Review Article

Unlocking the potential of ChatGPT in academic libraries

Abid Hussain [1]*

[1]*Depty Director Library, Institute of Strategic Studies Islamabad, Islamabad, Pakistan*

A B S T R A C T

This paper provides an overview of Generative Pretrained Transformer (GPT) and its application in academic libraries. Utilizing a qualitative approach to content analysis, this study synthesizes existing scholarship and addresses gaps in the literature. The scope and utility of ChatGPT in academic libraries are explored, revealing its potential to function as an intelligent virtual librarian. ChatGPT's implementation can alleviate the workload of librarians and effectively address complex queries from patrons. Additionally, the study highlights ChatGPT's ability to offer personalized assistance and research guidance through its natural language processing capabilities, enabling seamless communication with users. ChatGPT aids patrons in discovering resources that would typically demand significant effort from library staff. Despite its advantages, the study identifies areas for improvement, such as data security, dependence on technology, and the risk of providing incomplete or inaccurate information on specialized and complex topics. Nonetheless, ChatGPT emerges as a noteworthy tool for academic libraries in the current century. This paper contributes valuable insights into ChatGPT and offers practical guidelines for library practitioners globally. The content is derived from peer-reviewed research and serves as a comprehensive resource for librarians worldwide.

1. Introduction

Emerging technologies have altered the way of teaching and learning. Because of these advancements, academic librarians now need users' experience in the evolving landscape of information explosion. Owing to their needs, librarians across the globe are experimenting with cutting-edge technologies (Hussain, 2023).[1] With the advancement of technology, a wide range of innovative technologies has been introduced over the years. These include the Internet of Things, Big Data, Blockchain Technologies, Virtual Reality, RFID, Augmented Reality, and Artificial Intelligence (Hussain, 2020).[2]

Among these technologies, artificial intelligence has gained remarkable attention in the last few years. Different sectors utilized the applications of AI to transform their businesses and educational materials (Shihab et al. 2023).[3] AI compares an individual's pace against others using machine learning, deep learning, and sophisticated analytics. As AI technologies advance, they can identify gaps in instruction and education and increase educational capacity (Yamson, 2023).[4] AI is capable of performing multiple different duties for academic libraries. Libraries have used artificial intelligence (AI) applications to raise the level of their offerings. In academic libraries, AI offers a practical and effective means of dispersing knowledge and responding to user inquiries, improving results (Banerjee, 2022).[5] Thus, AI has made academic libraries more productive and efficient (Yamson, 2023).[4]

Libraries can use AI to provide reliable information in their time of need and can act as a valuable tool to integrate readers and libraries (Hussain, 2021),[6] In their

* *Corresponding author.*
E-mail address: abidhussain@issi.org.pk (A. Hussain).

study, Cox et al. (2023)[7] discovered that libraries of both developed and developing countries use the services of Global Positioning System (GPS), allowing users to locate material quickly existing in the libraries. Similarly, in one of his studies, Hussain, A. (2023)[8] ascertained that advanced countries have connected GPS to their library websites to facilitate users with exact rack numbers and sections to find their desired material without wasting time. Popular social media networks, like Facebook, Snapchat, Twitter, LinkedIn, etc., use AI to draw customers' attention to products launched in various sectors. Libraries in both developed and developing countries utilize social media applications to attract potential users and use them for marketing purposes (Hussain, 2023).[9] Similarly, radio frequency identification (RFID) devices best exemplify AI. RFID is integrated with Modern library software, which protects the library's contents from loss and theft.

In the last ten years, notable breakthroughs have been made in developing AI-based chatbots. Libraries worldwide utilize AI technology to offer maximal information to their scholars in the time of their needs (Lappalainen and Narayanan, 2023).[10] Hamburg University Library was the first academic library to launch the Stella project Chatbot in Europe (Allison, 2012).[11] Similarly, the University of Nebraska-Lincoln Libraries introduced the AI-based chatbot Pixel in the United States in February 2011. It was built with PHP code and a SQL server to provide data-driven responses to inquiries about the resources and services offered by the library (McNeal & Newyear, 2013).[12]

In the evolving landscape of libraries from clay tablets to e-tablets, libraries around the world are experimenting with new technology like AI, Chatbots, and similar kinds of large models and innovative tools like ChatGPT have become a vital factor of the advanced libraries. The GPT has a paramount impact on library services in the evolving technology landscape and libraries are embracing these technologies to fulfill the changing needs and expectations of their students, faculty members, and scholars associated with their organizations. Leveraging innovative applications like Chatbot, ChatGPT and similar kinds of applications will undoubtedly enhance the services in more smooth and sophisticated ways. Library staff can enhance their ability to provide exceptional services to their patrons and cater to the evolving technology landscape. It is assumed that incorporating advanced technology like AI exclusively ChatGPT will be the innovative services of contemporary libraries of the 21st century. This paper paper is an attempt to encompass the prospects and challenges of ChatGPT while implementing it in library services.

