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Article

Artificial Intelligence in Libraries: Between Innovative Practices and the Challenges of Library Education

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Abstract: This study examines aspects concerning the contributions of Artificial Intelligence in the context of Library Science practices and education. Its objective is to analyze, in light of the literature, how AI tools can be integrated into the processes of information organization, representation, retrieval, and mediation in libraries. This is a bibliographic, documentary, exploratory, and descriptive study with a qualitative approach, using sources such as: Oasis br, SciELO, CAPES Journals Portal, BRAPCI, Web of Science, and Google Scholar. The results present a set of AI contributions to the practices of information organization, representation, retrieval, and mediation, including: classification of informational materials; automation of cataloging and indexing practices; (semi-)automatic creation of abstracts; identification and management of metadata; development and updating of terminological control instruments (thesauri, ontologies, etc.); personalized search; intelligent recommendation systems; and mediation in the information search process. This text discusses the challenges of applying AI in libraries, such as the high cost of acquiring and maintaining tools and the scarcity of specialized technical skills. It presents a set of thematic approaches that can be considered in an Artificial Intelligence program for undergraduate Library Science students, including fundamental, practical, ethical, and formative aspects. It concludes by reaffirming that Artificial Intelligence is a transformative resource for libraries, fostering their advancement and renewal of services.

Keywords: Artificial Intelligence; Generative AI; libraries; Library Science; library training.

Inteligência Artificial em bibliotecas: entre a inovação das práticas e os desafios da formação bibliotecária

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Resumo: Estuda aspectos concernentes às contribuições da Inteligência Artificial no contexto das práticas e do ensino em Biblioteconomia. Tem como objetivo analisar, à luz da literatura, como as ferramentas de IA podem ser integradas aos processos de organização, representação, recuperação e mediação da informação em bibliotecas. Utiliza como metodologia a pesquisa bibliográfica, documental, exploratória e descritiva, com abordagem qualitativa, utilizando fontes como: Oasis br, SciELO, Portal de Periódicos CAPES, BRAPCI, Web of Science e Google Acadêmico. Apresenta como resultados um conjunto de contribuições da IA para as práticas de organização, representação, recuperação e mediação da informação, dentre elas: classificação de materiais informacionais; automação das práticas de catalogação e indexação; criação (semi)automática de resumos; identificação e gerenciamento de metadados; desenvolvimento e atualização de instrumentos de controle terminológico (tesauros, ontologias, etc.); busca personalizada; sistemas de recomendação inteligentes;mediação no processo de busca da informação. Discute acerca dos desafios para a aplicação da IA nas bibliotecas como o alto custo para adquirir e realizar a manutenção das ferramentas a escassez de competências técnicas especializada. Apresenta um conjunto de enfoques temáticos que podem ser contemplados em uma disciplina sobre Inteligência Artificial voltada para o curso de graduação em Biblioteconomia, incluindo aspectos fundamentais, práticos, éticos e formativos. Conclui reafirmando que a Inteligência Artificial é um recurso de mudança para as bibliotecas, favorecendo o avanço e a renovação dos seus serviços.

Palavras-chave: Inteligência Artificial; IA generativa; bibliotecas; Biblioteconomia; formação bibliotecária.

Inteligencia Artificial en bibliotecas: entre la innovación de las prácticas y los desafíos de la formación bibliotecaria

Resumen: Este estudio examina aspectos relacionados con las contribuciones de la Inteligencia Artificial en el contexto de las prácticas y la enseñanza de la Biblioteconomía. Su objetivo es analizar, a la luz de la literatura, cómo las herramientas de IA pueden integrarse en los procesos de organización, representación, recuperación y mediación de la información en las bibliotecas. La metodología empleada es bibliográfica, documental, exploratoria y descriptiva, con un enfoque cualitativo, utilizando fuentes como Oasis br, SciELO, CAPES Journals Portal, BRAPCI, Web of Science y Google Scholar. Los resultados presentan un conjunto de contribuciones de la IA a las prácticas de organización, representación, recuperación y mediación de la información, que incluyen: clasificación de materiales informativos; automatización de prácticas de catalogación e indización; creación (semi)automática de resúmenes; identificación y gestión de metadatos; desarrollo y actualización de instrumentos de control terminológico (tesauros, ontologías, etc.); búsqueda personalizada; sistemas de recomendación inteligentes; y mediación en el proceso de búsqueda de información. Este texto aborda los desafíos de la aplicación de la IA en las bibliotecas, como el alto costo de adquisición y mantenimiento de herramientas y la escasez de personal técnico especializado. Presenta una serie de enfoques temáticos que pueden considerarse en un curso de Inteligencia Artificial para estudiantes de Biblioteconomía de pregrado, incluyendo aspectos fundamentales, prácticos, éticos y formativos. Concluye reafirmando que la Inteligencia Artificial es un recurso transformador para las bibliotecas, que impulsa el avance y la renovación de sus servicios.

