University of Mosul

Faculty of Arts

Department of Information and Knowledge Technologies

Course Name: Information Technology

Instructor's name: Asmaa Ghanem Ramadan

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Artificial Intelligence in Libraries

Stage 3

the introduction

Recent digital and industrial revolutions have fostered a culture of innovation and technological development, leading to the emergence of numerous developments and breakthroughs in the field of artificial intelligence (AI). Artificial intelligence is a set of algorithms and technologies that mimic the functions of the human mind, enabling it to analyze data, link information, make decisions, and carry out tasks without the need for human supervision.

Artificial intelligence has seen tremendous growth over the past few decades, becoming an innovative and disruptive technology in many industries and areas of life. It has countless applications, from healthcare to agriculture, from engineering to finance, and even gaming and transportation.

In short, artificial intelligence has become an indispensable part of the current technological revolution, playing a fundamental role in achieving progress and innovation in many different fields and in libraries.

Artificial intelligence has revolutionized libraries by automating tasks, enhancing search capabilities, and improving user experiences. It can accelerate content indexing, provide personalized recommendations, and increase the speed of access to information. AI tools such as machine learning algorithms help categorize and organize massive amounts of data, making it easier for users to find relevant resources. Additionally, AI systems can handle complex tasks, allowing human experts to focus on more strategic activities.

In general, artificial intelligence is shaping libraries, making them more efficient, easier to use, and more adaptable to the digital age.

- **What is artificial intelligence?**?

Artificial intelligence (AI) refers to the field of computer science concerned with developing systems capable of solving cognitive problems associated with human intelligence, such as learning, creativity, and image recognition. AI can be of two types: generative AI, which can generate new content such as images and videos, and artificial general intelligence (AGI), which aims to develop systems with autonomous control and the ability to learn new skills. AI faces challenges such as data governance and privacy and is a vital technology that contributes to improving efficiency, providing new revenue opportunities, and enhancing customer loyalty.

- **History of Artificial Intelligence**

Artificial intelligence was first used in the 1950s, and was launched by the British mathematician Alan Turing through the concept of the “Turing Test,” which is used to determine whether a machine can behave in a way similar to intelligent human behavior.

Conferences in the field of artificial intelligence at Dartmouth and Hanover in 1959 by McCarthy, who was the first to use the term artificial intelligence (AI) to attract attention. Research in the field of artificial intelligence began outside the field of computer science and automation, and a specific definition was given to it: programming intelligent machines. Then, in 1972, it was linked again to intelligent computer programs. In the period extending from 1955 to 1971, artificial intelligence techniques developed significantly, and new techniques emerged, such as expert systems, fuzzy logic, and deep learning. In 1952, the chess program “Deep Blue” achieved a victory over world chess champion “Gary Kasparov,” which sparked great interest in the capabilities of artificial intelligence. This historical development has affected the field of libraries and information centers in the past ten years, and in the period extending from 1971 until now, it has witnessed The amazing development in artificial intelligence has become popular, thanks to technological advancements, the enormous capacity to process data, and its widespread availability. The development of deep learning has also influenced artificial neural networks. With this technology, artificial intelligence has the ability to analyze images, and even complete missing information, such as license plate numbers, as well as to recognize voices and faces, perform automatic translation of voice and text, images, games, robots, and autonomous driving, as well as personal assistant systems that have been used in medicine, commerce, marketing, finance, and libraries. It is one of the models of open artificial intelligence (OPEN AI), and its latest model is 4-GPT, which is used in intelligent conversations, translation, and automatic writing.

- **Areas dedicated to artificial intelligence**

Artificial intelligence spans a wide range of fields and applications. The fields devoted to artificial intelligence can be divided into several main categories:

- A. Machine Learning: Machine learning applications involve using data to train systems to make decisions and analyze models.
- B. Big Data Analysis: Focuses on using artificial intelligence to analyze and understand big data to extract patterns and trends.
- C. Artificial General Intelligence: aims to develop intelligent systems capable of performing a diverse range of tasks comprehensively.
- d. Interactive artificial intelligence: focuses on developing interactive systems capable of interacting with users in an intelligent manner.
- C. Autonomous artificial intelligence: It is related to developing systems capable of learning and improving themselves, without human intervention.
- H. Medical artificial intelligence: used to analyze health data, improve the quality of health care, and develop innovative health applications.
- X. Educational artificial intelligence: aims to improve educational processes and develop intelligent educational systems.

These areas represent some of the most common applications of artificial intelligence, and reflect the diversity of uses of this modern technology across various sectors and industries.

