

Agentic AI in Library and Information Science: Current Applications and Future Directions

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Abstract

This article explores the rise and influence of agentic artificial intelligence systems within library and information science (LIS). Agentic AI characterized by autonomous decision-making, goal-directed behaviors, and interaction with the environment is transforming traditional LIS practices in areas such as collection management, information retrieval, and user services. The article synthesizes current implementations, including intelligent cataloging systems, personalized recommendation engines, autonomous reference assistants, and adaptive discovery platforms. These applications significantly enhance resource accessibility, metadata quality, and user engagement, while also raising important considerations around human-AI collaboration, information equity, and the evolution of professional roles. The article identifies key technological and ethical challenges facing LIS institutions adopting agentic systems, such as data quality concerns, algorithmic transparency, privacy preservation, and the evolving role of information professionals. This analysis provides a framework for libraries and information organizations to strategically incorporate agentic AI while preserving core professional values and enhancing their essential societal functions.

Keywords: Agentic Artificial Intelligence, Autonomous Systems, Human AI Collaboration

Introduction

Throughout modern history, academic libraries have always shown that they can come up with new ways to use technology. These institutions have always been at the forefront of new technologies, from the first computerized cataloging systems to the creation of large digital repositories (Breeding, 2018). The rise of agentic artificial intelligence advanced computer systems that can see and understand their surroundings, make decisions on their own, and act in a way that helps them reach their goals with little human supervision marks a major step forward in the evolution of libraries.

Recent progress in large language models, complex analytical frameworks, and collaborative multi-agent architecture has made it easier for AI systems to grow quickly. These systems are very good at figuring out what users need, finding their way around complicated digital ecosystems, and providing tailored knowledge services. Artificial

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intelligence is now a major driver of innovation, especially in the fields of library and information science. This is because the development of information technology has sped up. Modern AI systems have brought about big changes in academic libraries, such as self-cataloging processes, advanced ways to find information, personalized ways to get users involved, and better ways to manage resources.

Libraries are important institutions that help organize and share information. As these AI technologies get closer to being fully developed, libraries face both new opportunities and big problems with putting them into use. The American Library Association's LibLearnX conference in Baltimore from January 19 to 22 had a lot of talks, panels, and workshops about artificial intelligence. It was a big topic of discussion. These professional meetings looked at both the ways that AI technologies could change things and the ways that they aren't working well in libraries right now.

Literature Review

Theoretical framework

1. Thinking about agentic AI in library settings

This academic study looks at how artificial intelligence has changed over time, from simple automation tools to smart collaborative entities in the fields of library and information science. The conceptual framework used here is based on Russell and Norvig's (2021) established theoretical paradigm, which defines agentic systems as entities that can perceive their environment and respond to goals in ways that support the functions of institutional libraries.

1.1 Working on its own

Independent functionality is a key feature of artificial agentic intelligence systems. It allows them to complete complex tasks in library settings with less human oversight while still being able to make complex decisions. Modern uses show how these AI agents could change how libraries work in the past. These systems can create metadata, classify content, and keep knowledge repositories up to date on their own. They can also learn from past interactions to make their operations more efficient over time (Russell & Norvig, 2021). Real autonomous operation becomes clear through proactive service delivery systems, where smart systems answer questions in real time while also predicting what customers will need using advanced behavioral pattern analysis and preference modeling methods. But this independence in operations makes it much harder to be open, responsible, and have ethical governance structures. Human supervisors often can't see how autonomous decision-making processes work, so we need to create comprehensive oversight frameworks that protect professional integrity standards (Noble, 2018). To integrate autonomous agentic AI into library and information science settings in a way that works, there needs to be a careful balance between operational independence and explainable accountability

mechanisms. These systems need to show that they are in line with basic professional values, such as principles of intellectual freedom, fair access provisions, and privacy protection protocols. At the same time, they need to improve efficiency and user engagement.

