Collaborative Cataloging with AI: An Experimental Study on OpenAI's ChatGPT-3.5

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Abstract

The paper introduces a proposed approach to machine cataloging through cooperation between the ChatGPT-3.5 AI model and human catalogers. The experimental method was employed. There were three samples: ChatGPT-3.5, ten catalogers, and a mixed sample. Participants were tasked with creating MARC records for twelve books following specific prompts. Speed, accuracy, and efficiency were tested. Generated records underwent both automated and human validation. Findings revealed that ChatGPT-human collaboration is more efficient than the sole ChatGPT and human groups in cataloging. Some errors were detected: invalid field formats, incorrect indicator data, and length discrepancies. The study examined the efficacy of generating bibliographic MARC records for books while excluding other types of information resources or metadata standards. While participants had positive experiences with AI collaboration, concerns were raised about potential shifts in future cataloging roles. The proposed approach helps reduce the cost of building library catalogs and frees librarians' time for other tasks. The paper reports errors in the generated records, assisting developers in refining AI algorithms. It serves as a roadmap for catalogers, indicating where AI reliance is suitable and where human intervention remains vital. The study introduces a pioneering approach and provides valuable insights for the future of cataloging practices.

Keywords:

Collaborative Cataloging, ChatGPT-3.5, Artificial Intelligence, MARC21, Chatbots.

1. Introduction

A chatbot, a chatterbot or smartbot, is a computer program that facilitates human-machine interaction through audio or messaging channels [1]. Among the most recent and efficient chatbots, ChatGPT has made a significant impact on the academic community. It was developed by OpenAI and formally launched on November 30, 2022 [2]. The acronym GPT stands for "Generative Pre-trained Transformer". This advanced deep learning model has achieved the fastest milestone in history by reaching 100 million monthly users, sparking a virtual arms race in adopting AI chat products [3].

Considering the intricate nature of processes in libraries and information institutions, there is considerable potential for applying AI services in enhancing and streamlining library services [4]. The emergence of ChatGPT is a vast opportunity that libraries and information institutions must exploit to facilitate many processes. As highlighted by Oyelude and Adetoun A. [5], ChatGPT has the potential to assist with technical and reader services, including addressing basic reference inquiries, navigating the library website, and aiding in Cataloging, classification, research, and collection development. Nevertheless, the potential risks of inaccurate query responses, limited comprehension, misuse, and overreliance on technology emphasize the need to view ChatGPT as a supplementary tool rather than a replacement for human librarians.

In library Cataloging, ChatGPT can play a pivotal role in streamlining the process by automating tasks that traditionally demand substantial time and effort. Additionally, it offers avenues for advancing

professional resources to keep libraries abreast of contemporary technologies. Specifically, the model excels in extracting essential metadata elements and can proficiently generate comprehensive records aligning with various metadata standards, including MARC records [6].

2. Objectives of the study

Artificial intelligence models, especially ChatGPT, have highlighted remarkable proficiency in natural language processing. The incorporation of AI into the Cataloging process presents the opportunity to automate specific tasks, consequently streamlining workflows and enabling human catalogers to concentrate on more advanced activities, including critical review and quality assurance.

Despite the remarkable capabilities of ChatGPT in creating MARC records, recent studies [6];[7];[8] have proven that humans are indispensable in reviewing these records. Human oversight is crucial to ensure that the records are devoid of biases and align with the specific policies of each library.

The current study aims to harness the potential of artificial intelligence while addressing the limitations and challenges inherent in its application in Cataloging and metadata generation. The researcher introduces the concept of "collaborative Cataloging with AI," a novel term in library and information science. This concept entails a collaborative approach between human cataloguers and artificial intelligence models in creating library catalogs adhering to metadata standards. By leveraging human expertise and AI capabilities, this collaborative cataloging approach emerges as a promising paradigm for tackling various challenges in the machine cataloging field.

The study's specific focus is to assess the collaborative capabilities of the ChatGPT3.5 AI model alongside human catalogers in creating MARC records. The research involves evaluating the quality and accuracy of records generated through this mixed collaboration. Additionally, the study aims to uncover the perspectives and experiences of human catalogers participating in this experiment, shedding light on their insights regarding the capabilities, limitations, and potential challenges of this collaborative approach.

The objectives of the study can be succinctly summarized as follows:

- Examine the collaborative dynamics between human librarians and ChatGPT-3.5 in the cataloging process.

