ORIGINAL ARTICLE

Generative Artificial Intelligence and Its Implications in Library and Information Centres

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ABSTRACT

Over the years it is seen that advances in information and communication technologies have changed the work of libraries and information centres. Artificial Intelligence (AI) that has emerged as one of the greatest inventions of information & communication technology has given great momentum to library services because it has the potential to revolutionize the libraries and information centres by augmenting standard library operations and services. Due to its advantages, the current trends in library and information centres indicate that libraries are depending more and more on AI to help library workers to carry out their responsibilities. Moreover, a new and advanced version of AI has emerged that is known as Generative AI. This article discusses about the evolution of AI and then focuses on Generative AI and its implications in library and information centres.

KEY WORDS

• Artificial Intelligence • Generative Artificial Intelligence • Traditional Artificial Intelligence • AI Implications

INTRODUCTION

It is worthy to mention that while AI applications have become popular in recent decades, the technology has a fascinating history, but it was not acknowledged as such until the 1950s. According to Kuipers & Prasad (2022), certain mathematicians and natural philosophers began to consider automating the mental process as early as in the 17th century. Since then, these ideas have matured slowly and are considered highly disputed. However, with the introduction of computers in the previous century, more people began to look into the potential of automation thinking. Since then, the AI industry has had its ups and downs, but as recently as the turn of the century, there has been a big surge in interest due to the availability of a massive amount of metadata.

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Modern AI began in the 1950s with the goal of solving complicated mathematical problems and developing 'thinking robots'. It was John McCarthy, a Stanford Professor who in 1955 defined AI as "the science and engineering of making intelligent machines" (https://hai.stanford.edu/sites/default/files/2020-09/AI-Definitions-HAI.pdf).

Lazzeri (2023) adds that from the outset, there were two competing approaches. One used formal rules to manipulate symbols, a logic-based approach not at all based on biology. This became known as **'good old-fashioned artificial intelligence',** the GOFAI. The other camp took inspiration from how the brain works and created **'artificial neural networks'** loosely inspired by our brains. These still had to be trained using certain procedures to solve the problems.

What is Artificial Intelligence: Definitions

Artificial intelligence is variously defined as given below:

Winston (1999) has defined AI as "the branch of computer science that focuses on comprehending the essence of intelligence and building computer systems that can perform intelligence-related tasks".

According to Nilson (1998) AI 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 adopting to new situations and problems".

While Irizarry-Nones, Palepu & Wallace (2017) have defined AI as "the development of computers and programming to carry out the tasks requiring human intellect, like decision-making, speech recognition, visual perception, language translation, speaking, and emotional feelings."

Heath (2018) is of the opinion that "it is the technology that enables machines be to have the abilities to plan, learn, reason, solve problems, move, and be creative to some extent".

So, in brief, artificial intelligence can be defined as the making of computers or machines intelligent just like human beings, in order to make them find solutions to complex problems in human fashion.

A survey made by McKinsey in 2022 shows the popularity of AI adoption that has more than doubled over the past five years, and investment in AI is increasing rapidly (https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-generative-ai). Artificial intelligence is being used in libraries worldwide along with other uses. The libraries throughout the world are implementing artificial intelligence to overcome two difficulties (Rani & Dhiman, 2023) AI-powered chatbots are demonstrating promise in facilitating speedy and highly tailored information requests for users who are accustomed to text messaging and 24-hour service, and they are also building programming that teaches people how to use AI tools safely and appropriately, as well as introducing them to new technologies.

Traditional Artificial Intelligence

Traditional AI that is often known as Narrow or Weak AI, focuses on performing a specific task intelligently. These are the systems designed to respond to a particular set of inputs. These systems have the capability to learn from data and make decisions or predictions based on that data. These are used for analysing historical data and making future numeric predictions.

Generative Artificial Intelligence

Generative AI, while on the other hand, can be thought of as the next generation of artificial intelligence. It is a form of AI that can create something new. It can produce original ideas or information without having to be specifically programmed to do so. AI functions by analysing current data with algorithms and producing new content in response to that analysis. 'Deep learning' or 'machine learning' are the terms frequentlyused to describe this process.

