technology. Computer technology goes beyond the various generations and thus now in the recent and final generation which is known as the generation of Artificial intelligence. Artificial intelligence is the most rapidly growing area of today's era which is affecting the world in many ways. In present scenario all the countries of world are giving concern to this generation which is the recent focus of research and development. Since there have been computers in our world, many people have been intrigued by the idea of building intelligent machines but now it is achievable. The study and creation of intelligent computers and software that can think, learn, gather information, communicate, manipulate, and perceive objects is known as artificial intelligence (Pannu, 2015).

Artificial Intelligence

Artificial intelligence is the combination of two words that is artificial and intelligence. Intelligence means the ability to learn, think and logical reasoning where as the artificial means the thing which is not natural and created by human being. So collectively the word artificial intelligence can be defined as creating the intelligence by human and then simulated into the machine. The Cambridge English dictionary defines artificial intelligence as

study of how to produce machines that have some of the qualities that the human mind has, such as the ability to understand language, recognize pictures, solve problems, and learn." (Cambridge dictionary)

In the view of Kok et al., (2009), It is the latest generation of computer technology where machines are so much smart that they can do the following:

- Machines that can perform like human.
- Machines that can take decisions by logical reasoning.
- Computers that can do the task as human do.
- System that can learn like humans.
- System that can provide possible solutions and suggestions for any problem.

It is clear from the above points that artificial intelligence is the replica of human. But now it is focus of consideration that these machines can replace humans? No it cannot be happen because these are the machines which human make, not the machines which make humans. These only can enhance the capabilities of humans and can works faster and smarter.

Turing Test

Alan Turing, the founder of modern computer conducted a test in 1950 to know about the intelligence of machine. The test can be carried out among three participants that is a machine, an interrogator and a human foil. Interrogator allows asking any question to both the participants. The roles of interrogator and foil are played by a variety of individuals, and if a sizable majority of the interrogators are unable to identify the computer apart from the human, the computer is regarded as an intelligent, thinking entity. After this in 1991 American philanthropist Hugh Loebner announced a contest that the first machine that will pass the Turing test will get an amount and an additional reward each year for further improvement. But unfortunately no machine passes the turing test. However, the introduction of ChatGPT in late 2022 rekindled the debate over whether or not the Turing test's criteria had been satisfied (Britannica, 2022).

History

Officially the history of Artificial intelligence can be traced back in 1950's when John McCarthy coined this term and at the same time he conducted a conference at Dartmouth College for debating machine learning (Banarjee, 2022). The continuous development of Artificial intelligence can be understood by the following figure:

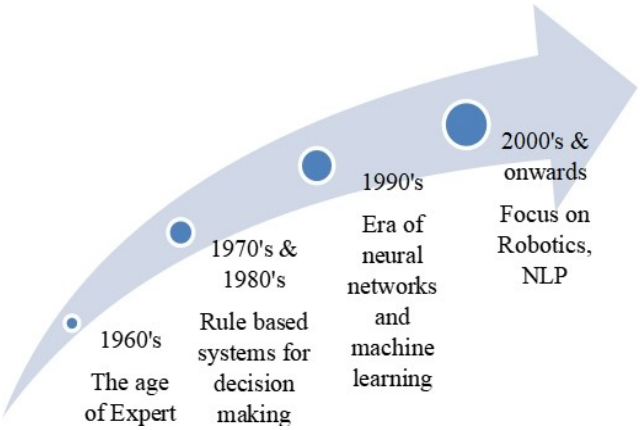

Figure 1: Ongoing development of AI with years

1950's: In 1951 Christopher Strachey at University of Oxford invented the very first Artificial Intelligence program which was known as Checker's (draught) program. The University of Manchester in England used the Ferranti Mark I computer to run Strachey's Checker (draughts) programme. Another achievement of machine learning took place in 1952 which was known as shopper and written by Anthony Oettinger at University of Cambridge (Copeland, 2019).

1960's: In the year 1960 programming language LISP (List Processor) for the AI established by John MacCarthy. Eliza and Parry, two of the most well-known early AI algorithms, produced a startling imitation of intelligent conversation in 1966. Joseph Weizenbaum of MIT's AI Laboratory created Eliza, a computer programme that mimicked a therapist. The fictional paranoid Parry was created by Stanford University psychiatrist Kenneth Colby (Copeland, 2019).

1970's: The MIT AI Laboratory's Marvin Minsky and Seymour Papert advocated in 1970 that similar AI research should concentrate on creating software capable of intelligent behaviour in smaller artificial

settings known as microworlds. The microworld concept had its first major success with Terry Winograd's 1972 was SHRDLU from MIT. A robot arm that moved above a flat platform covered in toy blocks was under the control of SHRDLU. Alain Colmerauer created the logic programming language PROLOG at the University of Aix-Marseille in France, where it was first used in 1973 (Copeland, 2022).

