Artificial Intelligence and Machine Learning: Application and Implications for Library and Information Centers

Sylvester I. Ebhonu & Magnus Igbinovia

Abstract:

Artificial Intelligence (AI) and Machine Learning (ML) are becoming increasingly important in the field of library and information services as they are bringing about efficiency and improved user engagement. The paper discusses different examples of artificial intelligence (AI) and machine learning (ML) applications in libraries categorized under collection development, readers' and reference services, user training and literacy, research data management, and catalogue and metadata services. Emphasis is placed on the need for libraries and Information Centers to leverage generative AI tools to automate routine tasks and deliver personalized services to library users. The paper also examined cases of AI and ML usage in the educational sector and then narrowed down this usage to the context of library and information centers. The implications of AI and ML in library and information centers were discussed with particular reference to implication in terms of requirements. In conclusion, the paper advocates responsible adoption of AI/ML, and need for continuous skill development amongst librarians to be able to effectively navigate the ever changing information environment.

Artificial Intelligence and Machine Learning: Application and Implications for Library and Information Centers

Sylvester I. Ebhonu, Admiralty University of Nigeria, Delta State, Nigeria

Magnus Igbinovia, David Umahi Federal University of Health Sciences, Nigeria

ABSTRACT

Artificial Intelligence (AI) and Machine Learning (ML) are becoming increasingly important in the field of library and information services as they are bringing about efficiency and improved user engagement. The paper discusses different examples of artificial intelligence (AI) and machine learning (ML) applications in libraries categorized under collection development, readers' and reference services, user training and literacy, research data management, and catalogue and metadata services. Emphasis is placed on the need for libraries and Information Centers to leverage generative AI tools to automate routine tasks and deliver personalized services to library users. The paper also examined cases of AI and ML usage in the educational sector and then narrowed down this usage to the context of library and information centers. The implications of AI and ML in library and information centers were discussed with particular reference to implication in terms of requirements. In conclusion, the paper advocates responsible adoption of AI/ML, and need for continuous skill development amongst librarians to be able to effectively navigate the ever changing information environment.

Keywords: Artificial intelligence, emerging technologies, machine learning, library service delivery, library and information centers

INTRODUCTION

The disruption currently experienced by library and information centers is precipitated by 'disruptive elephants' inclusive of the Internet, Artificial Intelligence (AI), Augmented Reality (AR) & Virtual Reality (VR). These disruptive innovations have altered conventional library practices especially with regards to how information is created, stored, retrieved, and disseminated. In 2013, the International Federation of Library Association and Institutions (IFLA) harnessed insights from experts across diverse fields with which they highlighted important global trends in the information ecosystem. The top five trends which are expected to transform the information ecosystem reflect the emergence of new technologies and its social impact on the society (Kumar Das, 2015). Again, IFLA conducted a similar trend report in 2024 and the presence of AI was reported as one of the technologies transforming societies (Dezuanni et al., 2024).

The aim of AI is to create intelligent systems that can learn, reason, and adapt, mirroring human intelligence. A subset of AI that enables systems to learn and improve its performance using large datasets is regarded as ML (Phippen, 2025). Both AI and ML are increasingly infiltrating every sector, including libraries and information centers, and adjusting the operations and service delivery pattern of these institutions. This aligns with the assertion of Mishra (2023) that AI and ML are now increasingly being used for improving efficiency and enhancing service delivery in library and information centers. On the import of AI and ML to libraries, Mishra (2023) averred that routine tasks like categorizing and indexing can be automated with the use of AI and ML technologies, which can also offer more accurate and effective information management and retrieval services in libraries. Moreover, Biswas (2024) opined that AI and ML offers libraries a competitive edge and a way to better serve their patrons in this era of growing information. Biswas further noted that through innovative service delivery and user experiences, the usage of AI presents opportunities to connect with and attract new users to the library, thus increasing library patronage. AI and ML are promising tools for libraries given their ability to quickly, observably, and demonstrably assist both librarians and users to achieve their goals.