- **The impact of artificial intelligence in libraries**

Artificial intelligence has revolutionized how office services are provided and how user experiences are improved. Here are some points that further illustrate this impact:

- A. Saving time and effort: By using artificial intelligence technologies, libraries can automate many routine processes, such as book classification, cataloging, and identifying digital resources. This saves library staff time and effort, allowing efforts to be directed toward more strategic activities, such as collection development and consulting services.
- b. Improving the user experience: By providing personalized recommendations and customized search results, users can find the resources they need faster and easier, which increases user satisfaction and enhances their library experience.
- C. Improved resource management: By using machine learning algorithms, libraries can organize and categorize resources more effectively, based on users' current interests and needs.
- d. Enhancing scientific research: Artificial intelligence can be used to analyze big data and generate new insights, facilitating the scientific research process and helping to discover new relationships and trends in knowledge.
- C. Providing advanced services: Artificial intelligence can enable libraries to provide advanced services, such as automated query response, text analysis, data discovery, and virtual assistance.

Overall, the integration of AI technologies and library services represents an important shift toward more efficient libraries and better service to users in the digital age.

- **Artificial intelligence and its applications in libraries**

Programs used in libraries with artificial intelligence technologies include:

- A. Smart search tools: These tools are used to index and organize materials accurately and smoothly, making it easier for users to find information.
- b. Personalized book recommendation programs: Analyze users' behavior and provide personalized recommendations to broaden their horizons and enhance their interaction with the library.
- C. Virtual support programs and virtual inquiry services: provide immediate support to users, by answering their inquiries and guiding them within the system.

- d. Material preservation and protection software: used to analyze images of books and other materials, identify signs of deterioration, and take preventive measures.
- C. Data analysis and process improvement programs: They help analyze data effectively and improve routine processes, which contributes to improving the efficiency of library management.

These programs play a vital role in improving library services and enhancing user experience by employing modern artificial intelligence technologies. Some of the helpful tools we mention are: Scite, Botsonic, Quillbot, Grammarly, Copy.ai, Dante, Research Rabbit, Puzzle Labs, MEM, and Fable Fiesta.

- **Programs used in libraries with artificial intelligence technologies**

There are programs for managing e-books, such as eXtreme Books Manager, Alfa eBook Manager, Epubor, Calibre, and Adobe Digital Editions. There is also a comprehensive tool for managing literature and improving academic performance, Mendeley. It is worth noting that there are office organization tools that help organize the office and increase productivity, such as shelves, cabinets, boxes, and containers.

Augmented Reality (AR) is one of the most important smart technologies for the future of libraries, especially academic ones. These advanced programs and technologies play a vital role in organizing and managing electronic libraries, through artificial intelligence technologies.

- **Comparison of search engines used in libraries between the past and the present (artificial intelligence)**

Search engines in libraries have evolved significantly from the past to the present, making search, communication, and storage processes more efficient, easier, and integrated with modern technology. Examples of old search engines include Google, Yahoo, Yandex, and Bing. Now, artificial intelligence engines such as Gemini, ChatGPT, and Perplexity have emerged.

I will explain how search worked in the past, and how it has evolved in the search and retrieval approach, and I will take the example of Google and Gemini:

Recently: Gemini

AI-based research

Old: Google

Algorithmic search

- Deep learning: Uses deep learning models to understand context and semantics, providing more accurate and detailed search results.

- Contextual awareness: Improved ability to understand the context of inquiries, especially in complex or ambiguous questions.

- PageRank: Google's basic algorithm that ranks web pages based on their importance, which is determined by the number and quality of links leading to them.

- Advanced algorithms improve understanding of search queries and context, providing accurate search results. Hummingbird, RankBrain, BERT:

- Novelty Algorithms: Google focuses on new and updated content to ensure fresh search results.

Knowledge Map Integration

- Semantic search: Uses a knowledge graph to understand relationships between entities, providing more meaningful and coherent search results.

- Direct Answers: The ability to provide direct answers to queries based on the knowledge schema, reducing the need to click multiple links.

Indexing

Crawling and Indexing: Googlebot crawls the web, indexing pages and their content to ensure comprehensive search coverage.

Advanced customization

- Behavioral Analysis: More advanced tracking and analysis of user behavior to further customize search results based on preferences and past interactions.

- Contextual Adaptation: Dynamically adapt search results based on the current context, such as the time of day, user activity, or device being used.

Understanding user intent

- Query Understanding: Google's algorithms analyze user queries to understand intent using Natural Language Processing (NLP) to interpret the meaning of words.

- Personalization: Customize search results based on user history, location, or preferences.

Enhanced content quality standards

- User feedback cycles: Continuously incorporating user feedback to improve search results.