- Assess the effectiveness of ChatGPT-3.5 in generating accurate and contextually relevant metadata for library resources.

- Evaluate the efficiency gains and potential challenges of integrating AI in collaborative cataloging workflows.

- Contribute insights and recommendations for the integration of AI in library cataloging practices.

3. Research Questions

The study seeks to investigate whether ChatGPT3.5 can generate high-quality MARC records alone or whether the cataloging task requires cooperation between human catalogers and AI models. The study seeks to address the following sub-questions in order to answer this question:

- Can ChatGPT3 serve as a Co-cataloger?

- To what extent does the collaborative Cataloging approach with ChatGPT-3.5 enhance the quality of metadata output?

- What is the comparative efficiency and speed of the collaborative Cataloging process in contrast to traditional human Cataloging methods?

- What challenges and limitations are associated with the collaborative Cataloging approach, and how can these be addressed to optimize the integration of AI in library technical processes?

4. Literature Review

Many recent studies have addressed various applications for artificial intelligence, especially ChatGPT, in libraries and information institutions. Sanji, Behzadi, and Gomroki (2022) [9] represented the feasibility of using chatbots in different sections of libraries. The researchers systematically reviewed articles within the chatbot domain, seeking to delineate the practical applications of chatbots within libraries and information institutions. The study's findings revealed that while some libraries have begun

integrating chatbots, their implementation still needs to be improved. The researchers stressed the imperative for libraries to harness the capabilities of this potent AI tool to enhance user satisfaction. Despite the advantages of employing chatbots, the study highlights several challenges librarians must navigate in embracing this technology.

Adetayo (2023) [10] investigated the possibilities and challenges of using artificial intelligence chatbots, particularly ChatGPT, in academic libraries. The research methodology involved sourcing literature from Google Scholar and Scopus database-indexed journals. This comprehensive review assesses the potential benefits and drawbacks of employing ChatGPT in academic library settings. The study identified that ChatGPT could support technical and reader services within academic libraries, including tasks such as addressing basic reference inquiries, facilitating navigation of the library website, and aiding with research, Cataloging, classification, and collection development. However, the research also highlights certain risks and limitations associated with ChatGPT, including the potential for inaccurate query responses, misuse, limited comprehension, input constraints, and a dependence on technology. As a result, the researcher suggested that ChatGPT should be considered a complementary technology rather than a replacement for human librarians.

In a recent study, Lappalainen and Narayanan (2023) [11] developed a tailored chatbot named Aisha for Zayed University Library in the United Arab Emirates. This chatbot's development is achieved by utilizing the Python programming language and the ChatGPT API. Aisha is specifically designed to offer prompt and efficient reference and support services to students and faculty beyond the library's regular operating hours. The study's findings underscored the significant positive impact of employing ChatGPT as a coding assistant during the project, particularly in enhancing the coding process. The results hint at the potential for a surge in new solutions based on generative models like GPT in the coming months. The study highlighted the need for user-friendly tools, accessible documentation, and standardized practices. These elements are crucial for facilitating the creation of applications based on large language models, ensuring that the benefits of advanced AI technologies are accessible and effectively utilized across diverse

domains. The study anticipates that advancements in these areas will contribute to the continued evolution and widespread adoption of generative AI in various applications.

In February 2023, Chen, X. [12] conducted a comprehensive evaluation of ChatGPT by subjecting it to various library references and article writing prompts. The primary objective was to compare the answers from ChatGPT with those from conventional library chatbots. Furthermore, the paper highlighted potential insights and lessons that the library community could extract from past transformative technological shifts, drawing parallels with examples like Google and the emergence of Web 2.0.

Lund and Wang (2023) [8] provided an in-depth overview of critical concepts related to ChatGPT. The paper adopted a comprehensive approach, featuring an interview with ChatGPT to explore its potential impact on academia and libraries. The interview delved into various aspects, discussing the advantages of ChatGPT in areas such as enhancing search and discovery, reference and information services, Cataloging and metadata generation, and content creation. Furthermore, the paper addressed ethical considerations, including privacy and bias. The study revealed that ChatGPT has significant potential to advance academia and librarianship in groundbreaking and challenging ways. The benefits discussed encompass improvements in search and discovery processes, reference services, metadata generation, and content creation. However, the paper emphasizes the importance of responsible and ethical use of this technology. It calls attention to the need for professionals to collaboratively engage with ChatGPT to enhance their work while highlighting the potential risks associated with unchecked use.