As AI and ML continues to show capacity to support libraries in realizing their goals, there is need for continuous scholarly exploration on how these emerging technologies can be applied for optimal utility. Phippen (2025) pointed out that as AI continues to evolve and new application domains are explored, its integration into work [inclusive of library operations] demands exploration in order to unravel new opportunities. Consequently, this paper further examined how AI and ML can be applied in libraries and information centers. The paper first provides a conceptual clarification to AI and ML and how generative AI works. Cases of AI and ML application in the educational sector was x-rayed and then narrowed down to library and information centers. It also x-rayed what this application would imply for libraries, particularly in terms of requirements. Anne (2025) opined that given the enormous way that AI support technical services in libraries, it is expected that libraries significantly invest in AI. By extrapolation, AI application in libraries has implication for library operations and management. This paper therefore contributes to strengthening the existing literature on AI and ML application and implication for library and information centers.

ARTIFICIAL INTELLIGENCE (AI) AND MACHINE LEARNING (ML)

Artificial Intelligence (AI) is a branch of computer science that focuses on creating computers that can simulate human behavior through learning, reasoning, and self-correction capabilities (Bermejo & Juiz, 2023). The authors added that we are currently in the third wave of AI, due to the enormous expectations associated with the first two waves. This third wave is characterized by systems that are more than mere tools for human use, rather are intelligent agents with the capability to reason about tasks, learn from surroundings, and act independently (Caldwell, 2024). AI is a collection of technologies that are mostly based on machine learning and deep learning and are utilized for a variety of business purposes, including data analytics, forecasting and prediction, object classification, natural language processing, recommendations, intelligent data retrieval, and more (Google Cloud, n.d). By implication, the relevance of AI as an intelligent system is hinged on its robust capability to mimic human intelligence for effective and efficient task accomplishment, decision making and error minimization. The capacity of AI systems to minimize

error is predicated on the unbiased nature of its learning data, which connotes the concept of Machine Learning (ML) algorithm.

Machine learning is a subfield or subset of AI that entails the use of computers to accomplish tasks effectively. Lepakshi (2022) noted that such tasks are accomplished by learning from extracted data and models. According to Taye (2023), in machine learning, a computer program is given a series of tasks to accomplish; if the machine's assessed performance on these tasks improves over time as it has more and more experience performing them, then the machine has learned from its experience. This indicates that the computer is using historical data to inform its predictions and judgments. As libraries and information centers strive for improved service delivery, integrating technologies like AI/ML introduces not just opportunities, but also challenges that LIS professionals should be aware of.

When AI is mentioned, ChatGPT is often the first thing that comes to mind. However, the history of AI dates back more than a century ago. A survey conducted in November 2022 on the perception and attitude of British Adults towards AI revealed that "OpenAI's ChatGPT was released two weeks prior to the time of the survey (Ada Lovelace Institute & The Alan Turing Institute, 2023). This implies the existence of AI utilization before 2022. This shows that there have been several use cases of AI before 2022—for example, face recognition in mobile phones, job eligibility screening, cancer diagnosis and prognosis, loan eligibility assessment, social media targeted ads and robotic vacuum cleaners.

The concept of AI and ML came to light from the work of Alan Turing's paper entitled "Computing Machinery and Intelligence" which was published in 1950 with the main aim of providing answer to the question "Can machines think?" (Turing, 1950). The paper discussed how intelligent machines are built and how their intelligence is tested (Anyoha, 2017). The path to current AI research was paved by works such as the Logical Theorist, a proof concept created by Allen Newell, Cliff Shaw, and Herbert Simon and presented at John McCarthy and Marvin Minsky's AI-pioneer program, called the Dartmouth Summer Research Project on Artificial Intelligence (DSRPAI), in 1956. Thereafter, two main factors are said to have reignited AI in the 1980s which are increase in funding and an extension of the algorithmic toolkit (Anyoha, 2017). In 1980s, the AI interventions were characterized by the rise in popularity of "deep learning" and "expert systems, as well as the Japan's significant investment in its Fifth Generation Computer Project (FGCP). Another important turning point in the development of AI was the 1997 defeat of chess great Gary Kasparov by IBM's Deep Blue, which was followed that year by the release of Dragon Systems' Windows speech recognition software.