Palabras-clave: Inteligencia Artificial; IA generativa; bibliotecas; Bibliotecología; formación bibliotecaria.

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1 Introduction

Libraries are central spaces in the preservation, organization, and dissemination of knowledge, historically acting as mediators between information and society. More than mere repositories of knowledge, these institutions ensure democratic access to information, promoting social, educational, and cultural inclusion. Over the centuries, they have established themselves as guardians of collective memory, playing a strategic role in civic development and the fostering of critical thinking.

The advent of the digital age has significantly transformed information landscape. The digitization of collections, the development of digital repositories, and the integration of emerging technologies have radically altered the operational dynamics of libraries and their interaction with their users. This evolution has required the service restructuring and the continuous updating of professional skills, demanding mastery of new tools and the ability to meet new needs.

Digital transformation is not only a challenge, but also an opportunity for libraries to expand their social role, optimize and renew practices, and remain relevant in a world increasingly driven by information and automation. Technology, especially Artificial Intelligence (AI) tools, emerges as an ally in the process of modernization, operational efficiency, and redefinition of information services. By integrating automated solutions, AI not only accelerates processes but also improves quality of decisions and service personalization, ensuring a faster response to user demands.

Al-Aamri and Osman (2022) state that AI represents one of the most significant and recent technological innovations, causing a major transformation in the activities of various institutions, generating remarkable results in the fields of library science and information science. This disruption is not limited to the automation of routine tasks but redefines the paradigms of information retrieval and mediation. By integrating machine learning algorithms and natural language processing, libraries transcend physical support, allowing for predictive data analysis and unprecedented personalization in meeting users' informational needs.

In general, AI tools refer to the ability of computer systems to mimic some aspects of human intelligence, such as reasoning, learning, decision-making, and problem-solving. When applied to the library ecosystem, this capability materializes into solutions that transcend conventional automation.

According to Russell and Norvig (2013), there are three fundamental areas of AI:

machine learning, which allows systems to learn from data and improve their performance without being programmed to do so; Natural Language Processing, which enables machines to understand, interpret, and generate human language; and Artificial Neural Networks, which replicate how the human brain works and are capable of recognizing complex patterns and performing very powerful analyses.

These resources have been employed in tools and systems aimed at automating processes, personalizing experiences, and expanding the analytical and responsive capabilities of institutions, including libraries. From this perspective, understanding these basic technologies allows for a clearer view of AI's potential to transform both librarians' professional practice and the services offered to society.

Given the above, this research aims to analyze, in light of the literature, how AI tools can be integrated into the processes of organizing, representing, retrieving, and mediating information in libraries.

The relevance of this study lies in the pressing need to reassess library practices from an AI perspective, which requires a redefinition of strategies aimed at optimizing the intellectual work of librarians and expanding democratic access to knowledge.

2 Methodological procedures

This research is characterized as bibliographic, documentary, and descriptive, with a qualitative approach. Data collection was carried out through a survey and analysis of scientific publications, focusing on the identification of concepts, debates, and theories related to the use of AI in libraries.

To collect information on scientific publications, the following sources were consulted: Oasis br, SciELO, CAPES Journals Portal, BRAPCI, Web of Science, and Google Scholar. The search strategy used the descriptors "Artificial Intelligence" and "libraries," as well as the combination of the first term with the expressions "information organization," "information retrieval," "information mediation," and "information services."

The searches were conducted using descriptors in Portuguese and English, between April and May 2025. The time frame encompassed publications from 2019 to 2025. This study is justified by the expansion of the topic in Information Science in recent years.

Initially, 225 publications were retrieved. After applying the exclusion criteria —duplication, inadequate periodicity, restricted access, and thematic deviation (AI outside the scope of information organization, representation, and retrieval) — 212 works

were discarded. The final sample consisted of 13 articles. It was observed that most of the excluded publications addressed general AI or related areas, such as Law, Marketing, and Data Science, as well as reference and accessibility services.

For the thematic identification of scientific productions, the ABNT NBR 12676 standard was applied. The standard guides the analysis of documents, the determination of subjects, and the selection of indexing terms. According to this guideline, document comprehension should be based on rigorous technical reading, ensuring that no essential data is omitted. From this perspective, the following were systematically examined: title and subtitle, abstract, table of contents, introduction, illustrative elements (tables and diagrams), and highlighted terms. After this screening stage, a critical reading of the studies was carried out, selecting those that demonstrated direct articulation with the object and analytical scope of this investigation.