1.2 The ability to interact with others

AI systems in library and information science are developing strong social skills that help them work with people and connect different computer systems together. These smart AI helpers can have real conversations with users, understand what they need, and remember what was discussed earlier, making library services more personal and helpful. They also work behind the scenes to share information between different databases and systems, making everything work together more smoothly. For example, an AI might automatically find research papers from different libraries, check if they're reliable, and organize them in a way that fits with local systems (Luo, Qin, Fang, & Qu, 2020; Huang, Zou, Cheng, Chen, & Xie, 2023). Guan, Mou, and Jiang (2020) explain that AI can even help research teams by keeping track of new information and letting people know when something important comes up. However, as AI gets better at acting like humans, libraries need to think carefully about trust, making sure people understand how these systems work, and avoiding situations where AI might mislead users (Coeckelbergh, 2021; Radford, Kim, Xu, Brockman, McLeavey, & Sutskever, 2023).

1.3 Adaptability that responds

Reactive AI systems in libraries can show amazing adaptability by automatically responding to changes in information environments and user behavior patterns. These systems keep an eye on data patterns and changes in the outside world all the time. They make operational changes, like changing the order of search results during major global events or managing digital collections by finding and flagging old or questionable materials (Russell & Norvig, 2021). This ability to respond could turn libraries into flexible knowledge centers that stay useful and trustworthy in information environments that change quickly. This kind of change makes these institutions responsive partners in increasingly complex information ecosystems that define modern digital scholarship.

1.4 Functionality that is proactive

Proactive AI systems in libraries could completely change how people use them by predicting what information they need instead of just responding to specific requests. Artificial intelligence can improve many library services, such as advanced virtual reference help, personalized recommendation algorithms, comprehensive data analytics, and smart search functions. These smart systems can look at how users behave and how academic research is changing to make personalized resource suggestions, automatically suggest relevant materials, and give users information literacy help before they even know what they need (Dell'Acqua et al., 2023). Proactive AI implementations could greatly improve

collection development strategies by predicting future research trends and community interests, in addition to helping individual users. These systems could also make it possible to run targeted outreach campaigns that connect specific groups of users with the resources and services they need.

2. Changing from tools to partners in evolution

Traditional library automation tools work like deterministic systems that follow set workflow sequences (Breeding, 2018). On the other hand, agentic systems work as semi-autonomous partners in complex information ecosystems. This major change fits with Nardi and O'Day's (1999) idea of "information ecologies," which says that technologies are part of complex networks that include people, established practices, and institutional values. The theory behind this study recognizes this important change from mechanical tools to smart collaborative partners.

Table 1

A Comparison of agentic AI and generative AI applications in library and information science

Dimensions	Agentic AI	Generative AI
Definition	Autonomous systems that can make their own decisions and act in ways that help them reach their goals.	Machine learning algorithms that make new content based on prompts and patterns they have learned.
Operational Model	Making decisions on your own and doing tasks ahead of time.	Making content that responds and putting creative ideas together.
Level of Independence	A lot of freedom and the ability to work on your own.	Low to moderate independence that needs clear directions.
Applications for Cataloging	Creating, validating, and ensuring the quality of metadata on its own.	Help with making MARC records automatically and following RDA rules.
Services for Reference	Finding information on your own and coming up with your own research strategy.	Answering questions and summarizing content in a timely manner.
Managing Collections	Recommendations for autonomous acquisition and finding gaps.	Content analysis and personalized recommendation systems.
User Engagement	Getting people involved	Handling queries quickly and teaching people how to find information.
Digital Libraries	Self-driving digitization, workflow management and storage.	Making metadata automatically and organizing digital assets.

Dimensions	Agentic AI	Generative AI
Organizing Knowledge	Building knowledge graphs and developing autonomous taxonomies.	Automatic subject analysis and text categorization.
Help with Research	Finding literature on your own and developing your own methods.	Help with formatting citations and summarizing research.

Table 1, This comparative study looks at agentic AI and generative AI technologies and how they can be used in library and information science. It shows how these two types of AI are different in terms of how they work, how they are used, and how they could change how libraries work and what services they offer. The analysis includes a table that compares the technologies and shows how they are different. It also looks at how each of them can help modernize library practices and make information services better.