2. What is ChatGPT ?

With the release of ChatGPT during the past two years, generative AI has made tremendous strides. ChatGPT is an AI-powered chatbot that creates unique material by responding to simple or complex commands. A chatbot is a computer software designed to mimic human-user communication, particularly on the internet (King, 2022).[13] Generative Pretrained Transformer (GPT) is a machine-learning model that can comprehend and produce language similar to humans using supervised and unsupervised learning approaches (Radford et al., 2018). Kirmani (2022)[14] explains ChatGPT as a public tool created by OpenAI which operates on the GPT language model technology (Jeblick et al, 2023).[15] This chatbot is extremely intelligent and can handle a variety of text-based requests. It can respond to basic inquiries and carry out more complex jobs like writing thank-you notes and assisting people in having difficult conversations about productivity problems (Liu et al. 2021). ChatGPT has potential use in various sectors of the information industry, including "Discovery search interface, research, reference, information literacy, digital literacy, data literacy, copyright, academic writing, and plagiarism" (Cox & Tzoc, 2023).[16]

3. ChatGPT- Some Key Concepts

ChatGPT is a component of various other applications and each application has its functions and features:

1. **Attention mechanism:** ChatGPT uses this application as a neural network to make predictions on the input data. This application allows ChatGPT to handle long-range dependencies. It also brings coherence to conversation and produces accurate and contextual responses to the query being asked. It also responds in more effective ways to a wide range of languages (Liu et al. 2021).

2. **Chatbot:** It is a computer program for the simulation of conversation with human users (King, 2022).[13] The basic purpose of a chatbot is to offer substantial benefits across diverse applications. It provides immediate, context-aware responses through intelligent means. In library services, Chatbot was initially deployed in Kornelia in Bern, Switzerland back in 2010 (McNeal & Newyear, 2013).[12] In the United States, it was launched in Mentor Public Library earlier in 2010. Similarly, libraries in Central Europe also incorporated Chatbot in 2012 (Allison, 2012).[11] The services of Chatbot were highly appreciated by the libraries in advanced countries for their immediate answers to questions about library services and resources.

3. **Generative model:** The purpose of the Generative model is to generate new ideas from the input data. This model generates human-like text in a given context. Similarly, this model goes under extensive pretraining on vast text to learn the intricacies of different languages like semantics, contextual relationships, grammar, etc. It can also be used to

produce coherent input data (Pavlik, 2023).[17]

4. **Multimodal Neurons:** This application plays a significant role in advancing the capability of ChatGPT to integrate information from different models like text and images. This model responds quickly like human neurons to different types of input data. Under this model, the feedback of the system gives both visual and textual information accurately without errors (Hussain, 2021).[6]

5. **GPT:** This model responds in a human-like language for supervised and unsupervised learning techniques. It is based on machine learning and is known as the most powerful model to understand the input and respond to it like a human. GPT is powerful for various natural language processing tasks and applications GPT function in ChatGPT enables the model to understand and generate human-like text, making it a powerful tool for various natural language processing tasks and applications (Radford et al. 2018).

6. **Language model:** The role of the language model is as powerful as GPT itself. Under this model of AI all human languages that have been fed in the ChatGPT are given answers in a similar human language in which questions are asked. This model also enables ChatGPT to produce an appropriate response asked by the users. In short, it underpins ChatGPT's natural language understanding and answer capabilities. Enables ChatGPT to produce coherent and contextually appropriate responses across various applications, from casual conversation to detailed content creation. Overall, the language model underpins ChatGPT's natural language understanding and generation capabilities (McNeil et al. 2022).

7. **Natural Language Processing (NLP)**: It is the field of AI that broadly depends on algorithms to interpret and analyze human language. This model answers human queries by extracting useful information with extracted meanings from text speech etc. (Hussain, 2023).[8]

8. **Neural network:** This model is composed of interconnected processing nodes that have been trained to perform different tasks. This is a machine-learning neural network and its purpose is to perform specific tasks to interconnect multiple layers of neurons to process and generate human-like text. This model also predicts the next word in a coherent manner (Bishop, 1994).[18]

9. **Supervised fine-tuning:** It is a machine learning technique in which a retrained model is trained to answer difficult queries. It also ratifies the performance of specific tasks (Bishop, 1994).[18]

10. **Transfer learning:** It is a very useful model of an AI machine and works like a knowledge tool. It can gain knowledge from tasks to improve its performance

on the other side. It answers the related queries and capable the GPT to answer quickly from one text to another (Pan & Yang, 2010).[19]

11. **Unsupervised pretraining:** It is also a machine learning technique of pretraining to train on a large dataset without any labeled examples. This model can be used to develop a deep understanding of language, which can utilized for specific tasks after fine-tuning. (Bishop, 1994).[18]
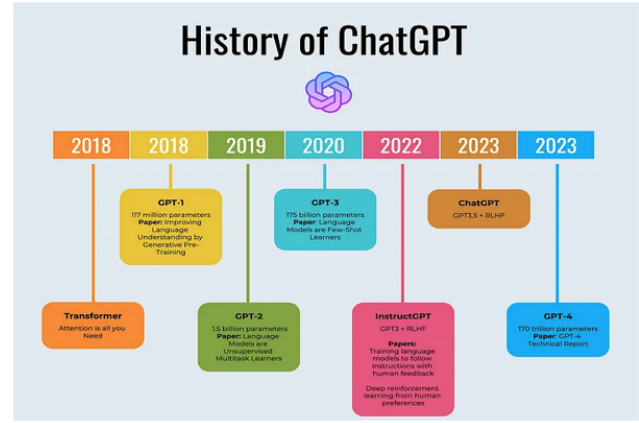
ChatGPT Timeline

