

Artificial Intelligence Emerging Trends in Libraries

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Abstract- Artificial intelligence (AI) is one of the emerging trends and applications of computing in libraries. It involves programming computers to do things, which if done by humans, would be said to require intelligence. The ultimate promise of artificial intelligence in libraries is to develop computer systems or machines that think, behave, and in fact rival human intelligence, and this clearly has major implications on librarian ship. The application of artificial intelligence in the library has become pervasive. They include expert systems for reference services, book reading and shelf-reading robots, virtual reality for immersive learning among others. Although the incorporation of artificial intelligence in libraries can be perceived to alienate librarians from their users, it will probably help libraries do more rather than taking over the jobs of librarians. It will enhance their services delivery. Artificial intelligence will greatly improve library operations and services and will upgrade and heighten the relevance of libraries in an ever-changing digital society.

Keywords: Justification for Applying Artificial Intelligence in Libraries, concepts of artificial intelligence (ai), foundations of artificial intelligence, application of artificial intelligence in libraries..

I. INTRODUCTION

Intelligence is the ability to think and learn facts and skills and also apply them when necessary. The prospect of developing computers or machines that perceive, learn, reason and behave like human being satisfactions many people. Humans are born with an innate ability to perceive, reason/think and act, which develops and improves over time as a result of so many factors. Intelligence in humans is measured by the Intelligence Quotient (IQ) obtained through series of aptitude test focusing on different aspects of intellectual functioning. Similarly, developing intelligent computers that perceive, think and behave like humans is the crux of Artificial Intelligence.

Intelligence in computers or machines depicts their ability to accomplish specific task in the presence of variability and monitor its environment and appropriately adjust its sections based on what it has sensed as pre requisites for intelligence. Intelligence

in machines is an anthropomorphism in that intelligence is defined by the criterion that the actions would appear intelligent if a person were to do it (McGraw-Hill Encyclopedia of Science and Technology, 2007). According to Ex Libris (2019),

intelligence in machines not only gives such devices the ability to learn but they are also configured to improve with use to perform functions better without being explicitly programmed because they are built to recognize and imbibe patterns efficiently on much higher scales than humans.

Artificial intelligence already touches many of our daily computing activities, most of the computer systems and mobile phones being developed today have artificial intelligence features and we have probably used them not knowing that they are intelligent machines. Examples of Artificial intelligence in computers are speech recognition, natural language processing, self-driving or autonomous cars, machine learning, deep learning and robotics. Artificial intelligence works based on perceptual recognition unlike human beings that operate on deep cognition. The power and advantage of Artificial intelligence lies in the fact that computers can recognize patterns efficiently at a scale and speed that human beings cannot.

The development of societies in recent times has been facilitated by the growing demand of access to information, and libraries are the prime source in providing this access.

The paradigm shift in the format and dynamics of information and knowledge as a result of the rapid advancement in computer technology and software applications especially artificial intelligence, have shifted libraries to adapt and use the commensurate supply of the same technologies. Unless libraries begin to explore the new technologies and innovate their information and services delivery, they may face obsolescence in this era.

Artificial intelligence is used in many areas such as medicine, military, business, education, gaming, libraries etc. The idea of creating artificial intelligence systems in libraries dates back to 1990. These intelligent library systems provide knowledge-based services to both the library staff and patrons (Asemi & Asemi, 2018).

Application of artificial intelligence in library system encompasses descriptive cataloguing, subject indexing, reference services, technical services, shelf reading, collection development, information retrieval system etc.

These have gone beyond Natural Language Processing (NLP), and knowledge-based services. With the advance mention artificial intelligence programming, creating a smart library is not only a possibility but a matter of time.

Corroborating this assertion, Corke (2013) reported that researchers and experts in the field of artificial intelligence are creating intelligent systems which can think and behave like librarians – library robots.

II. JUSTIFICATION FOR APPLYING ARTIFICIAL INTELLIGENCE IN LIBRARIES

Libraries have evolved structurally and content-wise through different eras: the ancient, medieval and modern era. In the ancient times, clay tablets and stones were used as media for transmitting information, through the medieval era of papyrus and parchments and the modern era of paper, microform and now the digital or electronic media (Gustavsson & Hedlund, 2011).

Libraries have acquired and maintained various forms of information resources throughout these eras so as to meet the information needs of its user communities. Similarly, a library was formally defined as a function of the physical building where books were kept for reading and other purposes. However, the definition of library today has gone beyond the physical building, it now centers on the collections and services offered, since virtual libraries have no physical walls and services could be rendered to users from remote locations. Consequently, in the effort to satisfy the dynamic information need so fits client else at the same time uphold its relevance in this ever-changing technological society, libraries have explored, incorporated and metamorphosed through different technological revolutions of clay tablets, stones, papyrus, parchments, paper, microforms, computers, Internet, virtual libraries, library 2.0, cloud computing etc.