Current uses and examples of how to use them

1. Services for information and reference

AI reference systems are some of the most well-known uses of agentic technologies in modern libraries (Russell & Norvig, 2021). Using AI chatbots in reference services makes libraries more appealing to millennials by making it easier to get help. These advanced systems go beyond simple conversational bots to offer advanced information services that can handle complicated research questions. Libraries can create and use AI chatbot systems with little technical knowledge and few resources. This makes the technology available to organizations of all sizes and budgets. Current implementations show how AI can effectively support reference services by keeping track of patron information needs across multiple interactions, suggesting related resources based on user needs, and smoothly passing complex questions on to human librarians when they need specialized knowledge. (Nawaz, 2021).

This paper looks at the use of artificial intelligence chatbots in library reference services in a systematic way. It shows that there is a growing body of academic research that supports these technological implementations. AI chatbot integration into reference services makes them always available and able to respond right away, which traditional staffing models can't do because they don't have enough resources.

2. Collection development and management

Agentic AI has a lot of potential to change how collections are developed by using systems that keep an eye on publishing outputs, look at how patrons use them, and suggest purchases that fit with the institution's goals. Artificial intelligence has completely changed how academic libraries work. It has brought about new ways of doing things, such as automated cataloging, better ways to find information, customized user experiences, and

better ways to manage resources. In the context of digital preservation, autonomous agents could keep an eye on digital collections all the time to look for files that are at risk of becoming obsolete, automatically move those files to a safer format, and check that the preservation results meet set standards. These systems are examples of what could be called “anticipatory preservation,” where AI agents deal with digital preservation problems before they get to the point where they are critical to operations (Nardi & O'Day, 1999).

3. Finding things and getting information

Most traditional discovery systems use keyword matching algorithms and simple relevance ranking systems (Breeding, 2018). More and more libraries are using AI to help with advanced research by doing things like full citation analysis, smart search, and help with literature reviews. Next-generation agentic discovery tools could use semantic understanding technologies to figure out what information needs are more complicated. In February 2024, ProQuest started a beta testing program for an AI product. Web of Science and Scopus.ai have also jumped on this tech trend. ScienceDirect has Eureka and EBSCO has their Concept Map interface. This shows that big database companies are actively adding AI features to their search and discovery platforms. These kinds of systems might be able to understand natural language questions, figure out what words mean in different disciplinary contexts, and come up with complicated search strategies that work across specialized databases with the right syntax changes for each system (ProQuest puts AI deeper in the researcher's journey for enriched insights and discovery, 2024; Launch of Scopus AI to help researchers navigate the world of research, 2024).

4. Making metadata and organizing knowledge

Libraries are using AI technologies more and more to improve metadata. Recent developments show that these technologies have a lot of potential to give people more control over organizing knowledge (Russell & Norvig, 2021). This research gives a thorough, organized look at all the possible uses for large language models (LLMs) and generative AI tools in library and information science operations, focusing on GPT model implementations and ChatGPT interface applications. Advanced systems could look at digital objects on their own, create descriptive metadata that meets professional standards, suggest classification terms from established controlled vocabularies, and find complicated connections between resources in large library collections. This is a big step forward from basic automation to smart knowledge organization that can change with new materials and new subject areas.

Problems with technology and putting things into action

1. Working with old systems

Libraries work in complicated technological ecosystems that have been built up over many decades, which makes it very hard to integrate agentic AI systems (Breeding, 2018). The technology that libraries use is like the layers of an archaeological site, as newer

systems are built on top of older ones that are difficult to alter without causing significant operational disruption. Integration strategies ranging from API-based middleware solutions to comprehensive system replacements require substantial resources and careful consideration of system architecture. However, the challenge extends beyond ensuring technical compatibility with legacy systems; it also involves aligning AI integration with institutional workflows and the technical capacity of current staff. Because many libraries lack the specialized technical tools required for large-scale overhaul, incremental integration strategies represent a more practical path forward.

2. Things to think about when it comes to data quality and bias

Library data collections often have historical biases that are built into how they are generated, how they are organized, and how organizations decide what to focus on (Noble, 2018). When AI systems learn from these collections, they could make library operations even more biased and keep them going. Researchers have found that librarians have a lot of trouble using AI programs in their libraries. Some of these obstacles are technological issues, not having enough skills and knowledge, not having enough money, and concerns with the organization's culture and structure. Organizations need to be dedicated to diversity and inclusion and use cutting-edge technology to cope with bias. This means that AI systems should be designed with ways to find and fix bias. Libraries should verify their AI systems for unfair outcomes on a frequent basis and correct any trends that are discovered to be unfair right away.