Figure 1: History of ChatGPT *Source:* Ross graves (2023)[20]

Open AI has contributed numerous applications to Artificial Intelligence and its developmental phases; nonetheless, the release of ChatGPT will remain a remarkable step in the history of Generative AI. Here are the various phases of ChatGPT (Figure 1):

1. **GPT-1:** The first application of OpenAI appeared in June 2018 known as ChatGPT-1. This model was the first transformer-based language model with more than 117 million parameters. At that time GPT-1 was one of the most prominent language models (Wu et.al, 2023).[21] Initially, books, reading comprehension, semantic similarity, textual alignment, sentiment analysis, and commonsense reasoning were fed to give quick responses to each query. This model brought a tremendous revolution in the history of OpenAI and remains the prominent language model of 2018. There were some loopholes in this model and data scientists worked hard to address this issue on a priority basis (Muhammad, 2023).[22]

2. **GPT-2:** Keeping in mind the loophole of GPT-1 soon after 2018, a new version of GPT-2 was released in February 2019. This language model was more powerful than that of GPT-1 with 1.5 billion parameters. This model was trained with information from the World Wide Web (WWW) in order to perform

broader tasks without any errors, however, soon after the model remained unsuccessful with the passage of time and the Open AI team kept an eye on the loopholes of this model (Kirmani, 2022). [14]

3. **GPT-3:** In 2020, the company with 175 billion parameters released a fine-tuned version of GPT-3. It was considered one of the most powerful language models of that time with more capabilities than that of the previous model. This model was also unsuccessful due to its subjectivity like biased networking etc. The concern was kept in mind by the company and it was made available for public access through an API and some control was retained by the company (Wu et. al,.2023) [21] However this language model was used by third parties to underlying technology instead of releasing the new version. The main goal of OpenAI with this model was to reduce offensive language and provide an accurate answer to the queries asked by humans for their information needs. The other goals included the misinformation of this language model to consider the loopholes for the next version. Soon after this, a new version was introduced for the public named GPT 3.5 that was a fine-tuned version of GPT-3. This model was helpful to generate natural language and code and it was released in November 2022 to identify the Reinforcement Learning from Human Feedback (RLHF). In this version, OpenAI also addressed the malicious issues in order to make it safer for the public (Kalyan, 2023). [23]

4. **GPT-4:** This model was released in March 2023 for paid subscribers and it was the improved version of GPT-3.5, many bugs were removed from the previous model to fulfill the complex tasks and to diminish the frequency of harmful and undesirable responses. The most significant aspect of GPT-4 was to find the context window from around 3000 words to approximately 25,000 words under this version. This version presented more information than that of the previous versions. In this version, the ability was to accept image input with multi-modality to the next level (Kocon et.al,. 2023). [24] The very positive aspect of this model is to understand the inputs and generate the output of each query in multiple formats like text, images, video, code, and audio in more exponential ways and the ability to comprehend the desired input and to answer each query with desired results (Kalyan, 2023). [23] Although ChatGPT-4 is considered the most powerful language model today, however, there are still some concerns, for the review team is working hard to address them. Though the technology has reached its peak still people, have different consensus towards ChatGPT (Flor et al. 2022). [25]

5. **GPT-5:** Since the launch of GPT-4, OpenAI has applied for a trademark of ChatGPT-5 in July 2023.

The United States Patents Trademark Officer (USPTO) has already made the consent, but the CEO of Opeanai Sam Atman has articulated that the company has not yet planned to release its latest version. He further cleared that loopholes and security issues in GPT-4 are undermined and would be addressed in the coming version of GPT-5 Biswas, S. S. (2023). [26]

4. Strategic Plan for Integrating ChatGPT in Academic Libraries

Academic libraries, including both college and university libraries, serve as vital resources for their communities. This section delineates strategic goals for integrating ChatGPT into academic library services (Aithal and Aithal, 2023). [27]

4.1. Goal 1: Enhance user experience and services

The primary objective is to adopt a user-centric approach in deploying ChatGPT services. Recognizing students and faculty as key users, library administration should conduct surveys to collect initial feedback and gauge interest. Libraries must design digital platforms and user interfaces that ensure seamless access to resources. Additionally, library staff should educate users on effectively accessing and evaluating information through organized information literacy programs (Bozkurt, 2023). [28]

4.2. Goal 2: Strengthen collaboration and partnerships

To meet this goal, library administration should establish partnerships with research centers to embed information literacy into the curriculum. Strengthening connections with other libraries will facilitate resource and service sharing. Collaboration with faculty members is crucial to enhance access to specialized research collections. Librarians should also engage with student organizations and stakeholders to align modern technology with library services (Singh, et al. 2023). [29]

4.3. Goal 3: Expand and diversify collections

Library staff should prioritize collection development that aligns with the curriculum and faculty research needs. Investing in digital resources, open-access materials, and educational resources is essential (Rahman and Watanobe, 2023). [30] Libraries should strengthen their acquisition processes to ensure timely access to the latest materials and implement data-driven strategies to optimize resource allocation (Nath et al. 2024). [31]

4.4. Goal 4: Embrace technological advancements

Embracing innovative technology requires continuous effort and robust solutions to monitor advancements and assess associated prospects and challenges. Library staff should explore the potential benefits and concerns of AI and its

applications. It is crucial for staff to stay informed about the usefulness of these technologies and the demands of patrons.

