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Artificial Intelligence Ethics and Best Practices in Libraries: A Narrative Review

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ABSTRACT

This study explores integrating artificial intelligence (AI) technologies in libraries, focusing on the ethical considerations, challenges, and best practices that shape their implementation and impact. Ethical principles such as privacy, fairness, transparency, and accountability are critical guiding frameworks for AI integration in libraries. Challenges, including cost constraints, technical complexity, and data privacy concerns, are examined, underscoring the need for vigilant attention to ethical considerations and responsible practices. Best practices in AI implementation, such as user-centric design, data privacy and security measures, and continuous monitoring and evaluation, are elucidated as strategies to promote ethical, effective, and equitable use of AI technologies in libraries. Moreover, staff training and capacity building on ethical considerations are essential for navigating ethical dilemmas and ensuring ethical decision-making in AI deployment. The paper concludes with a call to action for libraries to prioritize ethical considerations and adopt responsible AI practices in alignment with the core values of librarianship.

Keywords: Artificial Intelligence, Libraries, Ethical Considerations, Best Practices, Responsible AI Practices

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1. Introduction

Artificial Intelligence (AI) stands at the forefront of technological innovation, revolutionising various sectors

by simulating human intelligence in machines. Its applications range from predictive analytics to natural language processing, offering unprecedented opportunities for efficiency and insight across diverse industries. Within the realm of libraries, AI holds the promise of transforming traditional services, enhancing user experiences, and optimizing resource management.In libraries, AI encompasses a spectrum of technologies and applications designed to streamline operations, improve access to information, and personalize services for patrons. This includes automated cataloging systems, recommendation engines, virtual assistants, and more (Ali et al., 2024).

However, alongside the potential benefits of AI in libraries, a pressing need arises to address ethical considerations in its implementation. As AI systems become increasingly integrated into library operations, questions of fairness, transparency, privacy, and accountability come to the forefront. Without proper ethical frameworks and safeguards in place, there is a risk of perpetuating biases, infringing on user privacy, and exacerbating inequalities in access to information as observed by Cox (2023).Therefore, it is paramount to recognize the importance of ethical considerations in AI implementation within libraries. Ethical principles serve as guiding principles to ensure that AI technologies are deployed responsibly, ethically, and with due respect for all stakeholders' welfare. This paper explores the multifaceted intersection of artificial intelligence ethics and best practices in libraries.

Artificial Intelligence has a broad spectrum of applications and specialized domains, focusing on data, text, and images. Many of these applications are used in the business environment and by government agencies such as machine learning and Natural Language Processing (NLP). Machine learning and algorithms underpin typical information systems such as online search websites and social networks today. However, numerous researchers have pointed out issues in machine learning datasets on social media, including race, gender, and disability biases and an over-reliance on algorithmic content moderation that could further fuel the dissemination of disinformation.

2. Conceptual Discussion of Artificial Intelligence

At its core, artificial intelligence encompasses the development of algorithms and systems capable of performing tasks that typically require human intelligence. These tasks span a wide spectrum, including problem-solving, pattern recognition, natural language understanding, and decision-making. AI systems can be classified into two broad categories: narrow AI, which is designed to perform specific tasks within a limited domain, and general AI, which aims to emulate the breadth and versatility of human intelligence across diverse domains. While narrow AI has achieved remarkable success in areas such as image recognition, speech synthesis, and autonomous driving, the realization of general AI remains an aspirational goal that poses profound philosophical and technical challenges (Mishra, 2023).

The development and deployment of artificial intelligence systems rely on a myriad of technologies, algorithms, and methodologies. According to Basrsha and Munshi (2024), machine learning, a subfield of AI, plays a central rolein enabling computers to learn from data and improve their performance over time without explicit programming. Deep learning, a subset of machine learning, has emerged as a dominant paradigm, leveraging neural networks to achieve state-of-the-art results in tasks such as image classification, speech recognition, and language translation. Other components of AI include expert systems, which encode human expertise in the form of rules or knowledge bases, and reinforcement learning, which enables agents to learn optimal behaviors through trial and error (Saeidnia, 2023).