Interestingly, artificial intelligence is the current technology that has evolved with huge prospects and promising applications in libraries. Hence, the need to also explore this tech, its pros and cons, in order to adequately maximize its rich benefits for innovative and optimal services delivery in libraries, as Corke (2013) asserted that artificial intelligent systems (robots) will be an important technology in this century. In a nutshell, the crux for applying artificial intelligent systems in libraries is the fact that they are less prone to errors unlike human beings; they can work for 24 hours/7 days without getting tired thereby freeing the librarians to do other jobs. Ultimately, since computers can operate efficiently at a scale and speed beyond human abilities, it will maximize speed, efficiency and effectiveness in processing library materials and enhance library services delivery at all levels.

This chapter will focus on the concepts, foundations, application and advancement in the field of artificial intelligence in libraries, application of robots, virtual, augmented and mixed realities in libraries, their promises, benefits and demerits they hold for future libraries.

III. CONCEPTS OF ARTIFICIAL INTELLIGENCE (AI)

The sound of the term artificial intelligence often conjures images of robots or computers that talk. Artificial intelligence is an aspect of computer science that focuses on how computers learn (Machine Learning), interpret information, vision: character recognition, picture analysis, 3D perception, and modeling of the function of the eye; furthermore, it encapsulates speech recognition, speech production, understanding and use of natural language (Natural Language Processing), and Expert System which continues to gain more attention.

Furthermore, artificial intelligence is the programming and development of computers to perform human required-intelligence task, such as speech recognition, decision-making, visual perception, language translation, talking and emotional feelings (Irizarry-Nones, Palepu & Wallace, 2017). According to Heath (2018), artificial intelligence is the technology that enables machines be to have the abilities to plan, learn, reason, solve problems, move, and be creative to some extent.

Three main focus of artificial intelligence is perception, reasoning and action. Reasoning is fundamental in intelligence gathering, it involves internal processes or programming logic/algorithm, that makes computers think of the best way of action before performing the action. Similarly, McGraw-Hill Encyclopedia of Science and Technology (2007) maintained that artificial intelligence is a subfield of computer science focused with understanding the nature of intelligence and constructing computer systems with ability to make intelligent behavior. Moreover, it is primarily concerned with representations of knowledge and heuristic methods of reasoning using common assumptions and rules of thumb. Other definitions of artificial intelligence include: creating machines with minds (Haugeland, 1985), the study of mental faculties through the use of computational models (Charniak & McDermott,

1985), the explanation and emulation of intelligent behavior in terms of computational processes (Schalkoff, 1990), the science and engineering of making intelligent machines and computer programs (John McCarthy).

Artificial intelligence is concerned with the concepts and methods of symbolic inferences and representation of knowledge by machines. It is aimed at performing intelligent tasks such as logical thinking, learning new abilities and adapting to new situations and problems (Nilson, 1998 cited in Shohana, 2016). In a nutshell, artificial intelligence is making computers or machines intelligent just like human beings, in order to make them find solutions to complex problems in human fashion.

Furthermore, Asemi and Asemi (2018) asserted that the field of artificial intelligence deals with the study and development to computer systems or machines that exhibit some forms of human intelligence, such as learning new concepts and tasks, reasoning and drawing useful conclusions about a specific task, natural language processing or perception and comprehension of visual scene etc. The intelligence of computers can be measured using the 'Turing test', developed by Alan Turing in 1950s.

Although there are controversies and objections over this method. Irizarry-Nones, Palepu & Wallace (2017) however asserted that the artificial intelligence of computers or machines could be strong or weak. A computer with strong artificial intelligence is able to think and make decisions like human beings, it is also capable of learning from experience and re-program me itself to improve on past mistakes like in the movies. Weak artificial intelligence computers cannot think, learn or re-program me themselves; rather, they are specifically designed to respond to specific situation.

IV. TRENDS IN THE FIELD OF ARTIFICIAL INTELLIGENCE (AI)

Advance mention the field of artificial intelligence included autonomous vehicles or self-driving cars,

navigation systems, human versus computer games, fraud detection, robotics and machine learning—the application of artificial intelligence which give computers or machines the ability to learn from data gathered of past experience, re-programme and improve on itself without human intention (Irizarry-Nones, Palepu & Wallace, 2017). Machine learning simply implies the computer teaching itself through iteration and past experiences with data. In addition, artificial intelligence encompasses the following general areas of research:

automatic programming, computer vision, intelligent control systems, expert systems, intelligent computer-assisted instruction, image processing, natural language processing, planning and decision support, robotics, and speech recognition (Asemi & Asemi, 2018). The application of artificial intelligence has gained usefulness in most fields of study and its thriving fast with the development of smart phones, smart homes, Internet of Things (IoT) and Internet of Vehicles (IoV).

Interestingly, Artificial Intelligence is being used to generate and evaluate content including Artistic and creative work (LeFebvre, 2017). Washington Post newspaper uses an AI system – Heliograf to cover elections while IBM's Watson machine learning suite provides assessments, analytics, real-time scores and captions for sports and cultural events (Melendez, 2016; Alpert, 2016).