1980's: During this year the CYC project by Microelectronics and Computer Technology Corporation tested towards the symbolic Artificial Intelligence. The Australian Rodney Brooks developed the nouvelle AI methodology at the MIT AI Laboratory in the second half of the 1980's (Mihret, 2020).

1990's: AI experienced its greatest accomplishments in the 1990s and the early 21st century. In the skill sector, artificial intelligence is employed in a wide range of applications, including logistics, data mining, medical analysis, and many others. The increasing computational power of computers, the increased emphasis on solving precise subproblems, the development of new connections between AI and other fields working on related problems, and a renewed commitment by researchers to rigorous mathematical techniques and exact scientific standards were all factors that contributed to the success (Agarwal et al., 2013).

2000's: during 2000's, computer vision, robotics, and natural language processing took centre stage in AI research. As a result, innovative technology like self-driving cars and chatbots were created. With significant developments in fields like deep learning, reinforcement learning, and generative models, there has been a recent increase in interest in and investment in AI (Mihret, 2020).

Components or Scope of Artificial Intelligence

One of the most important branches of computer science is Artificial Intelligence which focused on the systems, having intelligence, capacity of reasoning and logic, which can understand human language and machines that can learn. Artificial Intelligence has many subareas which can be explained as follows:

Neural Networks

The goal of neural network research from the start was to simulate human mental processes on a few microchips. It implies to a sizable network of interconnected data sets that are constantly exchanging data with one another. Neurons, the computing units that make up neural networks, are linked together via weighted interconnections. An article on the potential function of neurons was written in 1943 by mathematician Walter Pitts and neurophysiologist Warren McCulloch. They created a basic artificial neural network using electrical circuits to simulate how neurons in the brain could function (Stanford University).

Expert System

Expert systems are knowledge-based systems that can execute some activities that would typically need human expertise. They are one of the first research areas in artificial intelligence (AI). In order to address specific domain problems, expert systems are used, and each stage of the reasoning process for a certain topic is determined by a human expert professionally. As a result, they act as a simulated advisory system for a certain problem domain (Tolun & Oztoprak, 2016). Beginning in 1965, geneticist Joshua Lederberg and artificial intelligence (AI) researcher Edward Feigenbaum of Stanford University in California created DENDRAL, the first expert system. A chemical analysis expert system was called DENDRAL. DENDRAL's performance was on equal with that of chemists who were skilled at this task (Copeland, 2019).

Machine Learning and Deep Learning

A subfield of Artificial Intelligence called machine learning is constantly developing and aims to mimic human intelligence by learning from the environment. Programmes that use machine learning recognise patterns in data and change their course of action accordingly. A machine learning algorithm is a computer procedure that makes use of input data to complete a task without being explicitly programmed. These algorithms

automatically adjust or adapt their design as a result of repetition (i.e., experience), they can be considered to be "soft coded" in the sense that they get better and better at doing what they are supposed to do (El Naqa & Murphy, 2015).

Natural Language Processing

The field of artificial intelligence known as "natural language processing" (NLP) studies ways to utilize computers to comprehend and modify natural language text or speech for beneficial purposes. Typically, a system or machine that analyses or synthesizes spoken or written language is referred to as a "natural language processing" system. These are the system which can understand the language of human and provide result accordingly (Joseph et al., 2016).

Robotics

Robotics is the study of the techniques and body of knowledge that can be utilised to build robots. Robotics is a subfield of AI that deals with the creation, design, production, and use of robots. These are made to perform various tasks instead of human or without the assistance of human. Robots are machine with the ability to detect changes in their surroundings and respond accordingly (Mihret, 2020). In 1961 the first industrial robot to perform tasks once carried out by people was named Unimate. The term "universal automation," which refers to the idea that this automated instrument might carry out a range of various activities, was how its creator, George Devol, came up with the name for his business, Unimation (The American Society of Mechanical Engineers).

Artificial Intelligence and Libraries

The techniques and applications of artificial intelligence have affected every area such as healthcare, medicine, industries, business, institutions etc. The library has also affected with this crux technology. Now libraries are becoming so smart than they are applying and utilizing this technology to stand their existence in this global era. Today libraries are using latest technology to provide better services to their users. Libraries are transferring from traditional to intelligent libraries by making use of brilliant equipment of latest age i.e., artificial intelligence. How AI applications can be used in different sections of libraries, it can be understood with the following points:

Practice of Artificial Intelligence in Acquisition of Library resources: One of the most important activities of libraries is building a good collection for users. The collection management in libraries is done according to the need of library. An automated system in library can manage the circulation data which can identify the active collection and can provide suggestions to library staff to the most approaching material by users (Banerjee, 2020).