HOW GENERATIVE ARTIFICIAL INTELLIGENCE (GEN AI) WORKS

AI is rapidly evolving, particularly with the introduction of Gen AI, which has increased the range of possible uses for AI. This implies that it will have a wider impact and change how jobs are performed and how labor is distributed (Cazzaniga et al. (2024). They added that (Gen AI) encompasses systems such as complex large language models that can learn from vast amounts of training data to produce new material, including text and graphics. Gen AI is a relatively new concept which has gained public attention, particularly after the November 2022 release of ChatGPT, an intuitive application that showcases the capabilities of GPT (generative pretrained

transformer) systems (Cao et al., 2023). As the name indicates, Gen AI generates contents based on trainings received from previous data, when the system is queried or prompted. In buttressing this, Brühl (2023) affirmed that Gen AI is a category of AI systems that can create new text, images, videos, or programming code in response to user-inputted requests. Bruhl furthered that some of these Gen AI like OpenAI/Microsoft chatbot ChatGPT, are built on top of the large language model (LLM) GPT-3/GPT-4.

Google's Gemini, when prompted "What is generative AI?", provides this answer (an excerpt): "Generative AI, or generative artificial intelligence, is a type of AI that can create new content, such as text, images, videos, music, and audio. It uses large AI models, called foundation models, to learn from large amounts of data and produce new content that's statistically relevant to the inputs it's given" (Google AI, 2024). It can be implied that Gen AI like ChatGPT has learned so much from data on the World Wide Web (WWW), covering data since the inception of the internet in the late 1980s. After these training lessons with large datasets, ChatGPT and other Gen AI tools are able to understand prompts. So, when using these tools, as in the case of ChatGPT, it breaks down the prompt into smaller units, called *tokens*, to determine the context of the question and identifies key tokens within that context and attempts to give a response that makes sense to the querier. The more we use it the more it learns from us and gets better. Most AI tools can also give disclaimer statements like this: "I have limitations and won't always get it right, but your feedback will help me to improve." This is what machine learning is actually all about—training models to learn from user interactions and data we feed into them.

CASES OF AI AND ML USAGE IN THE EDUCATIONAL SECTOR

AI and MI have gained popularity and acceptance across diverse sectors in the society, including the educational sector. This has positively influenced the use of AI by students and educators in pursuit of academic excellence and educational goals, respectively. AI has enabled students to receive personalized learning experiences based on data gathered from their interactions with AI-powered platforms (Kaledio et al., 2024). Thus, in interacting with AI systems, data are generated which invariably enabled AI to provide learning experiences to students based on their unique characteristics and preferences. By leveraging AI technologies, educators can create dynamic and engaging learning environments that cater to the unique needs and preferences of students, leading to improved learning outcomes and student success (Kaledio et al., 2024). Succinctly put, AI applications are critical for achieving educational success in the current dispensation.

Aside its enormous role in education such as tutoring opportunities, improving communication between teachers and students, AI provides solution to the academic and administrative difficulties encountered in education (Ahmad et al., 2021). The authors expanded that the relevance of AI in education is experienced across smart learning, virtual learning facilitator, tutoring system, learning management systems, online learning environment and learning analytics.

With learning been a social activity and acquisition of knowledge enabled by communication and team work, another case of AI and ML application in education is in the usage of Intelligent Tutoring System (ITS) which provides an effective substitute for one-on-one instruction (Simhadri & Swamy, 2023). According to the authors, ITS personalizes learning by

tailoring learners' course of study and selection of materials, offers cognitive support and scaffolding, and encourage active learning through dialogue. According to Kamalov et al. (2023), ITS uses strong algorithms and ML techniques to understand students' learning requirements and customize their teaching strategies accordingly. It also allows the ITS to answer questions, have meaningful conversations, and offer education on a range of topics. It is therefore permissible to posit that AI and ML provide a paradigm shift in educational practices towards providing learners with seamless experience.

The application of AI and ML in education is also seen in the intelligent assistance for collaborative learning as noted by Attaran et al. (2018). This is done by enhancing online group interaction which facilitates knowledge sharing, or providing summary of conversations that human tutors can use in directing students towards the course goals and objectives. Attaran et al. (2018) also noted that through Intelligent Virtual Reality (IVR), AI technologies can be applied in transforming educational practices. In supporting this claim, Büching et al. (2019) asserted that IVR is used to engage students in virtual reality and game-based learning which provides an innovative learning platform for students. Through this technique, virtual agents can act as instructors, guides or peers to students in digital or distant laboratories. This application addresses the scarcity in skilled manpower in the education sector and impact students with globally accepted best practices.