3. Evolution of AI Technologies in Library Services

Over the years, the landscape of library services has undergone a significant transformation, driven by advancements in technology and the emergence of artificial intelligence (AI). Integrating AI technologies into library services represents the latest chapter in a storied history of innovation and adaptation. From the invention of the printing press to the digitization of collections, libraries have continually embraced new technologies to expand their reach and enhance their offerings. However, it was not until the emergence of AI as a distinct field of study in the mid-20th century that the potential for intelligent automation in library services began to be realized.

The early applications of AI technologies in library services were modest in scope but groundbreaking in their implications. Expert systems, a form of AI that encodes human expertise in rules or knowledge bases, were among the first AI technologies to be deployed in libraries (Ali et al., 2024). These systems were used to assist patrons in navigating complex collections, answering reference questions, and providing personalized recommendations. While rudimentary by today's standards, these early forays laid the foundation for more sophisticated AI applications in the years to come.

As computing power increased and algorithms advanced, AI technologies played a more prominent role in automating and optimizing library operations. Automated cataloging systems, powered by machine learning algorithms, revolutionized organizing and classifying library materials, making it faster, more accurate, and less labor-intensive. Similarly, AI-driven recommendation engines have transformed how patrons discover and access relevant resources that are personalized to their interests and preferences. These advancements improved efficiency and access, enriching the user experience and fostering greater engagement and satisfaction among library patrons.

Artificial Intelligence has a broad spectrum of applications and specialized domains, focusing on data, text, and images. Many of these applications are used in the business environment and by government agencies, such as machine learning and Natural Language Processing (NLP). Machine learning and algorithms underpin typical information systems such as online search websites and social networks today. However, numerous researchers have pointed out issues in machine learning datasets on social media, including race, gender, and disability biases, and an over-reliance on algorithmic content moderation that could further fuel the dissemination of disinformation.

As stated by Hondonu-Wusu (2024), one of the most significant contributions of AI technologies to library services has been enhancing accessibility for patrons with diverse needs and preferences. Natural language processing (NLP) algorithms enable libraries to offer voice-activated search capabilities, making it easier for patrons with disabilities or limited literacy skills to access information. Similarly, AI-powered translation tools facilitate the seamless translation of library resources into multiple languages, breaking down language barriers and expanding access to non-native speakers. These advancements underscore the transformative potential of AI in democratizing access to knowledge and fostering inclusivity within library spaces.

The evolution of image, text, and data research methods, aided by AI, across various fields means that academics and libraries have already developed several proven instances of data and collection AI endeavors. AI is now utilized in libraries and research to enable innovative methods for computational research, information retrieval,

and the reuse of library collections in new and intriguing ways. Additionally, AI is heavily utilized in literature searches, evidence synthesis, and related fields, such as digital humanities and data science. Natural Language Processing, or NLP, plays a vital role in text and discourse analysis. Such techniques have been applied in diverse research fields, such as optical character recognition of ancient documents, topic modelling of political speeches, and literature retrieval with AI assistance. (Fiona 2022)

4. Key Milestones in AI Adoption and Integration

Libraries have historically been at the forefront of adopting new technologies to serve their patrons better and facilitate access to information. Over the years, the integration of artificial intelligence (AI) technologies has marked significant milestones in the evolution of library services, revolutionizing how resources are organized, accessed, and utilized. Some of these key milestones in the adoption and integration of AI include:

• **Automated Cataloging Systems:** One of the earliest milestones in AI adoption in libraries was the development and implementation of automated cataloging systems. These systems, powered by AI algorithms and machine learning techniques, revolutionized cataloging and classifying library materials. By automating tedious and time-consuming tasks such as assigning subject headings and class numbers, automated cataloging systems enabled libraries to manage their collections more efficiently, reducing errors and improving accuracy.