4.5. Goal 5: Continuous development and professional assessment

Stakeholders should provide opportunities for library staff to enhance their knowledge and technical skills for integrating ChatGPT with library resources and services. Staff should stay updated on emerging trends in academic librarianship and innovative models. Library administration should foster a culture of innovation and assess the impact of emerging technologies on services. Regular surveys and feedback programs from patrons are vital for continuous improvement. Strategic planning for new and emerging technology is essential to leverage strengths, address weaknesses, capitalize on opportunities, and mitigate threats associated with ChatGPT. By achieving these goals, libraries will remain dynamic and valuable hubs for the academic community.

5. Use of ChatGPT in Libraries and its Benefits

As mentioned earlier the use of ChatGPT is broad for all kinds of businesses like commerce, health, education industrial works, etc. In libraries, we can use ChatGPT for various purposes in order to facilitate library staff and its patrons in diverse fields. Here is the list of various services where we can utilize the ChatGPT for different purposes in the libraries:

5.1. Resource management and information search

In academic libraries ChatGPT can be used to organize resources in a sequential order and then make it an order to answer every query asked by patrons if a person asks about a specific book, he should ask from chatGPT to show the books of Harry Potter, Williamson, Rowling, etc. Additionally, one can ask ChatGPT to suggest a book in my discipline like fiction books in an online catalog. ChatGPT will answer each query asked by the patrons. It can help them to explore their desired information and retrieve them.

5.2. Helpful in library planning

ChatGPT can help the library staff manage the library inventory, like asking a question about how I can manage my library inventory, how can I plan an event in the libraries, how should I devise a library policy, etc.

5.3. Community services

ChatGPT can assist in planning and managing community services. It can provide suggestions about reading programs, workshop activities, special events, and more. For instance, you can ask questions like, "What reading programs should I organize?" or "What workshop activities should I arrange?"

5.4. Customer services

The main objective of ChatGPT in academic libraries is to satisfy their patron needs without spending more time. For instance, the customer asks a question how I can borrow a book from the library. The customer sometimes asks complex questions, it is ChatGPT that can answer them round the clock.

5.5. Technology

The technology needs of the patrons have become a query of the hours. The ChatGPT can help the patrons to ask their technology queries beyond contacting the library staff. Suppose a student can ask about the computer lab, e-book services, how to manage the digital archive, and what computer should I use for my research, etc. The ChatGPT can help the patrons with their complex questions.

5.6. Staff training

Staff training of library staff has become an enigma for the modern librarianship. Organizations are spending very less amount on staff training in academic libraries. ChatGPT can help the library staff to utilize their learning resources like how to deal with customers in the libraries, how to shelf books in academic libraries, library management techniques, library budgeting, how to conduct stocktaking in the libraries, etc. ChatGPT can provide pertinent answers to each query asked by the library staff. It can also suggest videos and organizations that impart library training in the region (Hussain and Rafiq, 2023).[32]

5.7. Troubleshooting

In today's world of complex environments, library staff are facing numerous issues related to library management and services. ChatGPT can help the library staff by providing them with exact and accurate solutions for any query like, how to resolve the cataloging issues of my software, electronic resources, Window updates, and computer hardware and software issues, etc. ChatGPT can only solve any difficult queries faced by the library staff without spending much time.

5.8. Catalogue maintenance

Modern libraries are using different software for their library inventories. This software uses advanced technologies and needs skillful staff to resolve the cataloging maintenance. ChatGpt is a useful tool for cataloging maintenance for instance if a library staff asks from the ChatGPT what is the best way to update my library catalog or how can I improve the Marc catalog to the latest

version. The ChatGPT can solve the difficult problem of the library staff without contacting the software experts (Yamson, 2023). [4]

5.9. Decision support

Library management comes across with difficult queries concerning their library resources and services. ChatGPT can provide them with accurate and meaningful information in the decision-making process. Suppose that a library is going to launch a Kosks in the library services, they can find the pros and cons of these services before implementing them into the library services. In short, ChatGPT is a resourceful application for decision making which can assist the library administration to identify the pros and cons of every new service.

6. Staying Current

As with other fields, library services also evolve from time to time. Staying current in academic libraries is a need of the hours. ChatGPT can help the library staff to know about the current trends in advanced country libraries. It can also help the library staff to know the perspective of developing countries. It can also help the library staff to know the services of those countries beyond English speaking because ChatGPT also provides multilingual support in difficult queries (Conroy, G. 2023). [33]

ChatGPT enables improved information access, suggests books for users to read, and gives recommendations to library patrons. It helps the library team display its inventory of books. ChatGPT offers personalized reading recommendations, multilingual assistance, and immediate access to information. It also explains where the information came from (Pand & Kaur, 2023). [34]

ChatGPT provides a more efficient and accurate search mechanism than other online search engines. It is better suited to the search engine for retrieving thousands of web pages, although not all are useful. Similarly, ChatGPT positively affects librarians' jobs. Answering customer inquiries, providing reading recommendations, and imparting library teaching can save the librarian time. It also instructs the librarian on expanding their resources and collection to meet the library's requirements. Library users still require assistance from the librarian in determining which ChatGPT suggestion is the most appropriate.