It is pertinent to note that AI and ML are structured to provide the required assistance needed by learners and tutors to meet their educational goals. This is basically hinged on their content (information and knowledge) generating abilities which are crucial to educational success. Libraries as vital part of educational institutions are now adopting AI and ML in revitalizing their service structure. It is therefore essential to take a quick glance at how AI and ML are transforming libraries across their service structures.

APPLICATION OF AI AND ML IN LIBRARIES AND INFORMATION CENTERS

AI when integrated into libraries has several benefits according to Gajbhiye (2024 p.9), which include "improved search and discovery, enhanced personalization, efficient metadata management, 24/7 virtual assistance, data driven decision making, digital preservation and access, enhanced accessibility, and predictive analytics for collection management." Similarly, Rahmani (2023) emphasized the transformative potential of AI in public library services, noting that these technologies can streamline operations and improve service delivery.

Application of AI/ML is not just about automating library operations and experiences for library users but it is also about redefining the roles librarians play. Generative AI platforms offer opportunity for libraries to improve service delivery, albeit at a surface level. If Librarians and other information professionals need to take the full advantage of the potential of AI/ML, they must go beyond just deployment of available tools and start creating purpose-built AI systems to automate peculiar library operations and improve user experiences. This will require collaboration with experts in computer science, data science, and machine learning. This section therefore

discusses briefly, from the hands-on experiences of the authors, ways that Librarians and Information professionals can creatively integrate AI/ML to improve library service delivery.

Collection Development

The role of collection development librarians in the aspect of creating and distributing surveys to their user community can be made easier through Google's AI-powered form creator to collect insights from patrons and with the aid of AI Tools like ChatGPT, the data collected can be analyzed to inform acquisition and weeding decisions. Many libraries today, at their circulation/porters' desk, collect a variety of relevant data about their users, which can be managed by AI tools to make meaningful decision regarding collection development practices.   Also with AI embedded in Library Management Systems (LMS), librarians can recall search histories and better understand the interests of their library users and recommend/acquire related materials accordingly.

Readers' and Reference Services

Chatbots and Virtual Assistants are good examples of how AI/ML can be used in transforming library service delivery through GPT trainers. Implementing an API (Application Programming Interface – a protocol for communication between platforms) within an LMS or Library Website is a way for libraries to automate their "Ask a Librarian" service. In the case of Admiralty University of Nigeria Library, an AI Chat Builder (GPT Trainer) was embedded in their website to serve as a virtual library staff, capable of answering user questions based on the library's data and FAQs. AI tools enhance intelligent information retrieval which enables Librarians to provide answers to users' query. This aligns with the assertion of Phippen (2025) that library users' experience is enhanced when search engines apply natural language processing (NLP) algorithms to understand user queries and provide more human-like results.

Generative AI tools like Gemini, Claude AI, Summarizer and Scribbr, can assist Librarians in creating book reviews and the SDI (Selective Dissemination of Information) service of libraries by suggesting books to library users. Another area worth exploring is the introduction of robots, which would execute routine manual tasks and respond to quick reference questions, while librarians are able to focus on important tasks.

User Education and Literacy

Madunic and Sovulj (2024) conducted a research on ChatGPT as a tool for designing and developing syllabi. In their work, they assigned ChatGPT the role of an expert in the subject of information literacy, and prompted it to develop a set of syllabi for an aspect of the subject. The results were given to human authorities in the field, and their assessment showed that ChatGPT can be especially good for developing first drafts for texts, and with human involvement as editors; the chatbot can be used to develop instructional materials. Libraries can use Gen AI bots (like ChatGPT) to develop effective, individualised syllabi on information literacy for their community.

In providing literacy to users on AI, the Mcgill Library is a good example as they provide on their website a tool (ROBOT Test), which anyone can use when reading about AI applications to help consider the legitimacy of the technology. The acronym ROBOT stands for 'Reliability, Objectivity, Bias, Ownership and Type.' Librarians can also utilize Midjourney, Bing AI Image

Generator, and Synthesia.io which allow them to transform text into audiovisual content for the purposes of providing information and education on particular issues to their users or students.

Research Data Management (RDM) Services

Academic libraries have the potential to delivery more effective and efficient RDM service to their patrons using AI/ML deep learning approach. AI tools like EndNote helps researchers organise their citations and reference list, facilitating efficient management of repetitive citations (Tandel, 2024). BibGuru a citation and bibliographic generator is also another relevant tool that enhances RDM services.