Based on this process, studies that presented a direct connection with the theme and analytical scope of this investigation were selected and cited, based on the criteria of relevance and pertinence.

Additionally, the investigation encompassed the mapping of digital ecosystems for prospecting specialized tools. This last step resulted in the identification of technological solutions capable of enhancing the practices of organization, representation, and retrieval, as well as systems focused on information mediation. Consulting these sources was fundamental to correlating the theoretical basis with the practical applications available on the market, offering an updated overview of the technologies that can be integrated into librarians' daily practice. It is noteworthy that the prospecting of these tools was carried out through systematic searches on specialized websites, using the Google search engine and the descriptors "Artificial Intelligence tools AND information organization", "Artificial Intelligence tools AND information representation", "Artificial Intelligence tools AND information retrieval", and "Artificial Intelligence tools AND information mediation". Furthermore, Chat GPT (GPT-5.5), developed by Open AI was employed as a complementary resource to identify and map Artificial Intelligence tools applicable to the research context.

This research also assumes a descriptive character by detailing, based on theoretical and documentary contributions, the contributions of AI to information services. As Gil (2002) explains, descriptive research aims to delineate the characteristics of a given phenomenon or reality, allowing the observation of relationships and patterns. In the context of this study, this approach enables the identification of how intelligent

technologies reconfigure routines and workflows in libraries.

Finally, the adoption of a qualitative approach enabled a critical and contextualized examination of the collected material. As Gil (2002) argues, this method prioritizes the depth of analysis over statistical measurements and is ideal for investigations focused on understanding meanings and social practices. Within the scope of this research, qualitative bias favors reflection on the impacts of AI on information flows, allowing for a multidimensional analysis that encompasses aspects from the optimization of library practices and user experience to informational autonomy and the ethical dilemmas to be faced by professionals in the field.

Based on the methodological procedures mentioned above, the analysis and discussion of the results obtained through this research is presented below.

3 Artificial Intelligence in Library Science: Impact on Practices and professional education

Artificial Intelligence (AI) has moved beyond a theoretical concept and has become the driving force behind a profound transformation in multiple fields of knowledge. Although its academic roots date back to the mid-20th century, the field has reached an unprecedented turning point thanks to the convergence of increased computing power and the massive availability of data (Big Data).

This scenario reached a critical inflection point with the launch of ChatGPT by OpenAI in November 2022. The tool not only popularized access to the technology but also triggered a collective awakening in various sectors of society, from the corporate environment to the education system. The impact was so immediate that it transformed public perception of AI, shifting it from seen as a futuristic promise to becoming a ubiquitous resource for assistance and automation.

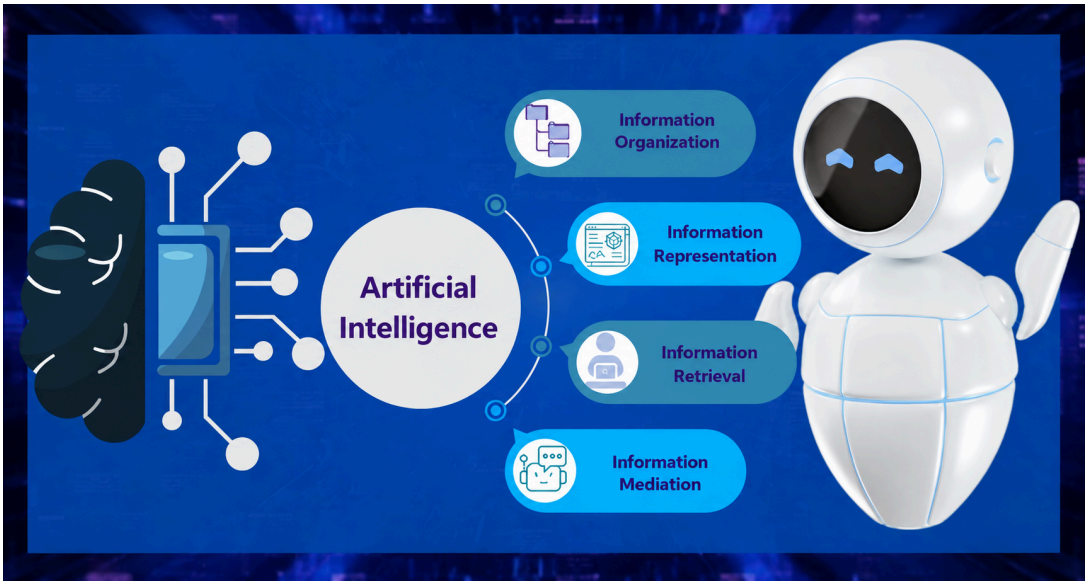
At the core of this revolution is Generative Artificial Intelligence, a sophisticated approach that stands out for its ability to create, not just analyze. Based on neural network architectures such as the Transformers, this technology is trained on massive datasets to identify deep patterns and structures. From this learning, AI becomes capable of producing original and coherent content, encompassing texts, images, audio, and programming code, adapting precisely to the application domain requested by the user (Coneglian et al., 2023).