1. According to Harris (2016),

AI has made a significant road in to education as IBM has come up with the Teacher Advisor an AI system which has been built to help teachers draw up personalized lesson plans by pointing them to best lessons in math and then customizing the lesson to fit their unique classroom needs. The Teacher Advisor has a data base of open educational math resources that provides over 2,000 free lessons, teaching plans and videos that can quickly search and bring up relevant answers (Fine, 2017).

Semantic Scholar uses machine learning and other AI systems to assist the academia search more effectively and efficiently through resources as more and more research get published (Metz, 2016). Artificial intelligence systems have been broadly classified from two different perspectives as outlined by Liu (2011):

2. The degree of their intelligence.

In this perspective, artificial intelligence systems are classified into: (1) reflex agents able to respond to stimulus from sensors such as heat sensor, light sensor, motion detection etc; (2) utility-based system; (3) goal-oriented systems; and (4) learning system such as machine learning systems that can teach computer programming.

3. The nature of their functionality

In this view, artificial intelligence systems can be categorized into (1) collaborative systems; (2) reactive systems; (3) Internet-based systems; and (4) mobile systems that can autonomously travel from one place to another to perform a task.

V. FOUNDATIONS OF ARTIFICIAL INTELLIGENCE

According to McGraw-Hill Encyclopedia of Science and Technology (2007), the four foundations of artificial intelligence are representation, search, reasoning and learning. These four foundations are basic requirements present in any artificial intelligence system.

Representations—This denotes the internal description of the problem or related knowledge of the intelligent system. Representation includes knowledge-based of the system to identify problems and the architecture on which it can be manipulated. Representation of an expert system for diagnosis would be the description and symptoms of a person with a disease. For a moving robot, it could include the symbolic 3D description of a room.

Search. This is one important aspect of artificial intelligence systems that is used for problem-

solving methodology. In some cases, a heuristic search is used to modify itself in response to the problem at hand. Example of search could be a data bases each of previous problems and solutions for the closest match to the current problem.

Reasoning. This is designed to turn knowledge into solutions to problems. This is the crux of the intelligence of the system. Reasoning could be deductive and inductive reasoning in which problems knowledge is used to deduce set of possible solutions, or used to build a hypothesis that best explains the existing

Knowledge and possibly the current problem. Example of reasoning include expert systems, where the solutions to problems are reasoned based on some set of rules or knowledge-based developed by human expertise to identify the rules of the problems.

Learning. The learning feature of intelligent systems makes them adapt and gather intelligence by learning the history or knowledge of the system. Learning covers the aspect of reconfiguring there presentation, adjusting the search to Be heuristic, updating the knowledge and augmenting the reasoning.

Some of the most common learning method soused in artificial intelligence systems are statistical learning (using the number of the different types of historical events to base future actions or to develop inductively pothouses, typically as summing that events follow some known distribution of occurrence), neural networks (networks are trained on existing knowledge and then applied to the problem, and in tempter the value of the outcome as solution), reinforcement learning (actions taken by an artificial intelligent system are rewarded or penalized based on their ability to solve the problem more or less accurately). These falls within the subject of machine learning and deep learning.

VI. APPLICATION OF ARTIFICIAL INTELLIGENCE IN LIBRARIES

Artificial Intelligence matters to libraries because it be used for organizing and making available large collection so information (ALA,2019). According to Sridevi and Shanmugam (2017), artificial intelligence is the modern technology which is sedate manages the digital library.

The ultimate promise of artificial intelligence is to develop computer systems or machines that think, behave and in fact rival human intelligence, and this clearly has major implications on librarianship.

Artificial intelligence is not just an intelligent system or software program, it is a biologically motivated technology used to replicate human ways of perceiving and processing information (Sridevi & Shanmugam, 2017). Intelligent library automation systems rely on artificial intelligence technologies to provide knowledge-based services to library clientele and staff.

Artificial intelligence in libraries should not be misconstrued with library automation. While the later implies the degree of mechanization to routine library operations, the former goes beyond just automating library activities, and create intelligent rational systems that behave and act like librarians and require little or no human intervention.

Artificial intelligent systems can replicate and thus replace a human being in the library, although, Huang, Kurniawan and Ho (2015) believed that this invention will never replace librarians, but will center on menial and time-consuming library operations such as shelf reading and leave the librarian stoengage with the patrons. Corroborating this assertion, Murphy (2015).

VII. CONCLUSION:

If libraries are to thrive in the new knowledge economy, they must innovate their services and re-examine their practices, a veritable means to achieve this is the application of artificial

intelligence in libraries. Libraries will greatly benefit by the development of artificial intelligence 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, artificial intelligence will greatly enhance library operations and services delivery, and will upload there evince of libraries in a never changing digital society. In If libraries are to thrive in the new knowledge economy, they must innovate their services and re-examine their practices, a veritable means to achieve this is the application of artificial intelligence in libraries.

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