Therefore, the term "Generative AI" may be described as deep learning models that, by given raw data, such as the entirety of Wikipedia or the collection of works by Rembrandt, may "learn" to produce outputs that are statistically likely to occur when prompted (https://research.ibm.com/blog/what-is-generative-AI). In statistics, generative models have long been used to evaluate numerical data. However, the development of deep learning made it possible to extend them to images, speech, and other complex data types.
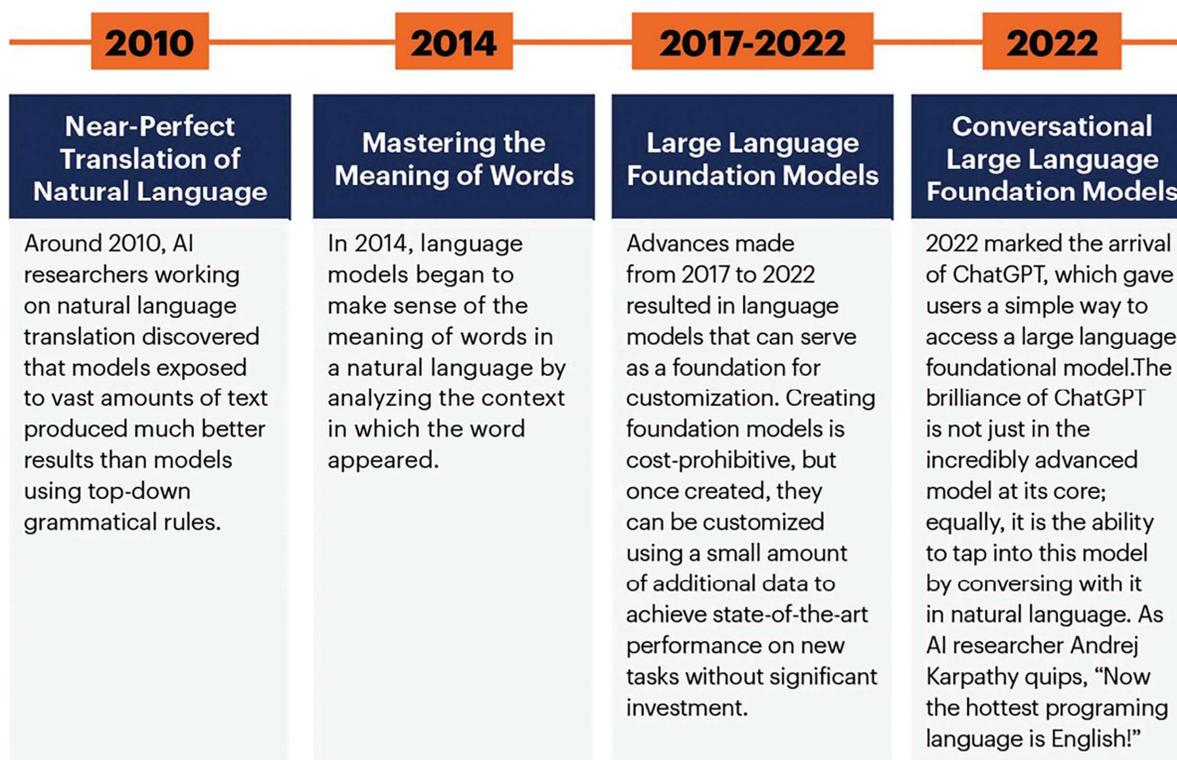
2010	2014	2017-2022	2022
Near-Perfect Translation of Natural Language	**Mastering the Meaning of Words**	**Large Language Foundation Models**	**Conversational Large Language Foundation Models**
Around 2010, AI researchers working on natural language translation discovered that models exposed to vast amounts of text produced much better results than models using top-down grammatical rules.	In 2014, language models began to make sense of the meaning of words in a natural language by analyzing the context in which the word appeared.	Advances made from 2017 to 2022 resulted in language models that can serve as a foundation for customization. Creating foundation models is cost-prohibitive, but once created, they can be customized using a small amount of additional data to achieve state-of-the-art performance on new tasks without significant investment.	2022 marked the arrival of ChatGPT, which gave users a simple way to access a large language foundational model.The brilliance of ChatGPT is not just in the incredibly advanced model at its core; equally, it is the ability to tap into this model by conversing with it in natural language. As AI researcher Andrej Karpathy quips, "Now the hottest programing language is English!"

Figure 1: Journey of Generative Artificial Intelligence

Figure 1 shows the development of the journey of Generative AI during 2010 to 2022 (https://www.gartner.com/en/topics/generative-ai) very well.

TraditionalAI Versus Generative AI

Both Traditional AI as well as the Generative AI are slightly different from each other rather Generative AI is supposed to be the higher version of Traditional AI. However, Marr (2023) has differentiated both of them as under:

Generative AI and Traditional AI can be differentiated primarily on the basis of their capabilities and applications. Generative AI goes one step further by producing new data that is similar to its training data, while Traditional AI systems are generally employed to analyse data and make predictions. Or put it another way, Generative AI is better at creating patterns than Traditional AI is at recognizing them. While Generative AI uses the same data to produce something completely different, Traditional AI may evaluate data and report back to you what it finds.