3. Requirements for openness and understanding

Library workers are always anxious about how “black box” many new AI systems are, especially when they affect basic tasks like finding information. It is important for users and librarians to understand how AI agents make decisions, especially when those judgments affect how people can access collections, how resources are shared, or how information is retrieved (Noble, 2018). AI needs to be explainable in academic and research environments since knowing why information is suggested can directly affect the work of scholars and the way they make decisions.

4. Learning new skills and knowledge

Librarians who want to employ AI in their libraries have a lot of trouble because they don't have the right skills and knowledge. This highlights how crucial it is to have full professional development programs. A lot of library workers don't have the required technical expertise to set up, run, and debug complicated AI systems. To solve this problem, a lot of money needs to be spent on professional training programs, working jointly with computer science departments, and designing AI tools that are easy to use and don't need a lot of technical knowledge to perform successfully.

Professional and moral consequences

1. Worries about privacy and surveillance

Libraries have traditionally supported the privacy of their users. This is a basic value that AI systems may undermine because they may need to gather a lot of information to perform well. One of the biggest ethical problems with library AI systems is that they let people customize things while still keeping their privacy safe (American Library Association, 2023). AI systems need a lot of user data to make personalized recommendations and offer specialized services, but this goes against libraries' long-standing vow to keep patrons' information private. Libraries need to build whole systems that let helpful AI apps run while yet keeping users' information private.

2. Changes in the professional role

As AI agents do work that librarians used to do, it makes us think about how librarians' jobs and responsibilities may alter in the future. Studies demonstrate that AI works best when it is seen as a way to build on human knowledge rather than replace it. This results in hybrid service models in which librarians concentrate on high-value tasks that need professional judgment, empathy, and comprehension of the situation (Dell'Acqua et al., 2023). This transformation in the field means that librarians need to gain new skills in AI literacy, data analysis, and managing technology. They also need to keep their basic talents in organizing material, helping users, and getting active in the community.

3. Digital equity and accessibility

Libraries help a lot of different people, some of whom can use technology and some of whom can't. If deployment plans aren't well thought out to make advanced AI systems accessible and inclusive, they could make the digital divide worse (Noble, 2018). Libraries need to make sure that AI developments don't make things tougher for those who don't know how to use technology or don't have access to it. They also need to give folks who want to talk to someone in person additional options to seek support.

4. Freedom of thought and censorship

AI systems that use algorithmic filtering and recommendation systems could accidentally suppress or skew how humans can get information. Libraries need to keep a close eye on AI systems to make sure they don't break the rules of intellectual freedom or create filter bubbles that prohibit individuals from seeing a wide range of opinions (American Library Association, 2023).

Future directions and new trends

1. Library systems with multiple agents

AI in libraries nowadays is mostly made up of single agents that do one job. In the future, systems will presumably use multi-agent architectures, in which specialized AI entities work together to help perform difficult library tasks. Multi-agent systems might be

better at growing, specialized, and remaining up and running, but they are also harder to manage and coordinate (Nardi & O'Day, 1999).

2. Combining knowledge graphs

Professional cataloging has built up a lot of structured metadata in libraries over the years. Russell and Norvig (2021) say that using this corpus of knowledge along with new semantic web technologies and knowledge graphs is a good method to make AI better. This strategy might help people think more deeply about information sources and how they fit together in context.

3. Uses of large language models

This study looks at how large language models (LLMs) and generative AI tools, such as GPT model implementations and ChatGPT interface applications, could be employed in library and information science work in a methodical way. Adding LLMs can make it easier to use computers, help you summarize information better, and provide more valuable research help tools. (Formanek, 2025)

4. AI networks that work together

In the future, AI systems in libraries might be able to collaborate with other institutions in bigger networks, sharing knowledge and talents while still letting people customize and manage how things work in their own library. This strategy could leverage the strength of many people working together while yet preserving the privacy and freedom of users and institutions.