• **Online Public Access Catalogs (OPACs):** The introduction of Online Public Access Catalogs (OPACs) represented a significant milestone in the digital transformation of library services. OPACs, often powered by AI-driven search algorithms, enabled patrons to search for library materials remotely and access a wealth of information from their own devices. This shift from traditional card catalogs to digital, searchable databases not only improved the accessibility of library resources but also paved the way for future innovations in AI-driven discovery and recommendation systems.

• **Personalized Recommendation Engines**: In recent years, personalized recommendation engines have emerged as a key AI-driven innovation in library services. These engines analyze user behavior, preferences, and past interactions with library resources to generate personalized recommendations for books, articles, and other materials. By harnessing the power of machine learning algorithms, personalized recommendation engines enable patrons to discover relevant content tailored to their individual interests, preferences, and reading habits, thereby enhancing the overall user experience and engagement with library collections.

• **Virtual Assistants and Chatbots**: Integrating virtual assistants and chatbots into library services represents another milestone in AI adoption, enabling libraries to provide on-demand assistance and support to patrons (Barsha & Munshi, 2024). These AI-powered tools can answer reference questions, provide research assistance, and guide patrons through library resources and services in real-time, enhancing accessibility and convenience for users. Virtual assistants and chatbots utilize natural language processing (NLP) algorithms to comprehend and respond to user queries, thereby making interactions with library services more intuitive and user-friendly.

• **Predictive Analytics and Data-driven Decision Making**: More recently, libraries have begun to leverage predictive analytics and data-driven decision-making tools to optimize resource allocation, improve collection development strategies, and enhance user engagement. To analyze large volumes of data, including circulation patterns, user demographics, and collection usage statistics, libraries can identify trends, anticipate

user needs, and make informed decisions about resource acquisition and allocation (Cox, 2023). These AI-driven insights enable libraries to better understand and serve their communities, ensuring that their collections and services remain relevant and responsive to evolving user preferences and demands.

Thus, Artificial intelligence can be quickly adopted in libraries for technical services such as classification and cataloguing, library management (including staffing and decision-making), library services (like reference), information services, and even information literacy. It becomes debatable whether AI adoption is successful, as much work remains to be done to achieve a fully inclusive adoption of the technology in libraries. (Harisanty et al. 2023)

Perceived Challenges Impeding the Adoption and Application of AI in Libraries

Exploring the individual AI practices of libraries and discussing these provides an opportunity for collaborative learning, which will ultimately enhance the adoption process and foster further innovation with emerging technologies. This, in turn, will help develop the theoretical foundation and maturity of the domain in terms of AI. (Yoon, J., Andrews, J.E., & Ward, H.L. (2022).

It will enable institutions to learn from one another, thereby improving their adoption while fostering innovation with other emerging technologies and contributing to the maturation and theorization of the entire AI domain.Artificial Intelligence (AI) holds immense potential to revolutionize library services, offering opportunities to enhance efficiency, accessibility, and user experience. However, despite the promise of AI technologies, libraries face many challenges that impede their adoption and application. According to Mishra (2023), Ali et al. (2024) and Cox (2023), some of the challenges impeding the actual adoption and application of AI in libraries include:

- One of the primary challenges facing libraries in adopting AI technologies is the cost associated with implementation and maintenance. AI systems often require significant financial investment in software development, hardware infrastructure, and staff training. Moreover, libraries may lack the necessary financial resources and technical expertise to develop and deploy AI solutions internally, resulting in a reliance on third-party vendors and outsourcing arrangements. Limited budgets and competing priorities further exacerbate the challenge, making it difficult for libraries to justify the upfront costs of AI adoption despite the potential long-term benefits.

- The integration of AI in libraries raises significant concerns related to data privacy and security. AI systems rely on vast amounts of data to train algorithms and make informed decisions, raising questions about the collection, storage, and use of patron data. Libraries must navigate complex regulatory frameworks, such as the General Data Protection Regulation (GDPR) and the Children's Online Privacy Protection Act (COPPA), to ensure compliance and safeguard patron privacy. Moreover, the potential for data breaches, algorithmic bias, and unintended consequences further complicates the adoption of AI in libraries.