The brainstorming process can be speed up with the aid of Generative AI, which can produce innumerable prototypes in a fraction of minutes. It can assist in writing screenplays, making deepfakes, and even making new songs in the entertainment industry. It may write reports or articles for a newspaper. Any area where creativity and innovation are essential could undergo a transformation using to Generative AI.

However, Traditional AI still performs admirably in applications that are task specific. Predictive analytics, recommendation engines, chatbots, and many more applications are powered by it. It powers the majority of the AI applications in use today that maximize productivity across a range of industries.

How Generative Artificial Intelligence (GAI) Works?

Generative AI models use neural networks to identify the patterns and structures within existing data to generate new and original content (https://www.nvidia.com/en-us/glossary /generative-ai/). One of the breakthroughs with Generative AI models are the ability to leverage different learning approaches, including unsupervised or semi-supervised learning for training.

The foundation models or large AI models that drive Generative AI are capable of multitasking and doing custom tasks like classification, Q&A, summarization, and more. Furthermore, foundation models can be tailored for specific use cases with very little sample data and very little training.

GPT-3 and Stable Diffusion are the examples of foundation models include, which allow users to leverage the power of language. For example, popular applications like ChatGPT, which draws from GPT-3, allow users to generate an essay based on a short text request.

Table 1: Models and Products of GAI

Company	Models	Products (these products might not have used exactly the samemodel as indicated in 2nd column)
Google	BERT, Gemini, LaMDA, PaLM	Google Search, Google Assistant, Google Translate, YouTube recommendations, Gemini (Chat form)
OpenAI	GPT-3, DALL-E, Whisper, Sora	ChatGPT, Codex, DALL-E image generator
Amazon	*(Not Public)*	Amazon Alexa, AWS AI services, Amazon Rekognition
Microsoft	GPT-3, DALL-E 2, CodeBERT	Bing Chat (copilot now), Microsoft Translator, Azure AI services, GitHub Copilot, Windows Copilot
Anthropic	Claude 3 Haiku, Claude 3 Sonnet, Claude 3 Opus	Claude AI assistant
Nvidia	GauGAN, StyleGAN	AI model training, AI-powered image generation
Meta (Facebook)	Llama 3, Llama 2	Facebook AI Research (FAIR) projects
Apple	OpenELM	Siri, Face ID, camera features, QuickType keyboard
IBM	Watson AI	Watson Assistant, Watson Discovery, Watson OpenScale

However, Generative AI does not require knowledge of or entry into code, rather it now generates the content most typically in response to natural language inquiries. Nevertheless, enterprise use cases for Generative AI are diverse and include advances in the design of materials science and development of the drugs and chips(https://www.gartner.com/en/topics/generative-ai).

Features of Generative AI

Generative AI possesses several features that make it an invaluable tool. These features include (https://vegavid.com/blog/difference-between-openai-and-generative-ai/):

- **Originality and Novelty:** It means AI is capable of creating creative and novel stuff that goes beyond what is possible for humans to imagine.

- **Personalization:** It makes it possible for libraries to deliver each user experiences and recommendations that are specifically catered to them, increasing user happiness and engagement.

- **Scalability:** Libraries can manage enormous volumes of data well since Generative AI can produce big volumes of information quickly.

- **Collaboration:** By combining data from several sources to produce a logical final product, this technology can help with collaborative content development.

- **Learning from Data:** In order to train and identify patterns, Generative AI algorithms need access to huge datasets. They are able to generate outputs that are coherent and understandable because they are able to identify underlying patterns, relationships, and trends in the data.

- **Real-Time Generation:** It means the Generative AI algorithms are able to produce material in real-time due to advances in computing power. This feature is very helpful for user-driven experiences and interactive apps in libraries.

Functions of Generative AI

Various functions may be assigned or performed using Generative AI. However, more broadly a Generative artificial intelligence may be used to carry out the following functions (https://vegavid.com/blog/difference-between-openai-and-generative-ai/).

- **Text Generation:** Generative AI can create human-quality text material, from writing realistic dialogue for chatbots to creating imaginative literature.

- **Image Creation:** Generative AI is capable of producing completely original photorealistic photos as well as fresh images that imitate established artistic trends.

- **Code Generation:** Generative AI is capable of automating the writing of code by producing functioning code snippets that meet predetermined criteria.