Technological evolution in libraries has been marked by continuous

transformations aimed at enhancing access to information and facilitating technical processes and information services. These transformations range from the automation of catalogs with integrated management systems to the use of virtual librarians, which are also reflected in changes in user behavior and ways of seeking knowledge.

The relationship between AI and library practices is two-way - both benefit from and reinforce each other. Figure 1 below illustrates the main contributions of AI, based on the literature in the field.

Figure 1 – Contributions of AI to library practices



Source: Prepared by the authors.

The mapping and critical reading of scientific literature provided a broader understanding of the potential uses of AI in libraries, including processes ranging from information organization, representation and retrieval to mediation initiatives focused on user experience. The results demonstrate that the adoption of AI-based technologies not only improves operational efficiency of libraries, but also transforms how information is accessed, represented, shared, and preserved.

Within information organization and representation, AI tools can be applied to automate and optimize the time required for activities such as cataloging, indexing, classifying, and abstracting documents. The use of algorithms capable of interpreting and processing large volumes of text, intelligent systems can identify keywords or themes that frequently appear, helping to speed up content description and representation.

Traditionally, cataloging and indexing require theoretical and technical knowledge, as well as time from the librarian. AI, through Natural Language Processing (NLP) and

Machine Learning techniques, can significantly automate these activities through tasks such as identifying and managing metadata; generating subjects and descriptors as suggestions; automatic classification, among others.

Sandes and Neves (2024) state that the application of specialized systems and AI algorithms improves the organization and representation of library collections using different resources. AI can contribute with the use of algorithms that examine the contents of documents, identify their keywords, classify materials, and even suggest descriptors based on natural language patterns. Furthermore, the importance of AI assistance for the development and updating of terminological control instruments that enable information representation practices is highlighted.

Creating and maintaining terminological control tools manually is a time- and resource-intensive process, requiring in-depth linguistic and domain knowledge. AI, through NLP and Machine Learning, can automate and accelerate steps such as automatic term extraction; identification of semantic relationships; normalization and disambiguation; and monitoring of new terminological updates in the domain.

These results reinforce the idea that human intelligence remains indispensable for semantic validation, ambiguity resolution, conceptual curation, and ensuring that Knowledge Organization Systems (KOS) accurately reflect the nuances and complexity of knowledge for users. In this scenario, AI acts as a powerful assistant, accelerating the process and improving efficiency, but it is the expert 's intelligence that ensures the coherence and conceptual quality of the system.

Following this line of reasoning, Caetano (2024), for example, conducted a comparative study between the KOS MEKOS (Mineral Knowledge Exploration System), developed for the field of Mineral Exploration in a stricto sensu master's degree context and a system created by Generative Artificial Intelligence. The research revealed that Generative AI can optimize mechanical tasks in some steps, but it does not replace the intellectual contribution of the domain modeler.

Tait and Pierson (2022, p. 266) state that “Near future applications of AI in LIS research and practice will likely rely on cataloguing and metadata to execute such tasks as collections and subject analysis, among others.” This premise highlights that the effectiveness of algorithms is conditioned by the quality of the input data, reinforcing the librarian's role as a data architect. Without structured, standardized, and semantically rich metadata, AI systems lose the ability to make precise connections, which makes cataloging not just a technical task of description, but the fundamental basis for predictive

intelligence and semantic information retrieval.

According to Kim (2019, p. 17), “many tasks in cataloging, abstracting, and indexing that are currently performed by skilled professionals may be automated by AI applications as they become more sophisticated.” In this scenario, AI sophistication allows professionals to focus on more complex activities, such as data curation, ethical analysis of algorithms, and the resolution of terminological ambiguities that machines are not yet fully capable of deciphering. Thus, automation mentioned by Kim (2019) does not negate the professional's qualification but requires it be redirected towards quality control and strategic information mediation.

