

# ***Research Progress in the Application of Artificial Intelligence in the Financial Field***

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**Abstract:** In the financial field, the application of artificial intelligence (AI) has become a key force driving industry innovation and transformation. However, there is still a significant gap in the comprehensive and systematic application of artificial intelligence in the financial field. This article reviews the research progress of AI in the financial field to fill this gap, aiming to provide a comprehensive perspective on understanding how AI reshapes the financial industry and its future development potential, and to provide some reference and inspiration for subsequent research. This article discusses the development stages of AI in the financial field, including the initial stage, penetration stage, and integration stage. Then, in-depth research was conducted on the application of AI in various aspects of the financial field, such as consumer end, investment end, financing end, etc. Finally, the challenges and future prospects faced by AI in the financial field were discussed. This article finds that AI has been deeply integrated and widely applied in the financial field, creating enormous value and promoting the intelligence, personalization, and customization of financial services. However, the challenges that come with it, such as data privacy and algorithm transparency, are new directions that require our continued attention and research. Therefore, this article not only provides us with a comprehensive perspective on the application of AI in the financial field, but also points out future research directions, so as to promote further development in this field.

**Keywords:** the application of artificial intelligence in the financial field, development stages, application directions, challenges, and future prospects.

## **1. Introduction**

In today's era of rapid technological development, artificial intelligence (AI) has become one of the important technologies guiding future development. Especially in the financial field, the widespread application of AI has become a development trend, which not only greatly promotes innovation in the financial industry, but also gradually changes the form of financial services, achieving intelligent, personalized, and customized service models. The application of artificial intelligence in the financial field has significant research value and significance. According to data from the American Banking Association (ABA), 77% of banks in the United States are currently utilizing artificial intelligence to improve service quality and efficiency, further enhancing customer experience. For example, through AI technology, banks can evaluate customer credit ratings through predictive models, which could

reduce bad debts and improve operational efficiency. There has been a large amount of research on the application of artificial intelligence technology in a specific scenario or problem in the financial field, but there is still a significant gap in the comprehensive and systematic application practice of artificial intelligence in the financial field. Therefore, this article aims to comprehensively and systematically review and summarize the existing research results on the application of artificial intelligence in the financial field to provide a comprehensive perspective for understanding the application of AI in the financial field. This article will cover the development stages and specific application directions of artificial intelligence in the financial field, as well as the challenges and future prospects of artificial intelligence in the financial field. It will demonstrate a unique thinking logic, provide systematic reference and inspiration for subsequent research, and also provide some practical reference for the financial industry.

## **2. Development stage**

With the rapid development of technology, artificial intelligence (AI) is gradually penetrating into every corner of the financial field. From its initial simple application to today's deep integration, it has gone through three main stages: initial, penetration, and integration [1].

### **2.1. Initial stage**

The application of artificial intelligence (AI) in the financial field began in the late 1980s, which can be seen as the initial stage of AI's application in the financial field. The main characteristics of this stage are mainly pilot and exploration, and the application breadth and depth of AI are relatively limited, mainly reflected in credit scoring, fraud detection, and transaction execution [2].

#### **2.1.1. Credit score**

As early as the 1990s, banks began to introduce AI technology for credit scoring. For example, Fair Isaac (FICO) in the United States has developed a credit scoring system based on neural networks. This system can evaluate the applicant's repayment ability based on various financial and personal information, such as credit history, debt level, family status, etc. This not only improves the accuracy of credit evaluation, but also greatly accelerates processing time [3].

#### **2.1.2. Fraud detection**

In addition, fraud detection is also an important area for the early application of AI in the financial field [4]. For example, credit card companies such as Visa and Mastercard use AI algorithms to detect abnormal transactions in order to prevent credit card fraud. These systems effectively prevent a large number of financial fraud behaviors by analyzing each transaction in real-time and discovering transactions that do not match the user's consumption patterns in a timely manner.