Cataloguing and Metadata Services (CMS)

This service can be enhanced in libraries using AI tools, by leveraging the AI operation principles of deep learning, data analytics, and object categorisation. Generative AI models are also able to assist in library operations like indexing, abstracting by extracting relevant bibliographic information, metadata or summaries more accurately and reducing the workload of cataloguers. This corroborates the assertion of Anna (2025) that AI technology through methods like Natural Languages Processing, experts systems, intelligent agents, deep learning, etc, can assist in cataloguing, classification and indexing.

IMPLICATIONS OF AI AND ML APPLICATION IN LIBRARIES AND INFORMATION CENTERS

A pre-survey distributed at one of the foremost virtual Artificial Intelligence Master's Class organised in Nigeria for Librarians and academics in the year 2023 tagged #AIM2023, was analyzed to help project the implication of AI as an emerging technology as perceived by Librarians and Information Professionals. The pre-survey first assessed the opinions of these professionals on whether AI and emerging technologies will cause more harm than good to humanity in the future. The result is seen in the pie chart below.


Opinions on AI and Emerging Technologies Impact on Humanity
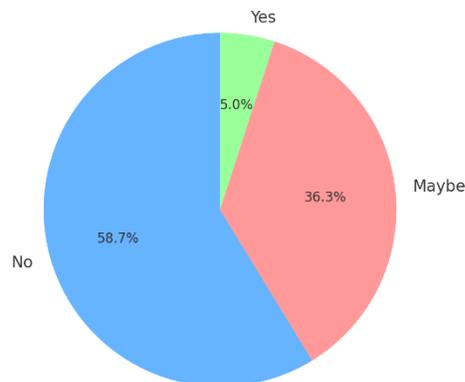
As represented in the pie chart, the finding suggests that while there is overall optimism about the role of AI and other emerging technologies in the future, there is also a notable degree of uncertainty. Therefore, Librarians are positive about the place of AI in their service delivery, which has implications for incorporating AI and ML into library service delivery system.

Implications in terms of Requirements

We cannot talk about the application of AI and ML in library practice without talking about the required skills to apply these technologies in our libraries. Below is a chart representing the distribution of more than 150 respondents (Librarians) who gave their opinion on 'their AI/Tech Proficiency Level' at #AIM2023.
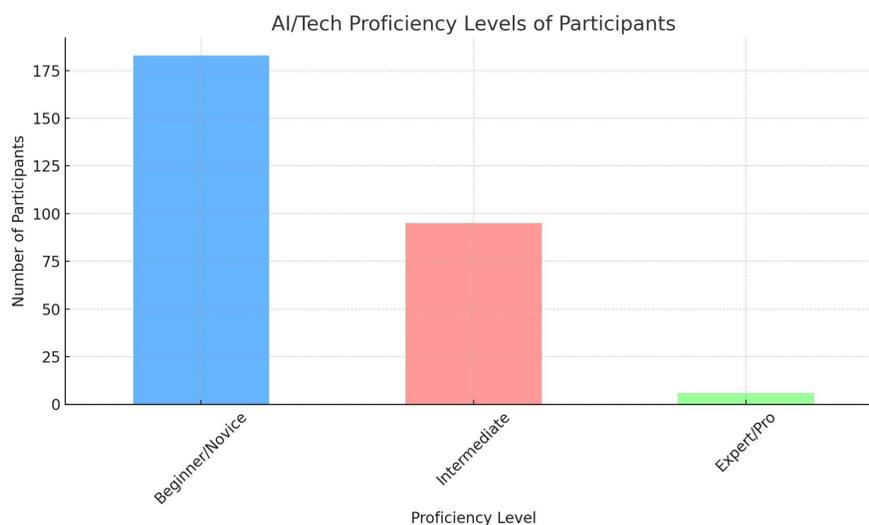
The finding suggests that majority of the participants who were Librarians categorize themselves as Beginner/Novice, indicating that they were at the early stages of learning about AI and other emerging technologies. Hence, there is need for a strong foundational introductory approach to equipping Librarians with skills required for effective application of AI in Libraries. To make the most of the possibilities that AI and ML offer libraries, Librarians must improve their skills. Based on the use cases touched in this paper, librarians must acquire skills like prompt engineering in the use of Gen AI because their patrons will rely on them based on their possession of these skill sets. Generally for Librarians and information professionals to be able to adapt to an AI-driven society these other four skills are pertinent:

    a. Cognitive and diversification skills (emotional intelligence, creative thinking, synthesizing, ethical values, etc.)