Conversely, Cox (2021) argues that, as AI advances replace the manual production of metadata, significant consequences emerge for library practice and the set of skills traditionally associated with the field. In other words, automatizing this process may reduce the scope for the exercise of conventional skills, directly impacting the librarian's profile and imposing an urgent renewal of qualifications.

From this perspective, Cox's (2021) concerns converge with the dissertation by Sousa and Fujita (2025), who emphasize the urgency of implementing continuous training programs aimed at adapting librarians to emerging technologies, particularly AI. This training should not be seen merely as technical learning, but as a fundamental condition for professionals to redefine the indexing process in an automated environment. By mastering AI tools, librarians cease to be threatened by automation and begin to act in the curation and refinement of these systems, ensuring the semantic precision that the machine, in isolation, cannot yet achieve. Therefore, the evolution of skills is what ensures the relevance of operations such as indexing as an intellectual and scientific practice, maintaining human protagonism in knowledge management.

Souza and Fujita (2025, p. 6) further emphasize that “AI is ready to progressively assume a role of great relevance for librarians, who, with the resources available, have the possibility of developing practice even more geared towards satisfying the needs of users [...]”.

This paradigm shift suggests that by delegating repetitive technical processing to algorithms, librarians gain the necessary availability to act in a consultative and empathetic manner. In this new scenario, the focus shifts from physical custody and bureaucratic organization to qualified mediation and the architecture of learning experiences. Thus, AI not only optimizes time but also enhances reference services, providing the library with opportunities to offer personalized services, such as on-demand

content curation and research support at levels of depth that would be unfeasible without technological assistance.

Regarding information retrieval, AI tools enable a more proactive and personalized search experience. Intelligent recommendation systems (such as e-commerce systems and streaming platforms, for example) are being integrated into digital catalogs and repositories, offering content based on users' browsing history and past behaviors.

“A real-time recommendation system could train itself based on user interactions to identify which types of content they are likely to engage with and which ones they will reject” (Cox; Mazumdar, 2022, p. 6). This functionality represents an evolutionary leap in information retrieval, as it allows the system to learn from the user's implicit behavior (such as clicks, reading time, and previous searches) to anticipate research needs. In library practice, this means that information mediation is personalized on a large scale, offering the user a much more fluid discovery path. However, this automation requires librarians to curate algorithms, ensuring that personalization does not create "information bubbles" or misinformation, and that collection diversity continues to be represented in an ethical and balanced way.

Although AI promotes a profound transformation in information retrieval, its implementation does not diminish the relevance of the librarian; on the contrary, it reaffirms their essential role (Cox, 2021). This overcoming is based on the premise that, although AI possesses a processing capacity unattainable by humans, it lacks discernment. Contextual and ethical commitment to informational diversity. By positioning AI as a support tool, and not as a replacement, the librarian reaffirms their relevance as a mediator capable of auditing algorithmic results, mitigating biases, and ensuring that technology serves democratic access, transforming a potential threat into an infrastructure for empowering reference services.

In the ecosystem of contemporary libraries, the integration of AI enhances the performance of digital libraries, databases, and institutional or research data repositories. This technological infrastructure enables users to benefit from specialized services remotely, overcoming geographic and temporal barriers. Beyond ubiquitous access, AI acts as a fundamental agent of social inclusion by enabling assistive technology resources, such as automated text reading, voice command interfaces, and audio description of images for visually impaired users. Additionally, the use of augmented reality and the automatic translation of documents in multiple languages democratize knowledge, ensuring that information reaches an increasingly broad and diverse audience.

Generative AI has profoundly altered how information is produced, distributed, and consumed, acting as a double-edged sword in knowledge mediation. On one hand, it acts as a powerful mediator, capable of synthesizing massive volumes of data, translating languages in real time, and personalizing learning for different levels of understanding. This capability facilitates democratic access to technical information, enabling lay users to understand complex concepts through adapted explanations, functioning as a bridge between raw knowledge and practical utility.

However, this same technical efficiency amplifies the phenomenon of disinformation on an industrial scale. The ease in creating synthetic content (such as persuasive texts, photorealistic images, and audio and video deepfakes) reduces the cost of news production. False information makes it extremely challenging to distinguish from reality. Unlike past manual disinformation campaigns, AI can generate endless variations of the same rumor, adapting the tone and argument to different psychological niches, which saturates the information ecosystem and hinders the work of fact-checking agencies.

In the context of user support, the implementation of AI-based virtual assistants and chatbots has become a common practice. Unlike traditional Frequently Asked Questions (FAQ) systems, which operate on static structures, these tools use Natural Language Processing (NLP) to interpret complex requests and provide instant, personalized responses. The differentiating factor of these assistants lies in their continuous learning capability (machine learning); by interacting with the public, the systems refine their algorithms, making information mediation progressively more effective, accurate, and aligned with the specific needs of each user.