Another study by Houston and Corrado (2023) [7] explored the profound implications of ChatGPT in academic libraries. The findings showed that ChatGPT proves valuable for reference interviews on fundamental questions and can offer introductory insights into complex topics; its use as a substitute for human expertise on nuanced or detailed inquiries is cautioned. ChatGPT's shortcomings include occasional inaccuracies, a lack of access to real-time library holdings, and challenges in identifying scholarly sources. Nevertheless, the technology's potential extends to assisting in metadata creation,

particularly in the realm of descriptive metadata for library items. Despite the benefits, the risks associated with AI warrant careful consideration, including potential employment concerns for librarians and staff, financial implications, social considerations, and privacy and functional risks. As the field of AI text generation rapidly evolves, it is imperative for information professionals to actively engage with these technologies, adapting their practices to meet the evolving landscape while keeping ethical values at the forefront.

A study by Panda, S. and Kaur, N. (2023) [13] investigated the feasibility of employing ChatGPT-based chatbot systems as substitutes for conventional knowledge-based chatbot systems in Library and Information Centers (LICs). Employing a qualitative research approach, the researchers conducted a comprehensive literature review and interviewed library and information science experts. The findings suggest that ChatGPT-based chatbot systems offer a viable alternative in LICs, providing more accurate and personalized responses to user inquiries, enhancing user experience, and easing the workload of library staff.

Oyelude (2023) [5] investigated the applications of ChatGPT in research work, emphasizing its benefits and drawbacks. The research delved into using ChatGPT as a tool for supporting scholarly writing. While positive applications were identified, such as its role as a preparatory writing tool, the study highlights potential drawbacks, notably the lack of source verification for the information provided. Despite its limitations, libraries, and librarians acknowledge the advantages of utilizing ChatGPT in specific contexts.

Only one study by Brzustowicz (2023) [6] has investigated the use of ChatGPT in library catalogs according to metadata standards. The researcher evaluated ChatGPT's potential for six items by providing the model with the title and comparing the ChatGPT-generated records to those available on OCLC's WorldCat. The researcher recommended conducting future studies to assess the utilization of AI-generated MARC records on a broader catalog scale.

Based on previous recommendations, the current study complements the research by shifting the focus from ChatGPT's standalone cataloging

capabilities to collaborative cataloging between AI and human catalogers. The objective is to leverage ChatGPT's demonstrated strengths while addressing potential obstacles that could hinder the realization of maximum benefits from human-machine collaboration. Furthermore, the paper incorporates in-depth analytics and introduces different findings that prove technical errors in the structure of ChatGPT3.5-generated records, which serves as a valuable tool for libraries and offers valuable insights for researchers and practitioners in the field.

5. Methodology

The study adopted the experimental method to investigate the collaborative cataloging between the ChatGPT-3.5 AI model and human catalogers. The focus was on ChatGPT-3.5's ability to create book MARC records, excluding other information resources. Participants were categorized into three samples (AI, human, and mixed). Participants were tasked with creating MARC records for twelve books the researcher had explicitly chosen from the Library of Congress catalog. Three tests were conducted: efficiency, accuracy, and speed, followed by automatic and human validation of the outputs. Personal interviews were conducted with the human catalogers to gather insights into their perspectives on the collaboration with the AI model. To ensure a balanced perspective, ChatGPT-3.5 was also queried.

The samples, the tests, and the validation tools are shown in Figure 1:
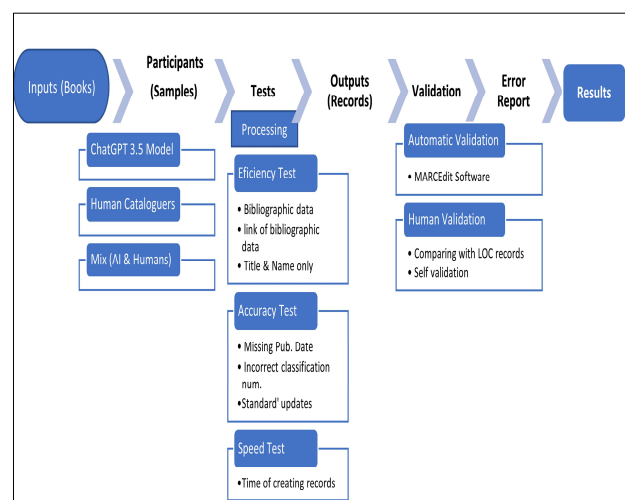

Figure 1 Study design flowchart

5/1 Samples

The experiment included three distinct samples:

AI Sample: Utilized the accessible free version of ChatGPT-3.5, released by OpenAI on November 30, 2022 [14].