Adetayo (2023) [35] claimed that chatbots like ChatGPT can help library users access resources and finish jobs without human help, saving librarians time for more in-depth support. ChatGPT also offers suggestions regarding patron usage and preferences, enabling librarians to make smarter decisions concerning library services and materials (Aithal & Aithal, 2023). [27] Muhammad (2023) [22] pointed out that since ChatGPT has a unique feature and an extremely user-friendly interface, it will become an indispensable

component of libraries. It will facilitate the management of the library's collection and resources and offer rapid, easy access to the required data. It additionally facilitates information retrieval and guidance (Hussain, A. 2020). [36]

Virtual Reference Services (VRS) have been incorporated with modern library services using the ChatGPT application. Such applications can be used to answer any query asked by the patrons. This application provides quick information about library resources and assists patrons with research queries. Such applications can enhance the library's efficiency around the clock (Yang & Dalal, 2015). [37]

In one of their literature review papers, Mali et al. (2023) explored that ChatGPT is helpful for language translation services in academic libraries. The scholars further stated that by integrating ChatGPT with translation roles, patrons could convert complex languages into their native languages (Stewart, E. 2024). [38] ChatGPT is based on AI-driven language translation tools that can be integrated into library services to bridge the language barriers for library users. This application can be used for many resources to promote inclusivity in library services.

Similarly, libraries can benefit from ChatGPT's assistance in the area of computer code. Library employees, including systems librarians, frequently have to write or alter software code, yet they tend not to be skilled programmers. Although they may look for examples and guidance online, on sites like Stack Overflow, they can avoid the tedious effort of using ChatGPT and related technologies (Houston & Corrado, 2023). [39]

Furthermore, in an experiment, Chen (2023) [40] asked ChatGPT questions concerning library services and then contrasted their answers with traditional chatbots for libraries. While traditional chatbots either did not comprehend the question or offered generic directions or the library's A-Z database page, ChatGPT could recommend specific resources. Chen added that a tailored ChatGPT could more accurately answer regional queries about library hours and available resources. Cox and Tzoc (2023) [16] highlighted that information literacy and digital literacy will be more crucial than ever, thanks to AI tools, and librarians must impart critical thinking abilities to students to verify facts and assess the standard of ChatGPT's responses. Moreover, like a librarian, ChatGPT can assist a user in crafting a focused search query and suggest a search engine for a certain kind of data. When asked, it can offer consumers advice on assessing a website or is prepared to evaluate a website and its credibility (Bradley, 2023). [41] ChatGPT can provide a reading list recommendation and construct a list of journals within a particular topic when requested. It is now the go-to source for any individual in search of information (Hosseini et al, 2023). [42]

7. Contrasting ChatGPT with Traditional Libraries

ChatGPT is comparable with traditional libraries in several aspects. ChatGPT can process and respond to questions more efficiently than conventional libraries. ChatGPT can provide a quick response when locating a particular book or an article, which could otherwise be time-consuming in physical libraries. Interestingly, librarians' bias could influence traditional libraries, and there is a possibility that resources are selected based on their point of view. According to Aithal and Aithal (2023),[27] depending on the data ChatGPT was trained on, it may also be subject to bias. Furthermore, in-person librarian-patron interactions are more likely to occur in traditional libraries, which could be effective in retrieving information and improving research methods. Similarly, ChatGPT allows patrons to raise questions, and it provides prompt answers, making it an interactive platform.

8. Contrasting ChatGPT with Digital Libraries

ChatGPT, an AI-powered tool, is capable of responding to specific queries and offering explanations across various subjects. In contrast, digital libraries typically offer a comprehensive database of e-books, journals, and online materials (Aithal & Aithal, 2023).[27] ChatGPT's ability to understand and respond to users' queries is enabled by natural language processing. However, searches in digital libraries are based on particular keywords to locate relevant material. Similarly, the chatbot's interactive feature has enabled it to provide interactive and appropriate answers Nov et al (2023).[19] On the other hand, digital libraries prefer to avoid this future and instead focus on independent search for resources. According to Aithal and Aithal (2023),[27] ChatGPT is helpful for swift and customized responses to specific queries, whereas digital libraries provide broad material and subject-area experts for further assistance. Therefore, both are effective for acquiring data. However, the preference depends on the person.