“We can easily imagine the AI-powered digital assistant mediating a library user’s information search, discovery, and retrieval process, directly interacting with library systems and applications” (Kim, 2019, p. 17). An example of AI application in this scenario is the virtual assistant Lívia, launched in 2020 by the Library of the Federal University of Ceará (UFC), more specifically at the Crateús Campus Library, which operates on social networks providing continuous and accessible information support. This innovation does not replace the librarians but helps to extend their service capacity and expand support hours for the public.

However, a critical aspect of mediation is the tendency language models have to present "hallucinations," providing incorrect information with an unquestionable tone of authority. As these tools are designed to be statistically convincing, they can invent facts,

dates, and bibliographic references. This results in a new digital literacy challenge - the user not only needs to know how to search for information but also must develop functional skepticism to validate the veracity of everything mediated by algorithms, at the risk of blindly trusting an automated synthesis.

For better understanding, an illustration summarizing the main contributions of AI to library practices of information organization, representation, retrieval and mediation mentioned above is presented:

Figure 2 - Axes of library science practices that can benefit from AI



Source: Prepared by the authors.

In this sense, synergy between library practices and AI not only optimizes operations but also transforms user experience, ensuring that libraries remain fundamental pillars in knowledge access in the digital age. In this scenario, the joint action of librarians and AI is crucial, as the professional's technical and humanistic knowledge is indispensable for guiding AI systems' development, ethical implementation, and curation, ensuring that the technology truly serves the informational and social needs of users.

In general terms, it is noticeable that integrating AI tools into the library ecosystem promotes a structural transformation in operational dynamics and in delivering value to users. Far from representing a threat to the relevance of librarians, AI is consolidating itself as a strategic ally, acting as a catalyst that enhances and optimizes the information lifecycle. This technological symbiosis allows library practices to transcend conventional technical processing, evolving towards more predictive, inclusive, and personalized

information management. Thus, technology does not replace human intellectual capital, but expands it, enabling the institution to respond quickly to the complex demands of contemporary society.

The following chart, for example, presents a set of tools and their respective functions for application in the context of libraries.

Chart 1 - Artificial Intelligence tools applicable in library services

TOOL	APPLICATION IN THE LIBRARY	COST OF USE
CatalogerGPT	Creates MARC records in MarcEdit format from book content provided as images, text, or PDF files. It can also determine Library of Congress subject headings, LC classification, and Dewey call numbers.	It's free and operates as an application within ChatGPT.
Melvin Dewey 3.0 CDD	Developed to assist librarians, students, and information professionals in classifying books and documents using the Dewey Decimal Classification (CDD)	Free and operates as a Custom GPT application within ChatGPT
UDC Classifier	Designed to assist librarians, catalogers, and information professionals in applying the Universal Decimal Classification (UDC) to books and other materials. Simplifies the complex UDC categorization process, aiding library cataloging.	Free and operates as a Custom GPT application within ChatGPT
HuggingFace	Automatic classification, summarization, sentiment analysis	Free and open-source, it can be model hosting or external APIs.
NLTK/ Spacy	Tokenization, lemmatization, morphosyntactic analysis, entity recognition	Free and open-source. Local use incurs no costs, except in cases of external integration.
TensorFlow/ PyTorch/ Keras	Model training for collection classification and reading recommendation.	Free and open-source. Potential costs when using advanced computing infrastructure (e.g., cloud-based GPUs).
Scikit-Learn	User data analysis, recommendation systems, and interest clustering.	Free and open-source. Potential costs when using advanced computing infrastructure (cloud GPUs).

Source: Adapted from Maciel et al. (2024) and based on the analysis of the ChatGPT tools.

