

# Research on the Development of University Libraries in the Era of Artificial Intelligence (AI)

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**Abstract:** Artificial intelligence is an important strategic technology of the 21st century, which has deeply impacted and transformed many fields such as social economy, culture and education, scientific and technological innovation, etc. As an important supporting department of higher education and scientific research, university libraries also face challenges and opportunities in the era of artificial intelligence. They need to adjust their service concepts, modes and contents in a timely manner to adapt to the new information environment and user needs. This article explores several key aspects of the impact of artificial intelligence on university library services, including information resource construction, service efficiency and quality, the professional competence of university librarians, and the development trends of university libraries, aiming to provide reference for the construction of university libraries in the era of artificial intelligence.

**Keywords:** Artificial Intelligence, University Library Services, University Library Development

## 1. Introduction

Artificial Intelligence (AI) refers to the intelligent behavior exhibited by machines or systems created by humans. It is a branch of computer science that mainly studies how to make computers simulate human intelligences.

AI techniques include machine learning, deep learning, natural language processing, computer vision, speech recognition, knowledge representation and reasoning, expert systems, etc.

In recent years, with the development of technologies such as the Internet, big data, and cloud computing, AI has made rapid progress and has been widely applied in various fields such as healthcare, education, transportation, finance, security, etc. It has brought enormous value and potential to the socio-economic development and the improvement of human life quality.

As an important supporting department of higher education and scientific research, university libraries also face challenges and opportunities in the era of artificial intelligence [1].

On the one hand, AI technology provides new means and resources for university libraries, which can improve the efficiency and quality of library services, meet diverse and personalized information needs of users, promote the sharing and utilization of library resources, and enhance the innovation and competitiveness of library services.

On the other hand, AI technology also puts forward new requirements and challenges for university libraries, such as how to adapt to the changes in new information resources and service models, how to improve the technical literacy and innovation ability of library staff, how to ensure the security and privacy of user data, how to deal with ethical and legal issues that AI technology may bring, etc.

This article starts with the concepts, characteristics, and development status of AI technology, analyzes the development trends of AI technology for university libraries, and puts forward development suggestions for AI technology in university libraries. The aim is to provide reference and guidance for university libraries to better utilize AI technology, improve service quality and efficiency, and meet the diverse needs of users.

## 2. Influence of Artificial Intelligence on University Library Service

Artificial intelligence refers to intelligent behavior exhibited by machines or systems created by

humans. It is a branch of computer science that mainly studies how to make computers have the ability to simulate human intelligence. AI technology includes machine learning, deep learning, natural language processing, computer vision, speech recognition, knowledge representation and reasoning, expert systems, and more.

In recent years, with the development of technologies such as the Internet, big data, and cloud computing, artificial intelligence has made tremendous progress and has been widely used in various fields such as medicine, education, transportation, finance, and security, bringing significant value and potential for social and economic development and improving human quality of life.

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On the other hand, AI technology also puts forward new requirements and challenges for university libraries, such as how to adapt to changes in new information resources and service models, how to ensure information security and user privacy, and how to train and attract librarians with AI skills.

This section will analyze the impact of artificial intelligence on university library services from the following aspects.

### ***2.1 Promoting the Construction of Information Resources in University Libraries***

Information resources are the foundation and core of library services. In the era of artificial intelligence, information resources not only include traditional printed and digital literature, but also various forms of data, knowledge, multimedia resources, and more.

These information resources have the characteristics of being massive, diverse, dynamic, and open, requiring effective use of AI technology for acquisition, organization, processing, storage, and retrieval.

For example, using web crawler technology can automatically collect various types of information resources on the Internet and perform classification, deduplication, filtering, and other processing; using natural language processing technology can perform segmentation, annotation, summarization, and classification operations on text resources, and extract key words, entities, relationships, and other elements; using computer vision technology can perform recognition, annotation, and classification operations on image resources and extract features, content, and style attributes; using speech recognition technology can transcribe, annotate, and classify operations on audio resources and extract speech content, emotions, intonation, and other features; using knowledge representation and reasoning technology can perform modeling, representation, and inference operations on knowledge resources and construct a knowledge graph; using machine learning technology can perform analysis, mining, prediction, and other operations on data resources, and discover patterns, models, and values in the data.

Through AI technology, university libraries can achieve intelligent management and services of information resources, improving their quality and efficiency to meet users' diversified and personalized information needs.

For example, using deep learning technology can achieve intelligent retrieval of information resources, providing users with search results that are highly relevant and comprehensive based on their semantic queries; using AI technology can achieve intelligent recommendation of information resources, providing users with personalized information services based on their interests, preferences, and behaviors; using AI technology can achieve intelligent Q&A of information resources, providing users with precise and comprehensive answers based on their natural language queries; using AI technology can achieve intelligent translation of information resources, providing users with multilingual information services based on their language preferences; and using AI technology can achieve intelligent creation of information resources, providing users with original or adapted content based on their creative needs.