#### **2.1.3. Transaction execution**

In terms of transaction execution, high-frequency trading (HFT) companies have begun to introduce AI technology for automated trading. These AI systems can execute a large number of transactions at the millisecond level, improving transaction speed and efficiency. HFT companies such as Virtu Financial and Tradebot Systems were early leaders in using AI technology for automated transactions [5].

In summary, the initial stage of artificial intelligence in the financial field was mainly focused on pilot and exploration, and its impact on financial business was relatively shallow. However, the

attempts and explorations at this stage have laid the foundation for the deep application of AI in the financial field, effectively promoting the progress of financial technology.

## **2.2. Infiltration stage**

The penetration stage of artificial intelligence (AI) in the financial field began in the early 21st century, characterized by the widespread application of AI technology in various services in the financial industry, such as investment consulting, consumer loans, risk management, compliance checks, etc. [6].

### **2.2.1. Investment consulting**

In terms of investment consulting, many financial institutions have begun to use AI technology to provide investment strategy advice [7]. Many wealth management systems of wealth companies use machine learning algorithms to conduct in-depth analysis of global stock market data, predict market trends, and provide investment advice to clients [8].

### **2.2.2. Consumer loans**

In terms of consumer loans, AI technology is applied in the approval process of loan applications. For example, many Internet finance companies, such as LendingClub and Zopa, are using AI technology to evaluate users' loan applications. These evaluation systems can analyze user credit history, financial status, occupational information, and other data to quickly and accurately determine credit limits [9].

### **2.2.3. Risk management**

In terms of risk management, AI technology has also shown significant advantages. For example, many banks and financial institutions are using AI technology to achieve more effective credit risk management. These systems collect and analyze a large amount of data, including customer transaction records, consumption habits, social network information, etc., to promptly identify potential credit risks [10].

### **2.2.4. Compliance inspection**

In terms of compliance checks, AI technology is being used to identify and prevent non-compliant behaviors such as fraud and money laundering. For example, banking giant HSBC utilizes AI technology to automatically review a large number of transaction records to identify and prevent potential money laundering activities [11].

In summary, during the penetration stage of artificial intelligence in the financial field, the application of AI has penetrated into various aspects of financial business, and its impact on the financial industry is becoming increasingly profound.

## **2.3. Integration stage**

The integration stage of artificial intelligence (AI) in the financial field began in the past decade. Its characteristic is that AI technology is not only widely applied within the financial field, but also deeply integrated with other fields such as data science and blockchain. It has become the core driving force for innovation and transformation in the entire industry, achieving comprehensive intelligence and personalization of financial business [12].

### **2.3.1. Intelligent financial services**

At this stage, AI technology has been widely applied in financial market trading, risk management, asset allocation, stock selection, and other aspects, greatly improving the efficiency and quality of financial services. For example, institutions such as Fidelity Investments and Vanguard have used AI-driven trading robots to provide customers with 24-hour online services. They can analyze large amounts of data, generate investment strategies, and even execute transactions directly [13].

### **2.3.2. Intelligent risk management**

Risk management is the core link of the financial industry. During the integration phase, many financial institutions have started using AI technology for real-time risk monitoring and early warning [14]. For example, JPMorgan Chase's COIN system can automatically analyze and interpret complex regulatory regulations, helping banks avoid compliance risks.

### **2.3.3. Personalized financial products**

AI technology is also used to develop personalized financial products. Financial institutions such as Citigroup and Morgan Stanley have begun to use AI technology to provide customers with personalized investment strategies and wealth management products. These systems analyze customer investment behavior through deep learning and machine learning algorithms, understand their risk preferences, and provide customers with the most suitable investment advice.

In summary, during the integration phase, AI has not only been deeply applied in various financial services, but also deeply integrated with other technologies, promoting the intelligent and personalized development of the financial industry.