    b. Digital skills (collaboration tools, machine learning, deep learning, prompting engineering, cybersecurity, data science, content creation and management, etc.)

    c. Strategic communication and advocacy skills (communication, user experience (UX) design, branding and digital marketing)

    d. Continuous learning skills (self-reflection, curiosity, etc.)

The full impact of AI and ML in the field of Library and Information Science can only be achieved through adequate data collection and management systems as well as the relevant infrastructure for managing and analyzing such data. If these basic needs are met, libraries will be able to take advantage of the advancements that AI has to offer.

Other Implications

a. The elimination or minimization of routine tasks in every aspect of library operations due to automation will afford librarians more time for self-development and brainstorming innovations to enhance the experience of their patrons in the library.

b. Since the release of ChatGPT in November 2022, over 2000 other AI tools have been launched. Librarians therefore, must position themselves as guides to their patrons, and to the society at large, in navigating the ever-growing tech environment.

c. Integrity in knowledge creation is under attack with the rise of AI. On 22nd May 2024, Elsevier removed an article written by Bader, et al. (2024) for their *Radiology Case Reports* publication. The reason for the removal was "because informed patient consent was not obtained by the authors in accordance with journal policy prior to publication" (Elsevier, 2024). However, in the course of reviewing the paper for removal, it was discovered that the authors "used a generative AI source in the writing process of the paper without disclosure, which, although not being the reason for the article removal, is a breach of journal policy". This has implication for LIS professionals in educating academics and students on the ethical use of AI for academic and research works.

d. Another implication of AI is the breach of privacy. Since AI systems depend on users' data to effectively function, users are at risk of various kinds of threats on the internet by having to supply their information while navigating AI-powered systems. Also, concerns have been raised over bias of AI systems, and also on whether AI itself plagiarizes.

e. Total reliance on AI for thinking and creation is a threat to what makes us human. Such reliance over time dulls the mind, depletes imaginative abilities, and erodes critical thinking. Sadly, even some academics now rely on Gen AI tools to write their papers for them. You wonder what the situation is in schools. What happens to our collective welfare as a people when our creative being is entrusted into the hands of AI machines that hallucinate in the responses they give to us?

f. On the ethical implication of using AI/ML, Jha (2023) discussed the prospects and challenges of AI in library operations, indicating that while AI can significantly enhance service quality, it also requires careful consideration of ethical implications and resource allocation. If you have used AI, acknowledge it to promote transparency. Libraries therefore should develop AI policies to regulate AI usage. Coleman (2020) emphasized that successful implementation of these technologies requires careful consideration of ethical implications, data management practices, and the potential for algorithmic bias, as highlighted by Coleman (Coleman, 2020).

CONCLUSION

AI is here to stay and will continue to disrupt how we live as well as professional practice including library service delivery. There are as many threats as there are opportunities for librarians and librarianship in the age of AI. This paper has touched on the application areas of AI in libraries: collection development, readers' and reference services, user education and literacy, research data management, and cataloguing and metadata services (CMS). The most urgent implication of this advancements is that librarians must upskill, and there is no bargaining that. Skills like prompt engineering, collaboration, are core skills librarians must acquire. The negative implications are there also, and that means librarians must also be on their guard to stem the negative tides that come with the advancements in AI. AI should serve the good of library and information science, and for every field of human endeavour, rather than bring doom upon us, and librarians must rise to their responsibilities as we advance forward in time.