## ***2.2 Promoting the Efficiency and Quality of University Library Service***

AI technology can help university libraries provide smarter, more convenient, and more personalized services, meeting users' diverse and dynamic information needs, and improving user satisfaction and loyalty. Specifically, AI technology can be applied in the following areas:

**Intelligent Robots:** Intelligent robots can serve as library attendants or assistants, providing users with navigation, consulting, lending and returning, and recommendation services. For example, the National Library of China uses face recognition technology to realize book lending and returning, and Nanjing University Library, Shenzhen Library and others have also conducted applied research in intelligent robots for library services. Intelligent robots can improve the service efficiency of libraries, save human resources, while also increasing user interactivity and fun.

**Intelligent Retrieval:** Intelligent retrieval refers to the use of natural language processing, knowledge representation and reasoning, and other technologies, to enable users to perform retrieval using natural language or voice, and provide more accurate, relevant, and diverse search results based on the user's intent, background, preferences, and other factors. For example, Google's Knowledge Graph is a typical intelligent retrieval system. It can display related entities, attributes, relationships, classifications, and other information based on the keywords entered by the user, and provide related links and images. Intelligent retrieval can improve user search results and experience, save user time and effort, and also promote users' acquisition and extension of knowledge.

**Intelligent Recommendation:** Intelligent recommendation refers to the use of machine learning, deep learning, and other technologies to provide personalized resource or service recommendations based on user behavior, interests, and needs. For example, Amazon's recommendation system is a successful intelligent recommendation system. It can recommend related products or content to users based on their purchase history, browsing history, review history, and provide reasons for the recommendations. Intelligent recommendation can increase user satisfaction and loyalty, improve resource utilization and conversion rate, and also stimulate user interest and demand.

**Intelligent Coaching:** Intelligent coaching refers to the use of natural language processing, knowledge representation and reasoning, and other technologies to provide professional, timely, and friendly learning or research coaching to users. For example, IBM's cognitive computing system, Watson, is a powerful intelligent coaching system. It can provide diagnostic or treatment advice for doctors or patients by comparing massive literature data, and provide evidence and confidence. Intelligent coaching can improve users' learning or research efficiency and quality, solve the problems or confusion they encounter, and also cultivate their thinking and innovative abilities.

## ***2.3 The requirements for University Library Librarians***

The application of artificial intelligence technology not only brings opportunities and challenges to university libraries but also poses new demands on university library librarians. Specifically, the requirements of artificial intelligence on university library librarians are mainly reflected in the following aspects:

**Technical ability:** The development of artificial intelligence technology requires university library librarians to master more technical knowledge and skills, such as natural language processing, machine learning, knowledge graph, computer vision, human-computer interaction, etc., in order to develop, maintain, train, and monitor various intelligent systems and devices, and improve the intelligence level of the library. At the same time, university library librarians also need to have certain programming and data analysis abilities to utilize various tools and platforms for data collection, processing, mining, visualization, etc., to provide data support for library management and services.

**Professional ability:** The application of artificial intelligence technology requires university library librarians to have higher professional knowledge and skills, such as information organization, information retrieval, information evaluation, information utilization, etc., in order to effectively manage and utilize various information resources and provide users with more accurate, relevant, and diverse information services. At the same time, university library librarians also need to have interdisciplinary knowledge and perspectives to effectively communicate and cooperate with experts and users in other fields and promote the sharing and innovation of information resources.

**Service ability:** The application of artificial intelligence technology requires university library librarians to have stronger service awareness and level, such as user needs analysis, user experience

design, user satisfaction evaluation, etc., in order to provide users with more personalized, intelligent, and human services based on users' characteristics, needs, preferences, and other factors. In addition, university library librarians also need to have certain innovative thinking and entrepreneurial spirit to constantly explore and try new service models and methods, and improve service effectiveness and impact.

**Ethical ability:** The application of artificial intelligence technology requires university library librarians to have higher moral literacy and sense of responsibility, such as information security, information privacy, information justice, etc., in order to comply with relevant laws, regulations, and professional ethical norms, protect the legal rights and interests of users and themselves, and prevent and respond to various potential risks and crises.

At the same time, university library librarians also need to have a sense of social responsibility and civic consciousness in order to actively participate in social public welfare activities, promote information literacy education, and promote social civilization progress.