9. Shortcomings of ChatGPT

It is important to note, however, that ChatGPT is not free from certain shortcomings. The shortcomings of the ChatGPT are its limited capacity, lack of accuracy and propensity for errors, reliance on technology, and privacy issues (Muhammad, 2023).[22] ChatGPT needs help understanding reference inquiries and a human librarian, which could result in incorrect query replies during reference transactions. According to Adetayo (2023)[35], academic libraries may find ChatGPT helpful, but risks and difficulties must be adequately considered before adopting it. To offer the best user experience possible, libraries must create precise guidelines and rules, conduct frequent performance reviews, and apply them morally and successfully (Sharma and Yadav, 2022).[43]

Most importantly, the made-up citations that the AI frequently generates are one of the prominent issues. The program creates citations and facts that are not true. Therefore, before a citation is safely submitted to study, the ChatGPT outputs must be validated and reviewed (Walters & Wilder, 2023).[44] ChatGPT cannot specify how to use the University Libraries to obtain specific books or papers. Arguably, it is emotionless and devoid of context awareness; unlike humans, it cannot interpret meaning "between the lines."(Yang & Mason, 2023).[45]

Ostensibly, ChatGPT's responses are only sometimes pertinent. Currently, ChatGPT cannot perform excellent reference interviews and determine the actual needs of users. ChatGPT may not be flawless, but it does so confidently if it makes any errors. However, in case of uncertainty regarding any answer, a skilled librarian would cross-check information from several sources rather than making bold statements about topics they need help understanding (Houston & Corrado, 2023).[39]

Furthermore, Yang and Mason (2023)[45] argue that users could utilize ChatGPT 24/7 to receive clear, concise information beyond regular library hours, but their responses might only sometimes be correct. Reference librarians can concentrate on more complex or specialized subjects that may require in-depth investigation and analysis. Reference librarians are better qualified to locate the information needed to address a user's query if they require institution-specific information. The authors, however, note that librarians need not fear ChatGPT but embrace it as a best friend.

Concerns exist regarding the privacy and security of data while utilizing chatbots like ChatGPT in libraries. The chatbot may collect personal data, rendering it vulnerable to cyber-attacks or exploitation for commercial or other purposes (Verma, 2023).[46] Furthermore, excessive reliance on ChatGPT in libraries could adversely affect the critical thinking skills of both librarians and patrons. As the chatbot efficiently responds to queries and provides information, it may diminish individuals' ability to think critically and solve problems independently (Mali & Deshmukh, 2023).

9.1. Implications of the study

This study proposes two types of implications: policy implications and practical implications.

9.2. Policy implications

The research findings underscore a pressing need for policy reforms in academic libraries across both developed and developing countries. In particular, the study reveals that libraries in developing countries predominantly offer traditional services, which may not be accessible outside the library premises. These findings suggest that policy adjustments are essential to modernize library services and

make them more accessible. To address this, librarians in developing countries should make use of open applications of ChatGPT that can allow the students and faculty members to visit the library regularly and to get training on open applications of ChatGPT. Library administrators should motivate their patrons to leverage advanced technology to facilitate this connection (Benoit, J. R. 2023). The surge of modern technology has brought tremendous revolutions in the library setup. ChatGPT is a technology that has emerged in the last year and has brought many services for its users exclusively in the library realm Alyasiri et al (2024).[47] Hence, the rapid rise of ChatGPT cannot be ignored. The librarians should make use of it by incorporating this technology into their library services. Similarly for those who live in slum areas and cannot visit the libraries daily. Under this technology, the library in developing countries should provide reference services to users without utilizing workers. Library administrators should know the patron's taste of emerging technologies and they should incorporate ChatGPT in library services to meet the unique needs of patrons in the given region.

9.3. Practice implications

The study also provides practical solutions for both libraries in developed and developing countries. Developed countries should use more sophisticated technologies in the present days because they are well-equipped with budgets, while the librarians in developing countries should learn the skills of such emerging technology initially, later on, the librarians should be equipped with the help of training via organizations or library associations in order to provide quick services to its patrons. Similarly, they will create an environment that helps their patrons in their reference needs. The library's objectives are to support their readers by providing them with the latest information, using this tactic will not only educate their patrons with robust technologies but also enable them to make a strong relationship with users. Librarians in developing countries should follow in the footsteps of developed countries. Although the lack of budget can hamper them from such services, ultimately ChatGPT has introduced some free applications, which enable librarians in developing countries to put their users in the right direction.

10. The Future of Libraries

The intersection of ChatGPT and libraries marks a significant development in the evolution of library services, becoming a major topic for organizations worldwide. ChatGPT is already having a profound impact on libraries, and this influence is expected to grow (Rose, 2023). Libraries that currently rely on conventional methods will find enhanced appeal by integrating ChatGPT into their services. However, libraries in developing countries often lag in adopting emerging technologies like ChatGPT. Despite this, in a knowledge-based economy, libraries play a crucial role. Modern amenities such as free Wi-Fi, cafes, and creative spaces are drawing people back to libraries. Additionally, the reach of libraries extends beyond their physical locations through the Internet, social media, crowd-sourcing, mobile services, and advanced applications (Firat, 2023).[48] Libraries around the world are transforming their services to meet the needs of today's users. Countries with substantial budgets have already incorporated AI applications into most of their services. Developing countries, while still behind, are following suit to meet the evolving needs of their patrons. As technology continues to advance, libraries must adapt to remain relevant in the 21st century. Despite facing challenges such as underfunding and competition from online services, the future of libraries—whether public, academic, or special—appears promising. Change is inevitable, and libraries must embrace it. Librarians need to rejuvenate their services to meet their patrons' changing demands. ChatGPT represents a robust technology that can help libraries stay on the right track (Ali, 2024).[49]