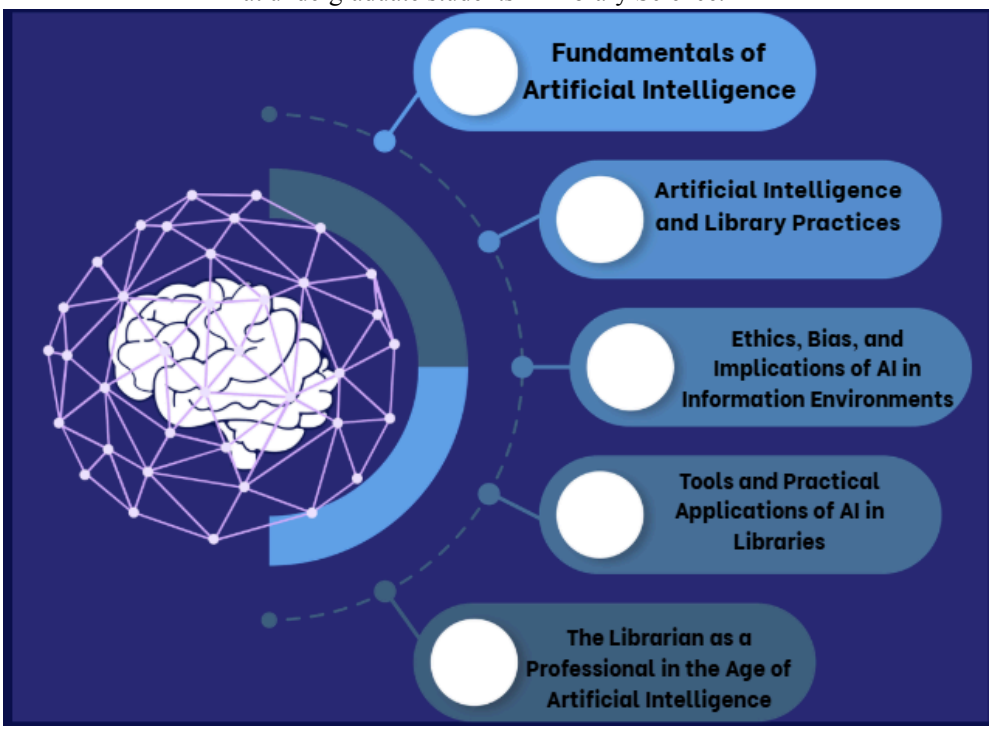
Despite the AI contributions mentioned above in this section, some analyzed studies also expose challenges to AI application in libraries. Among the main barriers is the high cost of acquiring and maintaining AI tools. “for example, licensing a third-party platform is expensive so access is premised on having available budget. So, resource richness would be a factor in choices as well” (Cox, 2023, p. 377). This financial limitation points to the risk of creating a "technological gap" between libraries with different levels of funding. Institutions with restricted budgets may be left behind in innovations, hindering the modernization of their services and perpetuating disparities in access to quality information. In this context, the dependence on proprietary and high-cost platforms reinforces the need for discussions about investment in open-source solutions and interinstitutional partnerships to enable the implementation of intelligent technologies in a more equitable and sustainable way.

Furthermore, the scarcity of specialized technical skills is one of the main obstacles to AI adoption in libraries, since the lack of internal expertise limits tool customization and development to meet the informational needs of users. This knowledge gap often imposes an external dependence on IT departments or private suppliers, which may compromise pedagogical and technical autonomy of the library.

Given this scenario, the education of future librarians must transcend operational instruction of ready-made platforms. That the academic curriculum should actively incorporate the study of algorithmic principles, critical data analysis, and the governance of automated information. By fostering a deep understanding of how technologies are built, the degree empowers the professional not only to utilize AI, but also to lead the development of innovative and ethical solutions, ensuring that the library maintains its leading role in curating knowledge.

Therefore, the structured and intentional integration of AI into curricula transcends technical learning; it's about shaping a resilient professional capable of leading the digital transformation in libraries. This academic update ensures that librarians become critical managers capable of aligning technological innovation with the ethical values of the profession. To operationalize this transition, Figure 2 presents a proposal of thematic axes that may underpin the syllabus of an AI course applied to Library Science, balancing technical, managerial, and humanistic competencies:

Figure 3 - Set of thematic approaches that can be considered in a course on Artificial Intelligence aimed at undergraduate students in Library Science.



Source: Prepared by the authors.

Regarding the fundamentals of AI, future library professionals should understand AI concepts and its main tools such as Machine Learning, Deep Learning, Natural Language Processing, and Computer Vision, as well as the history of AI and its development phases. This topic may also cover issues related to labor market transformations, privacy, security, and the role of information.

Regarding the intersection between AI and library practices, it is crucial to understand AI not as an isolated tool, but as a cross-cutting support that enhances various areas of activity. This technology optimizes core processes, spanning from knowledge organization and representation to information retrieval and mediation. Furthermore, its impact extends to strategic areas such as accessibility (promoting a more inclusive library) and support for managerial decision-making, where the analysis of large volumes of data underpins more assertive institutional choices aligned with user demands.