- Another challenge impeding the adoption of AI in libraries is resistance to change and technological anxiety among library staff and stakeholders. Fear of job displacement, lack of technical expertise, and uncertainty about the implications of AI on traditional library roles and workflows may hinder enthusiasm for AI initiatives. Moreover, misconceptions and myths surrounding AI, such as fears of sentient machines and concerns about the loss of human control, contribute to apprehension and resistance to its adoption.

- In some cases, the adoption of AI in libraries is hindered by a lack of clear use cases and demonstrated value. Libraries may struggle to identify how AI technologies can address specific challenges or enhance existing services, leading to uncertainty about the potential return on investment. Moreover, the complexity and technical nature of AI may obscure its practical applications, making it challenging for libraries to articulate a clear value proposition to stakeholders and garner support for adoption.

- Implementing AI technologies often requires high technical expertise and integration with existing library systems and workflows. Libraries may struggle to find or afford staff with the necessary skills to develop, deploy, and maintain AI solutions. Additionally, compatibility issues with legacy systems and software may hinder seamless integration, requiring libraries to invest in upgrades or customizations to support AI initiatives.

- The use of AI technologies in libraries may raise concerns related to intellectual property rights and copyright compliance. AI algorithms may analyze and generate content based on copyrighted materials, raising questions about fair use, licensing agreements, and attribution. Libraries must navigate legal and ethical considerations to ensure that AI applications respect copyright laws and intellectual property rights while still providing access to information and fostering innovation.

- The quality and representativeness of the data used to train AI algorithms can significantly impact the accuracy, fairness, and reliability of AI applications. Libraries may encounter challenges related to data quality, such as incomplete or outdated metadata, inconsistent cataloging practices, and biased training data. Addressing data quality issues and mitigating bias in AI algorithms requires careful curation, validation, and auditing of training datasets to ensure that they reflect diverse perspectives and avoid perpetuating discriminatory outcomes.

- Maintaining and scaling AI initiatives over time presents challenges related to sustainability, scalability, and long-term viability. Libraries may struggle to secure ongoing funding and resources to sustain AI projects beyond the initial implementation phase. Additionally, scalability issues may arise as AI applications grow in complexity or scope, requiring libraries to invest in scalable infrastructure and adaptive strategies to accommodate increasing demand and usage.

5. Empirical Studies on AI impact in libraries

The researchers conducted a quantitative investigation into the impact of AI learning, digital literacy, and

information stewardship on employee learning outcomes within the research and development department. Many regression-based studies found that artificial intelligence improved information energy. (Bo Yu. (2024). Technological competence has increased due to the adoption of AI in libraries.(Gao Penglong, Mustapa Fara Diva, Zhao Xue, & Zhou Yangyang. (2024).

AI refers to programming and developing computers to perform tasks that require human intelligence, such as speech recognition, decision-making, visual perception, language translation, and speaker recognition.(Irizarry-Nones, A., Palepu, A., & Wallace, M. (2017)Interviews organized by Springer Nature with 27 research librarians working in Europe, North America, and India revealed diverse views on the use of AI. The librarians emphasized three main ways in which they adopt generative AI tools for practical purposes in their everyday tasks.(Saskia Hoving)

In a study of Indian Libraries, the authors found that AI tools, such as smart shelving and optical character recognition, are among the technologies already adopted in Indian libraries.(Subaveerapandiyan, A. and Gozali, Alfian Akbar. 2024)

These studies conclude that exposure to artificial intelligence learning and practical learning are positively correlated with learning outcomes. (Ling Pu, Jun Liang, Jingkun Wang, Ning Zhang, & Weiping Zhong. (2024). The Impact of AI-Based Learning, Digital Literacy, and Information Stewardship on Learning Outcomes. Profesional De La información, 33(5).