11. Conclusion

Advanced technologies have brought tremendous revolutions in library services, particularly in the era of digital technology like AI. AI has introduced numerous applications; however, the role of ChatGPT is remarkable. The use of ChatGPT in library operations has brought significant changes in the field of librarianship. Library and information centers and ChatGPT have been strongly bonded. Earlier in 2018, libraries in developed countries incorporated chatbots for efficient services to answer quick queries from patrons. Since the advent of ChatGPT on November 30, 2022, libraries around the globe have combined ChatGPT with their library services to provide a variety of services that fulfill the demands of library patrons in their time of need. Interestingly, ChatGPT is a beautiful invention for library operations. However, it still has some shortcomings in the security and privacy of data, lack of accuracy and propensity for errors, and reliance on technology. Libraries and information centers across the globe consider ChatGPT to be a source of information, particularly for the complex queries patrons ask. Some librarians believe ChatGPT has become a go-to source for individuals searching for information. Many librarians argued that ChatGPT has its limitations. Still, they recommend that its role and efficiency cannot be outnumbered. Developed and developing countries have actively tried to incorporate ChatGPT for library operations for numerous reasons: it makes relevant data easily accessible, organizes intricate queries of readers, and offers effective round-the-clock services. It can also assist in managing libraries to improve their collection and

resources available whenever required.

11.1. Recommendation

This paper advises the use of ChatGPT in libraries. It is recommended that libraries should keep up with the constant advancements in technology to provide better services. ChatGPT, an intelligent AI software, can give library patrons access to resources and perform tasks independently without the help of humans. Therefore, incorporating ChatGPT could be more efficient and timesaving for librarians, allowing them to provide better assistance to patrons. Building on that, the expansion of library resources and collections that align with the needs of the library could also be done with the assistance of ChatGPT, resulting in an overall better service.

Moreover, as ChatGPT deals with natural language processing, its adoption is recommended as an effective tool for reader engagement, analysis of text, and other library operations.

The chatbot could also help answer difficult questions brought up by patrons, which, as a result, is timesaving for both librarians and patrons.

As the library deals with large volumes of text data generated by users, this can further help library staff, identify the users' behavior, preferences, and needs.

12. Source of Funding

None.

13. Conflict of Interest

None.

References

1. Hussain A. Uses of blockchain technologies in library services. *Lib Hi Tech News*. 2021;38(8):9–11.
2. Hussain A. Industrial Revolution 4.0: Implication to libraries and librarians. *Library Tech News*. 2020;37(1):1–5.
3. Shihab SR, Sultana N, Samad A. Revisiting the use of ChatGPT in business and educational fields: Possibilities and challenges. *J Multidisip Ilmu*. 2023;2(3):534–45.
4. Yamson GC. Immediacy as a better service: Analysis of limitations of the use of ChatGPT in library services. Information Development. *Inf Dev*. 2023;p. 1–10.
5. Banerjee S. The development of identification and reasoning skills in humans. *J Cogn Dev*. 2022;17(1):45–62.
6. Huang J, Tan M. The role of ChatGPT in scientific communication: writing better scientific review articles. *Am J Cancer Res*. 2023;13(4):1148–54.
7. Cox C, Tzoc E. ChatGPT: Implications for academic libraries. *Coll Res Lib News*. 2023;84(3):99.
8. Hussain A. Use of geographical information system (GIS) application in public libraries. *Library Hi Tech News*. 2023;40(1):1–5.
9. Hussain A. Use of artificial intelligence in the library services: prospects and challenges. *Library Hi Tech News*. 2023;40(4):15–7.
10. Lappalainen Y, Narayanan N. Aisha: A Custom AI Library Chatbot Using the ChatGPT API. *J Web Lib*. 2023;17(3):1–22.
11. Allison D. Chatbots in the library: Is it time? *Lib Hi Tech*. 2012;30(1):95–107.
12. Mcneal ML, Newyear D. Introducing chatbots in libraries. *Lib Technol Rep*. 2013;49(8):5–10.
13. King MR. The future of AI in medicine: a perspective from a Chatbot. *Ann Biomed Eng*. 2022;51(2):291–5.
14. Kirmani AR. Artificial intelligence-enabled science poetry. *ACS Ene Lett*. 2022;8:574–6.
15. Jeblick K, Schachtner B, Dexl J, Mittermeier A, Stüber AT, Topalis J, et al. ChatGPT makes medicine easy to swallow: an exploratory case study on simplified radiology reports. *Eur Radiol*. 2023;34(5):2817–25.
16. Cox AM, Pinfield S, Rutter S. The intelligent library: Thought leaders' views on the likely impact of artificial intelligence on academic libraries. *Libr Hi Tech*. 2018;37(3):418–35.
17. Pavlik PI, Eglington LG. Automated search improves logistic knowledge tracing, surpassing deep learning in accuracy and explainability. *J Educ Data Mining*. 2023;15(3):58–86.
18. Bishop CM. Neural networks and their applications. *Rev Sci Instr*. 1994;65(6):1803–32.
19. Nov O, Singh N, Mann D. Putting ChatGPT's medical advice to the (Turing) test: survey study. *JMIR Med Educ*. 2023;9:46939.
20. Rahman MM, Terano HJ, Rahman MN, Salamzadeh A, Rahaman MS. ChatGPT and academic research: A review and recommendations based on practical examples. *Manag Dev Stud*. 2023;3(1):1–12.
21. Wu T, He S, Liu J, Sun S, Liu K, Han QL. A brief overview of ChatGPT: The history, status quo, and potential future development. *IEEE/CAA J Automatica Sinica*. 2023;10(5):1122–36.
22. Muhammad A. AI ChatGPT Applications in Libraries-Challenges and Opportunities. *J Inf Doc Stud*. 2023;20:18–26.
23. Kalyan KS. A survey of GPT-3 family large language models including ChatGPT and GPT-4. *Nat Language Processing J*. 2023;6:100048.
24. Kocoń J, Cichecki I, Kaszyca O, Kochanek M, Szydło D, Baran J. ChatGPT: Jack of all trades, master of none. *Inf Fusion*. 2023;99:101861.
25. Flor LS, Friedman J, Spencer CN, Cagney J, Arrieta A, Herbert ME. Quantifying the effects of the COVID-19 pandemic on gender equality on health, social, and economic indicators: a comprehensive review of data from. *Lancet*. 2020;399:2381–97.
26. Biswas SS. Role of chat GPT in public health. *Ann Biomed Rng*. 2023;51(5):868–9.
27. Aithal S, Aithal PS. Effects of AI-Based ChatGPT on Higher Education Libraries. *Technol Soc Sci (IJMTS)*. 2023;8(2):95–108.
28. Bozkart A. ChatGPT User Guide For Libraries; 2023. Available from: https://medium.com/@ayhanbzkrt/chatgpt-user-guide-for-libraries-c09667745a8.
29. Singh J, Samborowski L, Mentzer K, Proceedings of the ISCAP Conference. A Human Collaboration with ChatGPT: Developing Case Studies with Generative AI. vol. 9; 2023. p. 6039.
30. Rahman MM, Watanobe Y. ChatGPT for education and research: Opportunities, threats, and strategies. *Appl Sci*. 2023;13(9):5783.
31. Nath S, Katoch OR, Sehgal S. Revolutionizing Research in Social Sciences: The Transformative Potential of ChatGPT. *Asian J Educ Soc Stud*. 2024;50(3):209–14.
32. Hussain A, Rafiq M. Perceptions of Academic Librarians toward Open Source Library System (OSLS): Case Study of Pakistan. *Sci Technol Lib*. 2023;p. 1–11.
33. Conroy G. Scientists used ChatGPT to generate an entire paper from scratch - but is it any good? *Nature*. 2023;619(7970):443–4.
34. Panda S, Kaur N. Exploring the viability of ChatGPT as an alternative to traditional chatbot systems in libraries and information centers. *Lib Hi Tech News*. 2023;40(3):22–5.
35. Adetayo AJ. Artificial intelligence chatbots in academic libraries: The rise of ChatGPT. *Lib Hi Tech News*. 2023;40(3):18–21.
36. Hussain A. Cutting edge: Technology's impact on library services. *Innov Desig Mark Inf Ser*. 2020;p. 16–27.
37. Yang SQ, Dalal HA. Delivering virtual reference services on the web: An investigation into the current practice by academic libraries. *J Acad Librarianship*. 2015;41(1):68–86.