References

Ada Lovelace Institute and The Alan Turing Institute (2023). How do people feel about AI? A nationally representative survey of public attitudes to artificial intelligence in Britain. Retrieved from https://www.turing.ac.uk/sites/default/files/2023-06/how_do_people_feel_about_ai_-_ada_turing.pdf

Ahmad, S. F., Rahmat, M. K., Mubarik, M. S., Alam, M. M., & Hyder, S. I. (2021). Artificial Intelligence and Its Role in Education. *Sustainability*, *13*(22), 12902. Retrieved from https://doi.org/10.3390/su132212902

Anna, N. E. V. (2025). AI/ Machine Learning for Cataloguing, Classification, and Indexing. Encyclopedia of Libraries, Librarianship, and Information Science, Volume 3, 355-363, doi:10.1016/B978-0-323-95689-5.00131-0

Anyoha, R. (2017, August 28). The history of artificial intelligence. Science in the News (SITN). Retrieved from https://sitn.hms.harvard.edu/flash/2017/history-artificial-intelligence/.

Bader, R., Imam, A., Alnees, M., Adler, N., ilia, J., Zugayar, D., Dan, A., & Khalaileh, A. (2024). Successful management of an latrogenic portal vein and hepatic artery injury in a 4-month old female patient: A case report and literature review. *Radiology Case Reports, 19*(8), 2106–2111. Retrieved from https://doi.org/10.1016/j.radcr.2024.05.010

Bermejo, B. & Juiz, C. (2023). Improving cloud/edge sustainability through artificial intelligence: A systematic review. Journal of Parallel and Distributed Computing, 176, 41-54. Retrieved from https://doi.org/10.1016/j.jpdc.2023.02.006.

Biswas, G. (2024). The Application of Artificial Intelligence (AI) in Library and Information Centre. *International Journal of Scientific Research in Engineering and Management (IJSREM)*, 8(7), 1-8.

Brühl, V. (2023). Generative Artificial Intelligence (GAI): Foundations, use cases and economic potential, CFS Working Paper Series, No. 713, Goethe University Frankfurt, Center for Financial Studies (CFS), Frankfurt a. M. Retrieved from https://doi.org/10.2139/ssrn.4515593

Büching C, Mah D-K, Otto S, Paulicke P, Hartmann EA (2019) Learning analytics an

Hochschulen. In: Wittpahl, V. (eds) Künstliche Intelligenz. Springer Vieweg, Berlin, Heidelberg. Retrieved from https://doi.org/10.1007/978-3-662-58042-4

Caldwell, T. (2024). The evolution of AI agents in the third wave of AI. Retrieved from https://www.forbes.com/councils/forbestechcouncil/2024/10/22/the-evolution-of-ai-agents-in-the-third-wave-of-ai/#:~:text=The%20third%20wave%20of%20the,earlier%20stages%20of%20AI%20development

Cazzaniga, M., Jaumotte, F., Li, L., Melina, G., Panton, A. J., Pizzinelli, C., Rockall, E. & Tavares, M. M. (2024). Gen-AI: Artificial intelligence and the future of work. IMF Staff Discussion Notes. Retrieved from file:///C:/Users/ASUS/Downloads/SDNEA2024001.pdf

Chomsky, N., Roberts, I., & Watumull, J. (2023). Noam Chomsky: The false promise of ChatGPT. The New York Times. Retrieved from https://www.nytimes.com/2023/03/08/opinion/noam-chomsky-chatgpt-ai.html

Coleman, N. (2020). Managing bias when library collections become data. International Journal of Librarianship, 5(1), 8-19. Retrieved from https://doi.org/10.23974/ijol.2020.vol5.1.162

Coursera (2024). What is machine learning? Definition, types, and examples. (2023, September 11). Coursera. Retrieved from https://www.coursera.org/articles/what-is-machine-learning

Dezuanni, M., Osman, K. Burton, & Heck, E. (2024). IFLA Trend Report 2024. IFLA trend report 2024: Facing the future of information with confidence: Phase 2. Brisbane: Digital Media Research Centre. https://www.ifla.org/news/trend-report-2024-report-launched/

Elsevier. (2024). Removal notice to "Successful management of an latrogenic portal vein

Gajbhiye, C. K. (2024). Impact of artificial intelligence (AI) in library services. International Journal for Multidisciplinary Research, 6(3). Retrieved from https://doi.org/10.36948/ijfmr.2024.v06i03.22452

Google AI. (2024). Gemini (November 7 version) [Large language model]. Retrieved from https://gemini.google.com/app.

Google Cloud. (n.d.) What is Artificial Intelligence (AI)? Google. Retrieved from https://cloud.google.com/learn/what-is-artificial-intelligence.