Practice of Artificial Intelligence in Technical section: After acquiring library resources in library a computerized system can help in data floating and feeding of bibliographic information of book. Additionally AI system can categorize the library materials i.e., able to arrange that which book will go in which subject area and can assign tags to library resources. In this way classification is done automatically (Arora et al., 2020).

Practice of Artificial Intelligence in helping users: One of the applications of AI which is natural language processing system can assist users because NLP system can understand the human language. Users can interact with NLP system which can provide solutions, suggestions, and answers of user's query.

Practice of Artificial Intelligence in Indexing: Another area where expert systems are being developed is indexing. The process of indexing a book entails the identification of concepts, their verbalization into descriptions, and the choice and assignment of restricted vocabulary terms that conceptually correspond to the verbal descriptions. To increase indexing uniformity and quality, the intellectual components of indexing must be automated (Vijayakumar & Sheshadri, 2019).

Practice of Artificial Intelligence in storing and providing information: One more subfield of AI is pattern recognition which can be used in storing large amount of information, the problem of space in storing information and reading material can be overcome. Furthermore, the required information to

Table 1: Traditional library verses Intelligent library

Traditional Library	**Intelligent library with AI**
Storehouse of knowledge in physical format	Store information in smart form such as QR, cloud
Large space	Limited or virtual space
silent space for reading	Innovative space for learning
Traditional services by human	Smart services with robots, machines
Limited time period of libraries	Available continual
Different sections for different activity	Every activity connected through IoT
Identification of users through Physical card	Identity through pattern recognition
Human indexer and abstractor	Indexing and abstracting through computers and machines
Help desk and reference desk	Interaction with chatbots and NLP system
Searching book through Card cataloguing	OPAC linked with automated cataloguing system

user can be provided in the form of QR, it can give easy access of information to user. Also, the users can be identified through biometric and other pattern recognition tool in place of library cards.

Practice of AI in reference service: Reference section is said to be the heart among all the sections of library. Reference queries can be managed by using chatbots in library. Users can interact with chatbots and this can provide answers to their queries.

Practice of AI in abstracting service: AI can summaries and produce an abstract of text documents in addition to understanding the content itself. Consequently, it will be beneficial for offering abstract services. In this way abstract service can be provided in more compatible manner (Arora et al., 2020).

Intelligent Libraries versus Traditional Libraries

Though the libraries exist from ancient periods to till now but passed away from many levels to maintain their extant. If we compare the libraries of ancient periods and modern age than we will see the enormous changes in their functioning and services. Here are some points which are comparing the traditional libraries with intelligent libraries containing Artificial Intelligence:

IFLA Directions on Ai In Library

IFLA has stated some recommendations for libraries, organizations and associations for the use of Artificial Intelligence in libraries which are as follows:

- Parent organizations should provide proper infrastructure and technologies to libraries to make them enable to use AI technologies.
- Organizations should be ensured that any regulation of AI protects privacy or equity principles.
- Library associations should provide support to library professionals in understanding the effect of AI as well as its intersections with privacy and ethical principles.
- Library associations should encourage libraries to play a larger role in educational systems as they prepare for potential changes to the labor

market brought on by AI.

- Associations should engage with AI programmer to build applications and tools for libraries.
- Libraries should provide support to users in building digital literacy.
- Libraries should assist to users for lifelong learning.

Benefits of Using Artificial Intelligence in Library

The benefits of Artificial Intelligence in libraries can be as follows:

- More faster and quick operations of library.
- More efficient and consistent services to users.
- Available at all the time.
- Required less space for huge data and information.
- Can handle compound activities.
- Less stress on human.
- Able to do repetitive task accurately.
- Error free work.

Obstacles in Implementing Ai in Library

Although there are many applications and advantages of Artificial Intelligence in libraries yet Banerjee (2022) considered certain limitations with it. These are as follows:

- Lack of technological skills in library staff.
- Insufficient budget for libraries.
- Lack of man power training.
- Absence of human emotions.
- Quality of the AI is programmer-dependent.
- Complexity in managing the enormous AI.

CONCLUSION

It can be argued that, Artificial Intelligence is the emerging trend of today's world. Libraries can use the applications of AI in all the areas such as acquisition and retrieval of information, reference and information services, cataloguing and OPAC, abstracting and indexing and other library activities. The advantages of AI for libraries included huge data in less space, quick operations, quality services, flawless activities, but there are certain challenges in the implementation of tools and techniques of AI, that can be limited budget of libraries, need of skilled manpower and so on. Although, the development of AI in Indian libraries is at very slow pace but in future it can become the blessed boon for libraries. Due to the focus on more technological innovation progressively, future of libraries will be dependent on AI to make them more user-oriented place.

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