Human Sample: Consisted of ten catalogers with at least three years of experience in the MARC 21 standard.

Mixed Sample: A collaborative mix of human catalogers and ChatGPT-3.5.

The goal of selecting the three samples was to investigate whether the ChatGBT3.5 model could do the cataloging task alone, whether human catalogers would provide more high-quality outputs, or whether collaboration between humans and AI would be the ideal model.

Specific prompts were provided to both human catalogers and the ChatGPT-3.5 model. Human catalogers were instructed to collaborate with the AI model, leveraging their expertise to involve inputting relevant bibliographic data and ensuring the records' contextual accuracy and completeness. Concurrently, ChatGPT-3.5 was prompted to collaborate with human catalogers by any specific guidelines or requirements provided, and it responded as follows: as follows:

> "Absolutely! I'm ready to collaborate on creating MARC 21 records for your scientific experiment. Please provide the details of the items you'd like to catalog, and we can begin the process. Feel free to include any specific guidelines or requirements you have for the records."

5/2 Tests

The quality of the generated MARC records was evaluated through three tests:

5/2/1 Efficiency Test

The efficiency test was designed to measure ChatGPT3.5's proficiency in creating MARC records in three stages:

First, the human catalogers were asked the ChatGPT3.5 model to:

> "Generate a MARC record for the following bibliographic data for a book, considering writing the name of fields, indicators, subfields and their symbols according to the MARC 21 standard: (the bibliographic data)".

The researcher extracted the bibliographic data for the books from the LOC catalog. The same prompt was repeated for five English books. The selection of these books aimed to ensure diversity in the bibliographic data, testing the model's proficiency in handling both mandatory and optional MARC fields. Table I provides details on the chosen books along with their respective links in the LOC catalog:

Table I The books sample

N.	Title	Author	LOC' Record Link
1	**Alan Turing: the enigma**	Hodges, Andrew	https://catalog.loc.gov/vwebv/holdingsInfo?searchId6061&recount25&recPointer0&bibId18316148
2	**Robots in academic libraries**	Iglesias, Edward	https://catalog.loc.gov/vwebv/holdingsInfo?searchId6107&recount25&recPointer5&bibId17572410
3	**Deadly medicine**	Susan Bachrach	https://catalog.loc.gov/vwebv/holdingsInfo?searchId6144&recount25&recPointer5&bibId15987165
4	**Food politics**	Paarlberg, Robert L.	https://catalog.loc.gov/vwebv/holdingsInfo?searchId6203&recCount25&recPointer9&bibId23078103
5	**RLG Digital Image Access Project**	Patricia A. McClung	https://catalog.loc.gov/vwebv/holdingsInfo?searchId5627&recPointer5&recCount25&bibId1644111

Second, ChatGPT3.5's ability to extract bibliographic data from online catalogs was tested. The links to the other five books in the LOC catalog were provided to the human catalogers, who asked the ChatGPT3.5 model to:

> "Generate a MARC record for the following book link: (the link)"

Third, ChatGPT3.5 was asked to create MARC records for "Shakespeare's Play of the Tempest" and the "Harry Potter series" without providing them with

bibliographic data other than the title and author to assess their original cataloging capability.

5/2/2 Accuracy Test

The accuracy test assessed the model's capacity to identify and fix errors, uncover missing bibliographic data, and adapt to ongoing updates in the MARC21 standard. Intentional scenarios were applied, including missing the publication date for Book No. 1, providing an incorrect classification for Book No. 2, and testing knowledge of recent updates to gauge familiarity with the MARC21 standard (Update No. 35 on December 20, 2022, Update No. 36 on June 20, 2023, and Update No. 37 on December 20, 2023) [15].

5/2/3 Speed Test

The speed achieved through the proposed collaborative model was monitored by counting the time spent generating each record.

5/3 Validation tools

Generated records underwent both automated and human validation to ensure adherence to MARC standards:

Automated validation utilizes the MARC Validator tool integrated into the MARCEdit software, a freely accessible library metadata editing tool [16]. MARCEdit is a multifaceted suite encompassing tools for data acquisition, updating, management, and validation [17].

Human validation involved comparing records with those available in the LOC catalog. The researcher, with three years of experience as a MARC record quality controller, also conducted manual validation of the outputs.