6. Ethical Frameworks for AI in Libraries

As artificial intelligence (AI) becomes increasingly integrated into library services, ethical considerations are crucial in guiding its responsible implementation and usage. Ethical frameworks for AI in libraries are grounded in core principles that govern the development, deployment, and use of AI technologies (Saeidnia, 2023). These principles are informed by ethical theories, including utilitarianism, deontology, and virtue ethics, as well as legal and regulatory frameworks. Key ethical principles include:

- **Privacy:** Libraries must safeguard patron privacy and confidentiality, ensuring that AI technologies respect individual autonomy and comply with relevant data protection laws. This includes minimizing data collection, implementing robust security measures, and obtaining informed consent for the processing of data.

- **Fairness and Equity:** AI algorithms should be designed and implemented to promote fairness, equity, and non-discrimination. Libraries must mitigate biases in AI systems that could perpetuate or exacerbate existing inequalities based on race, gender, or socioeconomic status.

- **Transparency:** Libraries should strive for transparency in AI systems, explaining how algorithms work, what data they use, and how decisions are made. Transparency fosters trust and accountability, enabling users to understand and scrutinize the actions of AI technologies.

- **Accountability:** Libraries must establish mechanisms for accountability and redress in cases of harm or misuse arising from AI technologies. This includes assigning responsibility for AI systems, monitoring their performance, and providing avenues for recourse for individuals affected by them.

Applying ethical frameworks for AI in libraries requires a multifaceted approach that encompasses policy development, stakeholder engagement, and ongoing monitoring and evaluation. Libraries can integrate ethical considerations into AI initiatives through the following strategies:

- Libraries should conduct ethical impact assessments to identify potential risks, biases, and ethical implications of AI technologies before deployment. This process involves engaging with diverse stakeholders, including library staff, patrons, and community members, to assess the' social, cultural, and ethical implications of AI applications.

- Libraries should develop and adhere to ethical guidelines and codes of conduct that outline the expected behaviors and responsibilities related to AI technologies. These guidelines should address data privacy, algorithmic transparency, and bias mitigation, providing clear standards for ethical decision-making and accountability.

- Libraries should prioritize staff training and education on ethical considerations related to AI technologies. This includes raising awareness of ethical principles, providing guidance on ethical decision-making, and offering resources to address ethical dilemmas in practice.

7. Best Practices in AI Implementation in Libraries

Artificial Intelligence (AI) technologies hold great promise for revolutionizing library services, offering opportunities to enhance access, efficiency, and user experience. However, successful AI implementation in libraries requires careful planning, consideration of ethical implications, and adherence to established best practices. Supporting this, Mupaikwa (2025) states that adopting a user-centric design approach is the foundational best practice in AI implementation in libraries. Libraries should prioritize understanding the needs, preferences, and behaviors of their patrons when developing and deploying AI technologies. This includes conducting user research, soliciting feedback, and iteratively refining AI solutions to align with user expectations and enhance the overall user experience.

Furthermore, ensuring the privacy and security of patron data is crucial in the implementation of AI in libraries. Libraries must establish robust data privacy policies and security protocols to protect sensitive patron information from unauthorized access, misuse, or breaches (Hodonu-Wusu, 2024). This includes implementing encryption, access controls, and data anonymization techniques to safeguard patron privacy while leveraging data to improve AI algorithms and services.

Transparency and explainability are essential principles in the implementation of AI, particularly in contexts where AI systems make decisions that impact users (Enakrire & Oladokun, 2023). Libraries should strive to make AI algorithms and processes transparent and understandable to patrons, explaining how AI technologies work, what data they use, and how decisions are made. This fosters trust, accountability, and user confidence in AI-driven library services. Going further, Subaveerapandiyan(2023) states that other ethical practices in the use of AI in libraries:

- Libraries must actively identify and mitigate biases that may be present in AI systems, particularly those that could perpetuate or exacerbate existing inequalities based on factors such as race, gender, or socioeconomic status. This includes implementing bias detection tools, diversifying training data, and incorporating fairness metrics to assess and mitigate bias in AI algorithms.