- Advanced spam filtering: more powerful mechanisms

Content quality

- Expertise, Reliability, Trust: EAT content with an emphasis on trusted sources.

Google Quality Rating

- Spam detection: algorithms are used

To detect spam and filter out low-quality content.

Manual reviews to remove low-quality or misleading content.

Multimedia search:

- Multimedia integration: Seamless integration of text, images, video, and voice search capabilities, providing a richer and more diverse search experience.
- Cross-platform compatibility: Ensuring a consistent search experience across different devices and platforms.

Comprehensive search

- Combined results: Combine different types of content (web pages, news, images, videos, and local listings) into a single search results page.

Main differences

In terms of technology, Google relies heavily on traditional algorithmic approaches combined with machine learning, while Gemini may rely on more advanced AI and deep learning techniques. In terms of understanding user intent, both seek this; Gemini may provide a deeper understanding of context, thanks to more advanced intelligent models. In terms of personalization and context, Gemini is more advanced and produces context-aware search results compared to what Google currently offers. If we were to compare the quality of search results, both focus on quality, but Gemini may utilize more sophisticated user feedback systems and spam filtering.

Finally, in terms of multimedia search and cross-platform compatibility, Gemini provides better integration of different media types and ensures consistent performance across different devices, improving the overall user experience.

In short, Google is a well-established search engine that relies on powerful algorithmic search capabilities, and Gemini represents a more futuristic, AI-driven approach that could offer a deeper understanding of context, advanced personalization, and improved integration of diverse types of content.

- **Ethics of Artificial Intelligence in Libraries**

“In November 2017, UNESCO achieved consensus among Member States to adopt the first global ethical framework for the use of artificial intelligence. Today, we are taking another major step by obtaining the same commitment from global technology companies. I call on all technology stakeholders to follow the example of these first eight companies. This public-private alliance is essential to creating AI that works for the public good.” This was the basis for the second AI Cultural Forum, and UNESCO has, for the first time, committed companies to adopting human rights principles when manufacturing, selling, developing, purchasing, and using AI software. Among the most important provisions:

This agreement identifies potential harms resulting from the development of artificial intelligence, adheres to safety standards, prevents or mitigates any harmful effects, and addresses them in accordance with local standards. Currently, fifty countries have committed to this first-of-its-kind technical framework, developed under UNESCO's supervision. With UNESCO's tireless efforts to achieve progress with the private sector, it has resulted in the establishment of the Business Council for Ethics in Artificial Intelligence, co-chaired by Microsoft and Telefónica.

(Telephone)

AI ethics represent a set of rules and principles aimed at achieving fairness, accountability, transparency, and explainability in AI applications. Government agencies, individuals, and other organizations can benefit from these ethics as a guide for the responsible use of AI technologies, while respecting the rights of citizens and local communities. These rules promote the ethical use of AI and ensure its application in a manner that preserves moral and social values. However, despite the many benefits of these modern technologies in libraries and information centers, we cannot ignore their ethical repercussions in many areas and circumstances. The most important of these are the reduction of the workforce, the loss of human contact between the beneficiary and the librarians, the lack of exchange of expertise and knowledge in libraries, and the complete reliance on machines. However, these machines can sometimes escape their programming through hacking or viruses, disobeying orders and acting aggressively towards the beneficiary. Malware can also change the data assigned to a beneficiary listed in the library's regulations, to cancel their subscription or modify its expiration date. This violates the beneficiary's privacy and security.

It is important to note here the issues of fairness and bias, as the programmer imposes restrictions and preferences that suit the community, and this may conceal facts and diversity that the beneficiary should be aware of, such as the Gaza issue in American society. Certainly, there is a blocking and reduction of options to suit the ethnic, social, and sexual beliefs of a particular community, as well as technological dependency and the inability of some libraries and their need for these expensive smart software that constitutes a financial burden on their existence, especially small neighborhood libraries and school libraries.

Conclusion

Artificial intelligence technologies have revolutionized many sectors, including libraries, helping to improve the quality of work and achieve results in a short time in diverse fields such as classification, indexing, handling big data, modern communication technologies, advanced learning, and automated assistance. These technologies have also enabled the development of advanced smart systems that meet the needs of users, within artificial intelligence algorithms that provide assistance and support. They can also answer questions, assist in research, and provide recommendations and suggestions.

AI algorithms are also used to analyze large amounts of data in libraries to identify patterns and trends in patron behavior and preferences. This analysis can be used to customize services and provide different groups with appropriate library collections. Libraries are also equipped with AI-powered chatbots to provide quick access to information. All of this impacts the user experience, making libraries even more important and valuable in the age of digital technology. Therefore, the integration of AI into libraries has led to improved efficiency, availability, and user-centric orientation.