Jha, S. K. (2023). Application of artificial intelligence in libraries and information centers services: prospects and challenges. Library Hi Tech News, 40(7), 1-5. Retrieved from https://doi.org/10.1108/lhtn-06-2023-0102

Kaledio, P., Robert, A., & Frank, L. (2024). The impact of artificial intelligence on students' learning experience. Social Science Research Network (SSRN). Retrieved from https://dx.doi.org/10.2139/ssrn.4716747.

Kamalov, F., Santandreu Calonge, D., & Gurrib, I. (2023). New era of artificial intelligence in education: Towards a sustainable multifaceted revolution. Sustainability, 15(16), 12451. Retrieved from https://doi.org/10.3390/su151612451

Kumar Das, A. (2015). The IFLA trend report. Retrieved from https://www.slideshare.net/slideshow/ifla-trend-report/43464803

Lepakshi, V. A. (2022). Machine learning and deep learning based ai tools for development of diagnostic tools. Computational approaches for novel therapeutic and diagnostic designing to mitigate SARS-CoV-2 Infection. 2022:399–420. doi: 10.1016/B978-0-323-91172-6.00011-X.

Madunic, J., & Sovulj, M. (2024). Application of ChatGPT in information literacy instructional design. *Publications*, *12*(2). Retrieved from https://doi.org/10.3390/publications12020011.

Meta. (2024). *Meta AI* (November 6 version) [Large language model]. Retrieved from https://wa.me/13135550002?s=5.

Mishra, S. (2023). Ethical implications of artificial intelligence and machine learning in libraries and information centers: A frameworks, challenges, and best practices. *Library Philosophy and Practice (e-journal)*. Paper 7753. Retrieved from https://digitalcommons.unl.edu/libphilprac/7753

Phippen, A. (2025). Artificial Intelligence. Encyclopedia of Libraries, Librarianship, and Information Science, Volume 4, 3-11. doi:10.1016/B978-0-323-95689-5.00098-5 3

Rahmani, M. (2023). Exploring the integration of AI in public library services. *AI and Tech in Behavioral and Social Sciences*, *1*(4), 33-39. Retrieved from https://doi.org/10.61838/kman.aitech.1.4.6

Simhadri, N. & Swamy, T.N.V.R. (2023). Awareness among teaching on AI and ML applications based on fuzzy in education sector at USA. *Soft Comput* (2023). Retrieved from https://doi.org/10.1007/s00500-023-08329-z

Tandel, B. (2024). Artificial Intelligence (AI) tools used in libraries. *International Journal of Research Publication and Reviews,* *5*(6), 4195–4199. Retrieved from https://orcid.org/0000-0003-3581-1789.

Taye, M. M. (2023). Understanding of Machine Learning with Deep Learning: Architectures, Workflow, Applications and Future Directions. *Computers*, *12*(5), 91. Retrieved from https://doi.org/10.3390/computers12050091

Turing, A. M. (1950). Computing machinery and intelligence. *Mind (49)*, 433–460. Retrieved from https://www.csee.umbc.edu/courses/471/papers/turing.pdf.

About the authors

Sylvester Israel Ebhonu is a Digital Transformation Leader, Associate Lecturer and Head of the Research and Scholarly Engagement Unit at the Admiralty University of Nigeria Library, Ibusa. He holds B.Sc. (Hons) and M.Sc. degrees in Library and Information Science from Delta State University, Abraka, is currently pursuing a PhD in LIS, and is a Certified Librarian of Nigeria. Through his digital platforms and capacity building initiatives in Responsible AI/Digital Literacy, Library Automation, Leadership, Career Development, and Youth Empowerment, Sylvester has impacted over 15,000 individuals alongside organisations and institutions. Sylvester is an Associate Member of the Practical Artificial Intelligence Development Foundation and currently serves as National Public Relations Officer of the Nigerian Library Association.

Magnus Osahon Igbinovia is an award winning Librarian and Lecturer, affiliated to the University Library and Institute of Knowledge Management and Knowledge Economy, both at David Umahi Federal University of Health Sciences (DUFUHS). He is currently the Ag. Head of Electronic Library and Academic Support Service in the institution, where he brings to bear his wealth of experience in library service delivery. He is an avid researcher and was a panelist in the United Nations' 9th Multi-stakeholder Forum on STI. ORCID: http://orcid.org/0000-0001-9104-2991