• AI implementation in libraries should be accompanied by continuous monitoring and evaluation to assess the impact, effectiveness, and ethical implications of AI technologies over time. Libraries should establish mechanisms for ongoing assessment and feedback, soliciting input from patrons, library staff, and stakeholders to identify areas for improvement and address emerging ethical challenges or concerns. This iterative approach enables libraries to adapt and refine AI solutions in response to changing user needs and technological advancements.

• Building staff capacity and expertise in AI technologies is crucial for the successful implementation and operation of AI systems. Libraries should invest in staff training and professional development programs to equip librarians and staff with the knowledge, skills, and competencies necessary to leverage AI technologies in their roles effectively. This includes training on ethical considerations, data management practices, and technical skills related to AI development, deployment, and maintenance.

7.1 Exemplifying Libraries Adopting AI in Africa

Several African libraries have adopted AI technologies to enhance their services and operations.

• **University of Pretoria Library**: Libby is the name of the robot at the University of Pretoria's library. Libby is an autonomous robot designed to assist users in locating and retrieving books and other materials within the library. It features sensors and navigation technology that enable navigation through the library's aisles and respond to user requests for specific items. Libby represents an innovative application of robotics and AI to enhance library services and improve user experiences.

• **Carnegie Library of Alexandria (Egypt):** The Carnegie Library of Alexandria has implemented AI-powered recommendation systems to suggest books and resources to users based on their reading preferences and past borrowing history. These recommendation systems utilize machine learning algorithms to analyze user behavior and provide personalized recommendations.

• **Kenya National Library Service (Kenya):** The Kenya National Library Service has employed AI for cataloging and organizing library collections. AI algorithms automate book classification and tagging, making searching for and accessing relevant materials easier for users.

Several libraries and academic institutions in Nigeria have also begun incorporating AI technologies to enhance their services and operations.

• **University of Lagos Library:** The University of Lagos Library has implemented AI-powered systems for resource discovery and retrieval. These systems use machine learning algorithms to analyze user queries and recommend relevant books, articles, and other materials from the library's collection. For example, the Robot Scholar was introduced to the UNILAG library in 2020.

• **Covenant University Library:** Covenant University Library has utilized AI for digitization and preservation of rare and valuable manuscripts and documents. AI technologies such as document recognition and classification are employed to digitize and archive historical materials, ensuring their long-term preservation and accessibility.

• **National Library of Nigeria:** The National Library of Nigeria has adopted AI-driven cataloging and indexing systems to organize and manage its vast collection of books and documents. These systems use machine learning algorithms to automate the classification, tagging, and metadata extraction processes, making it easier

for users to search and access library resources. The National Library of Nigeria has launched Boldscholar, an AI-powered E-library platform with Indigenous contents, managed by Boldscholar Research Limited, an education technology company in Nigeria.

8. Conclusion

The integration of artificial intelligence (AI) technologies in libraries represents a significant advancement with profound implications for information access, user experience, and library services. Given the position of this paper, it is evident that AI offers libraries opportunities to enhance efficiency, personalize services, and improve decision-making processes. However, amidst these opportunities, it is crucial to underscore the importance of ethical considerations in AI integration to ensure that these technologies are deployed responsibly and in alignment with the core values of librarianship. The paper further explored various ethical principles and frameworks that guide the navigating the complexities of AI implementation in libraries.

The paper alsoemphasizes that ethical considerations are crucial in protecting the rights and well-being of library patrons and stakeholders. Moreover, as libraries serve diverse communities with varying needs and perspectives, it is essential to adopt inclusive and equitable approaches to AI integration that prioritize accessibility, diversity, and social responsibility. Furthermore, the integration of AI in libraries holds tremendous potential to enhance the delivery of information access and services. Still, it also presents ethical challenges that must be addressed with vigilance and integrity.

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