- **Music Composition:** Generative AI has the capacity to write creative music in a variety of genres, which will promote innovation in the sector.

Future of Generative AI

AI is developing with the passage of time fastly. It is expected that over the next five years, organizations should expect to see a growing impact from generative AI. Gartner Company, n.d.) forecasts that (https://www.gartner.com/en/topics/generative-ai):

- From less than 5% in 2020 to 40% in 2024, enterprise applications will include embedded conversational AI.

- Up from 5% in 2021 to 30% of businesses by 2025, AI will be used to enhance development and testing processes.

- Regenerative design AI is expected to automate 60% of the design work for new websites and mobile apps by 2026.

- More than 100 million people will use robocolleagues by 2026 to help them with their jobs.

- Almost 15% of new applications by 2027 will be produced automatically by AI without human input.

However, today, none of this is taking place at all.

Implications of Generative AI in Libraries and Information Centres

A future is brimming with various possibilities in Generative AI that has the potential to revolutionize various industries and other areas. Likewise, the Generative AI in libraries has a bright future ahead of it. The following technological advancements are expected to be taken in libraries and information centres (Sultan, 2023).

- Generative AI can promote enhanced precision and quality by make use of upcoming advancements in Generative

AI which probably are going to concentrate on making generated content more precise and high-quality so that it meets user expectations.

- If human expertise is merged with Generative AI, it can result in cooperative efforts where human judgment and creativity enhance AI-driven content creation.

- Libraries will be able to provide highly personalized and immersive experiences thanks to Generative AI, which will increase user happiness and engagement.

- Generative AI can also help libraries by offering content in several languages to become more inclusive and accessible to people with impairments.

- Generative AI will likely focus on enhancing the quality and accuracy of generated content, ensuring it aligns with users' expectations.

However, in order to ensure accountability, transparency, and justice, the research community and libraries must address a few ethical issues, such as:

- Who is responsible for enforcing compliances and consequences for irresponsible uses?

- What will happen if something goes wrong, who will be held accountable, how will justice be served, and how will transparency and accountability be maintained?

- How can it be ensured that creators and owners of intellectual property preserve control and are fairly compensated?

Besides, who will oversee the seamless operation of all aspects throughout its life cycle, and how will they go about doing so? For instance, are boards required to have an AI ethics lead? in the field of Generative Artificial Intelligence(https://www.gartner.com/en/topics/ generative-ai). So librarians and other staff should ensure the transparent and ethical use of AI GAI technologies, safeguarding user privacy and upholding ethical principles as suggested by Suhas & Narayanrao (2014).

CONCLUSION

Thus, it is seen that the libraries can offer advantages including improved customer

interaction, tracked customer information, analytics, improved lead creation, and cost savings by using AI chatbots more and more. However, it is evident that due to the possibility of erroneous inquiry responses, limited comprehension, and technological reliance, chatbots are a complementing tool rather than a replacement for human librarians. Inspite, the librarians may support AI integration and have a significant role in teaching consumers about AI. Librarians can also plan seminars and workshops to introduce AI principles and resources to teachers. By giving faculty members the required information and tools, they can empower them to comfortably incorporate technology into their pedagogical approaches. Safeguards can also be put in place by librarians to guarantee user security. They may promote AI, to assist educators and learners in using it responsibly, and investigate the precise ways in which this technology can improve student learning. AI is here to stay: its ability to provide access to all kinds of educational resources, including the Generative AI technologies currently under development, is already vested in librarians (Boedigheimer, 2024). However, the library as it exists today will drastically change due to artificial intelligence (Omame & Alex-Nmecha, 2020). But artificial intelligence would not lessen the human aspect in libraries. Nevertheless, to guarantee the appropriate and equitable application of AI in library settings, thorough consideration of the ethical implications, staff training, and accessibility are required (Dhiman & Kaushik, 2023).

Arlitsch & Newell (2017) are of the opinion that despite the increasing adoption of AI in libraries and the opportunities it presents, the trend is still in its nascent stages. Though a few libraries have so far implemented AI due to various considerations, such as the availability of facilities, budgetary constraints, human resources, and policy-related issues, all of which determine a library's capacity to incorporate AI but Boedigheimer (2024) make sure that the technology's future promises to have a significant impact on many areas, including expanding human access to knowledge.

Hence, Generative AI represents distinct yet intertwined aspects of the rapidly evolving AI landscape. By harnessing the power of Generative AI for creative endeavours, scientific breakthroughs, and educational advancements, a future may be unlocked where it will empower humanity to achieve extraordinary things and the libraries will be able to interact with AI technology in a variety of ways, especially the Generative AI.

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