6. Findings

The paper presents a proposed approach to streamline the machine Cataloging process for libraries and information institutions by exploiting the potential of artificial intelligence models. This approach addresses concerns related to bias, ensuring a more comprehensive dataset in alignment with each library's policy.

The findings revealed the noteworthy quality of the ChatGPT-3.5-generated records. While human catalogers may introduce errors during the input or description, AI consistently avoids such inaccuracies. However, one participant expressed the inability of AI to accurately perform some critical tasks, such as determining a book's subject, without cataloger input or accessing relevant data in online open catalogs. ChatGPT-3.5 has also expressed that it may face challenges in accurately interpreting nuanced Cataloging rules, especially in complex or ambiguous cases.

Examination through the MARCEdit software revealed some things that could be improved in the ChatGPT-3.5-generated records, including invalid field formats, incorrect indicator data, and length discrepancies in the MARC records. Further human analysis and correction may be required to ensure compliance with MARC standards. ChatGPT-3.5 has expressed that his records may need to be customized further based on specific requirements and the MARC 21 standards for each institution or project. Table II shows reports exported from the MARC Validator software:

Table II MARC Validator Report

Num.	Errors reported by Marc Validator
R 1	050-Invalid field format; invalid characters present between the indicator and first subfield: 0$aQA29.T8$bH63 2014. 050-ind2: Invalid data (\) Indicator can only be 04.
R 2	008: Length appears to be invalid. Reported length is: 38. Expected length: 40 050-Invalid field format; invalid characters present between the indicator and first subfield: 0$aZ675.U5$bR615 2013. 050-ind2: Invalid data (\) Indicator can only be 04.
R 3	008: Length appears to be invalid. Reported length is: 37. Expected length: 40 050-Invalid field format; invalid characters present between the indicator and first subfield: 0$aHQ755.5.G3$bD43 2004. 050-ind2: Invalid data (\) Indicator can only be 04.
R 4	Critical Error: Leader does not appear to be present at the start of the record. 008: Length appears to be invalid. Reported length is: 4. Expected length: 40

	050-Invalid field format; invalid characters present between the indicator and first subfield: 0$aHD1415. 050-ind2: Invalid data (\) Indicator can only be 04.
R 5	050-Invalid field format; invalid characters present between the indicator and first subfield: 0$aZ692.P5$bR55 1995. 050-ind2: Invalid data (\) Indicator can only be 04. 010: Has been marked as a non-repeating field.

The table clearly summarizes the errors identified during the automated validation of MARC records. This comprehensive breakdown facilitates a systematic understanding of the areas that need attention and correction in each record. The "critical error" in Record 4, indicating the leader's absence at the start of the record, is particularly noteworthy, indicating a fundamental problem with the structure of the record. Validating these errors will ensure that the MARC records comply with cataloging standards. The table is a valuable tool for catalogers and data managers to prioritize and streamline the correction process.

The study investigated ChatGPT-3.5's capabilities, revealing that when provided with the title and author of a book, the model can access bibliographic data from online library catalogs, contingent upon data availability. However, a limitation emerged as ChatGPT-3.5 needs access to external URLs or specific web pages. In cases where the data is not open-access, the human cataloger plays a pivotal role by providing the complete bibliographic data to the model, enabling ChatGPT-3.5 to create the MARC record subsequently, emphasizing how cataloging is a collaborative process and highlighting the mutually beneficial interaction between human expertise and the AI model.

Regarding the accuracy of the ChatGPT3.5 and its ability to detect incomplete data, the results revealed that it could detect incompleteness, even providing warnings that missing data should be completed and providing an example of how to write it in the MARC record. The results also revealed his ability to detect errors and point them out. However, the study emphasized ChatGPT3.5's limitations in incorporating updates post-January 2022, indicating the necessity for awareness regarding potential standard amendments beyond this date. So, ChatGPT-

3.5 occasionally generates responses that sound plausible but may need to be corrected or nonsensical [18]. It must implement the modifications introduced in MARC21 updates issued after January 2022. When it was asked about these updates, it answered:

"As of my last knowledge update in January 2022, I don't have specific details on MARC 21 Updates No. 35, No. 36, and No. 37. My training data includes information up to that date, and I don't have real-time capabilities or access to databases that would contain the latest updates."