Additionally, the curriculum should incorporate a critical dimension regarding ethics, algorithmic biases, and the socio-technical implications of AI in informational environments. This axis should deepen the debate on data privacy and algorithmic transparency, addressing accountability for automated decisions. Moreover, it is essential to investigate how training data may introduce or amplify systemic biases, distorting representation and neutrality in information retrieval. Complementarily, the syllabus should address the challenges of generative AI in content production and the ambivalent

role of technology in both the propagation and combating of misinformation, empowering librarians to act as ethical mediators in a complex digital ecosystem.

The proposed curriculum also suggests the practical exploration of AI tools and applications, through the presentation of relevant platforms and systems, such as those previously mentioned. This approach should be enriched by the analysis of real-world use cases and the study of successful implementations in national and international libraries, enabling the critical understanding of operational challenges faced by these institutions.

Finally, the syllabus should foster discussions about the librarian's profile as a strategic agent in the AI age. This implies elucidating the need for emerging skills that reposition them as data curators, algorithm analysts, AI project managers, and defenders of ethical principles. In this sense, the importance of interdisciplinarity is highlighted, promoting solid partnerships with data scientists, developers, and IT specialists. Complementarily, the librarian takes a fundamental pedagogical role in AI literacy , guiding users towards a conscious, critical, and proficient use of these new technologies.

Chart 2 below presents a summary of the proposed content that may to be included in a core AI course in undergraduate Library Science programs:

Chart 2 - Summary of the proposed contents to be covered in a course on Artificial Intelligence within Library Science curricula.

THEMATIC APPROACHES	CONTENTS
Fundamentals of Artificial Intelligence	AI concepts and its core tools (Machine Learning, Deep Learning, Natural Language Processing, and Computer Vision), along with the history of AI and its stages of development. Transformations in the labor market, privacy, security, and the role of information.
Artificial Intelligence and Library Practices	Diverse activities that can benefit from and be optimized with AI support: information organization, representation, retrieval, mediation, digital preservation, collection management, accessibility, and decision-making support.

Ethics, Algorithmic Biases, and the Implications of AI in Information Environments	Data privacy, algorithmic transparency, accountability, implications of training data for introducing or amplifying bias, as well as its impact on information representation and retrieval; implications of Generative AI in content creation and usage; the role of AI in the spread of and fight against disinformation.
Tools and Practical Applications of AI in Libraries	Overview of AI platforms and libraries relevant to application in information units, alongside the analysis of successful implementations and challenges of AI in national and international libraries.
The Librarian as a Professional in the Age of Artificial Intelligence	Importance of developing new competencies such as data curation, algorithm analysis, AI project management, and ethical advocacy. Importance of partnering with data scientists, developers, and Information Technology specialists, as well as the librarian's role in educating users about AI.

Source: Prepared by the authors.

The proposed course aims to train librarians capable of leading the digital transformation, understanding the logical principles of technology and being able to critically evaluate its sociocultural implications and contribute to its development ethically and efficiently.

4 Final Considerations

It has been observed that AI provides the necessary technological resources to enhance information services, optimizing the cycle that encompasses tasks spanning from knowledge organization and representation to its retrieval and personalized user mediation. The integration of these technologies is not limited to the pursuit of operational efficiency; it redefines the paradigms of information representation, access, sharing, and preservation, ensuring that libraries operate dynamically and responsively in the face of the complexity of the contemporary digital landscape.

This research has identified a two-way relationship between AI and library practices, where both benefit from and reinforce each other. Regarding AI potential for library practices, contributions related to information organization and representation, retrieval, and mediation were highlighted.

Despite the observed advantages, AI implementation within libraries presents

significant challenges that transcend the technological barrier. The high cost of acquisition and continuous maintenance of platforms represent considerable financial barriers, often aggravated by complex ethical dilemmas regarding privacy and transparency. In addition, the shortage of professionals with specialized technical skills constitutes a critical bottleneck; this gap in qualified human capital not only delays the adoption of intelligent systems but also hinders innovation and the development of new processes and tools in the library context.

Given this scenario, a reassessment of Library Science curricula becomes imperative, aiming to align them with the rapid pace of technological transformations that are reshaping information services, fostering digital, ethical, critical, and analytical skills in future professionals.

As a follow-up to this research and aiming to deepen the understanding of the topic, the following future studies are recommended: a diagnostic analysis of Library Science curricula in Brazil, aiming at mapping the inclusion of courses focused on Artificial Intelligence; the performance of empirical tests to validate the applicability of the syllabus proposed in this study; and an investigation of the practical implementation of AI in Brazilian academic and public libraries. Additionally, surveys should be conducted on librarians' perceptions and level of digital literacy in order to identify barriers and opportunities from adopting these technologies in daily professional life.

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