#### ***2.4 The Development Trend of University Libraries***

The rapid development of artificial intelligence technology will bring tremendous impact and changes to university libraries. According to relevant literature and web information, the development trends of university libraries under artificial intelligence mainly include:

**Intelligent library spaces:** using technologies such as 5G network, Internet of Things, and edge computing to realize the intelligent management and control of library space, facilities, and equipment, providing users with intelligent services such as contactless borrowing and returning, self-service queries, intelligent navigation, virtual reality/augmented reality, creating a knowledge acquisition and communication environment with a combination of virtual and real, dynamic interaction, and immersive experience.

**Intelligent resource system:** using natural language processing, machine learning, knowledge graph and other technologies to achieve intelligent collection, organization, processing, mining, and recommendation of various information resources, forming a multi-dimensional knowledge repository and knowledge graph, supporting users to easily access high-quality knowledge resources based on problem scenarios, and conduct deep learning and creation.

**Intelligent user services:** using technologies such as big data analysis, artificial neural networks, and expert systems to achieve intelligent monitoring, analysis, and profiling of user behavior and demand, providing users with customized and intelligent solutions, and offering intelligent services such as problem solving, automatic summarization, literature translation, and knowledge Q&A to enhance user satisfaction and loyalty.

**Intelligent management mode:** using technologies such as cloud computing, blockchain, and genetic algorithms to achieve intelligent optimization and innovation of library business processes and service activities, establishing a data-driven decision support system to improve library management efficiency and effectiveness, and promoting collaborative cooperation between the library and other institutions and platforms.

In summary, artificial intelligence technology will enable university libraries to develop towards higher efficiency, accuracy, personalization, and innovation, providing stronger support for national innovation and human comprehensive development.

### **3. The Recommendations for the Development of University Libraries**

Based on the analysis of the development trends of artificial intelligence in university libraries, this article proposes the following recommendations to promote the better utilization of AI technology, enhance service quality and efficiency, and meet the diverse needs of users:

**Strengthening learning and training in AI technology:** University library staff should constantly update knowledge, grasp the basic principles, application scenarios, and development trends of AI technology, and improve their technical literacy and innovation ability [2].

In addition, the library should strengthen cooperation with AI-related professional institutions and enterprises, introduce advanced technology equipment and platforms, and regularly organize training and exchange activities to promote the dissemination and application of technology.

Enhancing research and innovation in AI technology: University libraries should actively participate in the research and innovation of AI technology, carry out targeted projects and experiments based on their own business characteristics and user needs, explore optimized and innovative solutions of AI technology in library space, resources, services and management, and form an intelligent library model with independent intellectual property rights and distinctive advantages [3].

Strengthening assessment and supervision of AI technology: University libraries should establish a sound evaluation and supervision mechanism for AI technology, regularly evaluate and review the effects, risks, ethics, and other aspects of AI technology, timely identify and address potential problems and challenges, and ensure the safe, reliable, legal, and reasonable operation of AI technology [4].

Promoting the publicity and promotion of AI technology: University libraries should fully utilize various media and channels to actively promote the application achievements and value of AI technology in libraries, improve users' awareness and acceptance of AI technology, stimulate users' interest and participation in AI technology, and promote good interaction between users and AI technology [5].

In summary, artificial intelligence technology has brought new opportunities and challenges to university libraries. University libraries should actively embrace change, adapt to it proactively, and creatively apply it to continuously enhance their competitiveness and influence.

This article analyzes the development trend of university libraries supported by artificial intelligence technology from the perspective of the concept, characteristics, and current status of artificial intelligence technology. It also proposes development suggestions for university libraries based on artificial intelligence technology, with the aim of providing guidance and reference for university libraries to better utilize artificial intelligence technology, improve service quality and efficiency, and meet the diversified needs of users.

This article believes that artificial intelligence technology is a technology that simulates and extends human intelligence, with features such as autonomy, adaptability, learning, and creativity, and is at the forefront of world technological innovation.

The rapid development of artificial intelligence technology will bring about enormous impact and changes to university libraries. The development trends of artificial intelligence technology in university libraries mainly involve intelligent library space, intelligent resource system, intelligent user service, and intelligent management model.

To promote the better use of artificial intelligence technology in university libraries, this article proposes several suggestions: strengthening the learning and training of artificial intelligence technology, enhancing research and innovation in artificial intelligence technology, strengthening the evaluation and supervision of artificial intelligence technology, and enhancing the promotion and publicity of artificial intelligence technology.

The shortcomings of this article are that due to time and data limitations, the specific application case analysis of artificial intelligence technology in university libraries is not deep or comprehensive enough, and the problems and challenges brought about by artificial intelligence technology have not been thoroughly discussed. It is hoped that future researchers can supplement and improve this article to make more contributions to the better utilization of artificial intelligence technology in university libraries.

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