Interviewees confirmed the pivotal role of cataloger-provided bibliographic data in influencing ChatGPT-3.5's output quality. One interviewer confirmed that the quality of the ChatGPT-3.5 output depends primarily on the quality and completeness of the bibliographic data provided by the cataloger. Another interviewer indicated that ChatGPT-3.5 had helped him not only in creating MARC records but also in many technical tasks, such as extracting the classification number of a specific topic and Romanizing Arabic names for Arabic books.

Remarkably, the study disclosed ChatGPT-3.5's extraordinary speed, creating a MARC record in an average of only one second, compared to 10 to 20 minutes for human catalogers. The time spent generating MARC records can vary depending on the length and complexity of the bibliographic data. Collaborative Cataloging further expedited the process, requiring only one to two minutes for AI creation and human review, substantially reducing time compared to manual methods. Simplifying the process of cataloging and metadata generation, with cooperation between humans and artificial intelligence, will lead to the ease and speed of creating catalogs for libraries and information centers, and this is expected, in turn, to reduce costs.

Participants unanimously expressed positive experiences with AI collaboration, stressed that working with artificial intelligence was exciting and interesting, helped them immensely in simplifying the task and speeding up its completion, and gave them more time for other tasks. The intuitive interface and user-friendly interaction facilitated a smooth collaborative process. Participants unanimously emphasized the necessity of human oversight in the Cataloging process. ChatGPT-3.5 was seen as a

valuable assistant but not a replacement for human expertise. A final review by human catalogers was crucial to ensuring the integrity and accuracy of the Cataloging records. Despite the advantages, concerns were voiced about the future of their jobs, as they expected some jobs to disappear shortly and other jobs to appear.

7. Discussion

The study discussed the cooperation between the ChatGPT3.5 AI model and human catalogers in the cataloging process. The experimental examination of three samples has proved the effectiveness of the collaborative cataloging approach rather than depending totally on AI. Results demonstrated that while the ChatGPT3.5 model can efficiently produce high-quality MARC records; human oversight remains crucial for ensuring accuracy and compliance with library policies. These findings align with recent studies [6]; [7]; [8], emphasizing the indispensable role of humans in reviewing cataloging records. The AI model can't import bibliographic data from databases or export records directly to online catalogs. These tasks must be performed by a human cataloger, who must review and modify incorrect or incomplete data himself, most notably adding the leader tag (LDR) per his library policy.

Although Brzustowicz's (2023) study [6], which is most relevant to the current study, did not report technical errors in the AI-generated records, the current study detected some errors outlined in a report. This technical report may help the model's developers with future technological advancements. Furthermore, the researcher believes integrated library systems will depend on AI algorithms shortly. Hence, this study helps systems analysts and designers discover the technical errors that AI models may fall into, which may help develop more sufficient systems. The study also serves as a roadmap for library catalogers, delineating areas where reliance on the ChatGPT model is viable and human intervention is necessary.

The generalizability of the results is limited to the ChatGPT3.5 ability to generate MARC bibliographic records for books. Future research should investigate the AI's capabilities in dealing with other information sources and metadata standards while addressing privacy concerns and assessing the

AI's impact on library staff roles and user access to collections.

This study contributes to the ongoing discourse on AI applications in libraries, offering practical insights for optimizing the cataloging process. It also advances the theoretical understanding of human-AI collaboration. It highlights the complementary nature of human and AI capabilities in cataloging, prompting further exploration of ethical and social dimensions in library practices.

8. Conclusion

The study conducted an experimental examination of the effectiveness of collaborative cataloging with the AI ChatGPT3.5 model. The study's primary goal is to ascertain if libraries can rely only on ChatGPT3.5's capabilities or if cooperation between AI and human catalogers is necessary. The findings showed that ChatGPT-human collaboration is more efficient than the sole ChatGPT and human groups in cataloging. These findings underscore the promising potential of integrating AI technologies into library workflows, enabling cost-effective cataloging and freeing librarians' time for other tasks.

In conclusion, the study supports collaborative cataloging using AI as a more effective model than traditional human methods, guaranteeing improved quality, efficiency, and speed. It unveils a promising future for machine cataloging, where the fusion of human and artificial intelligence capabilities results in high-quality outcomes tailored to the requirements of libraries and information institutions.

Acknowledgment

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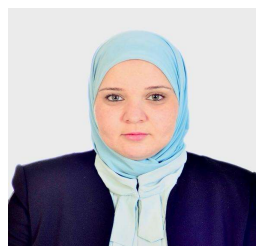
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