38. Stewart E. Bard vs ChatGPT: Which is Better in 2024. *Enterprise Management*. 2024;360.

39. Houston AB, Corrado EM. Embracing ChatGPT: Implications of Emergent Language Models for Academia and Libraries. *Tech Ser Quart*. 2023;40(2):76–91.

40. Chen X. ChatGPT and its possible impact on library reference services. *Int Ref Ser Quarter*. 2023;27(2):121–9.

41. Bradley P. The future of search is intelligent. *Comp Libr*. 2023;43(3):36–40.

42. Hosseini M, Gao CA, Liebovitz DM, Carvalho AM, Ahmad FS, Luo Y. An exploratory survey about using ChatGPT in education, healthcare, and research. *Plos one*. 2023;18(10):292216.

43. Sharma S, Yadav R. Chat GPT-A technological remedy or challenge for the education system. *Glob J Enterp Inf Sys*. 2022;14(4):46–51.

44. Walters WH, Wilder EI. Fabrication and errors in the bibliographic citations generated by ChatGPT. *Sci Rep*. 2023;13(1):14045.

45. Yang SQ, Mason S. Beyond the Algorithm: Understanding How ChatGPT Handles Complex Library Queries. *Internet Ref Ser Quart*. 2023;28(2):1–55.

46. Verma M. Novel Study on AI-Based Chatbot (ChatGPT) Impacts on the Traditional Library Management. *Int J Trend Sci Res Dev*. 2023;7(1):961–4.

47. Alyasiri OM, Salman AM, Salisu S. ChatGPT revisited: Using ChatGPT-4 to find references and edit language in medical scientific articles-Journal of Stomatology. *Oral Maxillofac Surg*. 2024;125(5S2):101842.

48. Firat M. What ChatGPT means for universities: Perceptions of scholars and students. *J Appl Learn Teach*. 2023;6(1):57–63.

49. Ali MY. AI ChatGPT Applications in Libraries -Challenges and Opportunities Kütüphanelerde ChatGPT Uygulamaları -Zorluklar ve Fırsatlar. *J Inf Doc Stud*. 2024;20(1):18–26.

Author's biography

Abid Hussain, Depty Director Library ⓘ https://orcid.org/0000-0003-2551-0974