Recommendation

1. Proposed framework for responsible implementation

Based on recent technological advances and known implementation problems, I propose a full framework for responsibly integrating agentic AI into library settings. Based on five main ideas, this framework combines technical, ethical, and professional factors into one implementation plan.

1.1 Principles of value alignment

It should be clear that library AI systems value intellectual freedom, privacy protection, fairness, and accessibility when they are built and run. As libraries get more agentic AI systems, it's very important to make sure that they are in line with the library's core professional values. If AI technologies aren't clearly in line with these core values, they could go against the basic principles of library service delivery (Noble, 2018). To use AI in real life, it needs to be checked against professional ethical standards on a regular basis, and there needs to be a clear way to fix things when they go wrong. Libraries should have clear rules that explain how AI systems should show and reflect professional values

1.2 Adding to instead of automating

The main goal of planning how to use automation should be to improve people's skills, not to replace them. People should still be able to make complicated decisions, but automation should only be used for simple tasks (Marcus & Davis, 2022). AI shouldn't try to take the place of human professionals. Instead, it should help librarians improve their current skills and only automate simple, repetitive tasks. Humans should still be in charge of making decisions and interacting with other people (Dell'Acqua et al., 2023). A lot of careful task analysis is needed to find out which tasks can be automated and which ones need to be watched by people. There should also be clear rules about when people need to step in when AI systems have problems that are too hard or too sensitive.

1.3 Open operation

Library AI systems should be clear about why they make recommendations and take actions, especially when the stakes are higher. Users and staff can see how decisions are made, what data sources are used, and what biases might affect the results when AI systems are open (Noble, 2018). To put it into action, you need to create easy-to-understand explanation interfaces and thorough documentation of what the AI system can do and what it can't do.

1.4 Rules for ongoing assessment

Libraries should find ways to check AI systems for bias, effectiveness, and how well they fit with the library's mission. To make sure that agentic AI systems keep working well, they need to be checked often to make sure they are still effective, fair, and in line with the institution's mission and values (American Library Association, 2023). Assessment protocols should include regular bias audits, effectiveness metrics that match library goals, and ways for stakeholders to give feedback. This will make sure that AI systems keep doing what they are supposed to do.

1.5 Getting involved in the community

Libraries should get their communities involved in decisions about how to use AI, making sure that the technology meets the needs and wants of users. This includes clear communication about what AI can and can't do, as well as set ways for users to give feedback and control how AI interacts with them.

2. Effect on the roles of information professionals

A lot has changed in the way information professionals do their jobs because of AI systems. They make everyday tasks easier and faster, but they also add new problems that require different skills. Research shows that AI can help people do much better on difficult tasks that require a lot of knowledge (Dell'Acqua et al., 2023). These systems help with basic tasks like cataloging and reference services, which lets librarians spend more time on planning and teaching. On the other hand, this change in the field means that information professionals need to learn new skills in AI literacy and data analysis in order to properly manage these

technologies (Nardi & O'Day, 1999). This change means that professionals need to keep learning and getting used to new technologies while still being good at what they already know how to do. Librarians have trouble using AI programs in their libraries because they don't have the right skills or knowledge. This shows how important it is for libraries to offer full training programs and help people learn more about AI technologies.

Conclusion

This academic article goes into great detail about how libraries are using agentic AI. It talks about the problems libraries are having as they try to change, such as issues with technical accuracy, ethical concerns about algorithmic bias and privacy, and operational issues with training staff and allocating resources. The study is about agentic AI systems that can work on their own, change in real time, and solve hard multi-step problems while still keeping libraries' basic promises to provide fair access, intellectual freedom, and community service. AI is a big part of technological progress, especially in library and information science, as information technology keeps getting better quickly. This method puts ethical concerns first and uses value-driven design instead of putting technical implementation first. This makes sure that AI helps libraries do their jobs instead of hurting them (American Library Association, 2023). To successfully add agentic AI to libraries, there needs to be a careful balance between what the technology can do and what professionals think is right. You need to keep an eye on this balance and change it as needed as technologies and user needs change. In a world where more and more information is available online, libraries that use this balanced approach to implementation will be better able to serve their communities.

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