The application of artificial intelligence in the financial field has gone through three stages: initial, penetration, and integration, each of which has brought many innovations and changes. With the continuous development and improvement of AI technology, its application in the financial field will also be more extensive and in-depth. In the future, it is worth looking forward to more financial products and services transforming and upgrading with the help of AI, making greater contributions to the development and prosperity of the financial market.

## **3. Application direction**

With the continuous progress of artificial intelligence technology and the continuous expansion of its application fields, its application directions in the financial field are also becoming increasingly rich and diversified. From the consumer end to the investment end, and then to the financing end, artificial intelligence is playing an increasingly important role.

### **3.1. The application of artificial intelligence in the consumer end of the financial field**

Artificial intelligence (AI) is playing an increasingly important role in the consumer end of the financial industry. By providing personalized services, optimizing user experience, and enhancing security and efficiency, AI is reshaping the financial experience of consumers. The following are some specific applications and detailed examples of AI in the financial consumer end.

#### **3.1.1. Personalized financial advice**

AI can provide more personalized financial advice. Machine learning algorithms can provide personalized budget recommendations, investment strategies, etc. based on user transaction history,

income levels, consumption habits, and other data [15]. For example, financial technology company Mint.com utilizes AI technology to provide users with customized savings and investment advice.

### **3.1.2. Virtual Assistant and Customer Service**

AI virtual assistants can simulate the behavior of human customer service and provide 24/7 online services. Through natural language processing (NLP) technology, virtual assistants can understand user questions and provide corresponding answers [16]. This not only improves the response speed of customer service, but also reduces the operating costs of financial institutions. For example, many banks have launched AI-driven virtual customer service assistants that can handle simple queries, transactions, and complaints.

### **3.1.3. Contactless payment and smart wallet**

AI technology has driven the development of contactless payments and smart wallets, providing consumers with more convenient and secure payment methods. Through near-field communication (NFC) technology, consumers only need to place their phones or smart bracelets close to the payment terminal to complete the payment. The smart wallet application can manage users' bank cards, coupons, and loyalty plans, providing a one-stop payment and financial management experience.

### **3.1.4. Credit approval and personal loans**

AI technology simplifies the credit approval process, making personal loans faster and easier. By analyzing the user's credit history, income status, and expenditure patterns, AI systems can automatically evaluate the borrower's repayment ability and risk level, and quickly make loan decisions [17]. Some online lending platforms have achieved rapid approval and lending through AI technology, meeting the immediate funding needs of consumers.

### **3.1.5. Insurance customization and intelligent claims management**

AI technology can provide customized insurance products and services based on the personal situation and needs of consumers. Through big data analysis, AI systems can predict potential risks and losses, and recommend corresponding insurance products to consumers. In addition, AI can simplify the claims process and quickly process claims requests through automated review and intelligent loss assessment.

### **3.1.6. Risk management and anti-fraud**

AI technology also plays an important role in risk management and anti-fraud [18]. By analyzing consumer transaction behavior and patterns, AI systems can identify suspicious transactions and issue warnings. This helps financial institutions to detect and prevent fraudulent behavior in a timely manner to protect the financial security of consumers [19].

In summary, artificial intelligence has been widely and deeply applied in the consumer end of the financial field, providing consumers with more convenient, personalized, and secure financial services. With the continuous progress and innovation of technology, the application of AI in the financial consumer end will become more rich and diverse in the future.

## **3.2. The application of artificial intelligence in the investment end of the financial field**

Artificial intelligence (AI) plays a huge role in the investment side of the financial field, providing investors with more accurate and efficient investment strategies and services through data analysis,

market trend prediction, automated trading, and risk management. The following are some specific applications and detailed examples of AI in the financial investment end.

### **3.2.1. Data analysis and prediction model**

AI technology can process and analyze a large amount of financial data, including historical prices, transaction volumes, financial reports, news events, etc., to discover patterns and trends in the data. Through machine learning and deep learning algorithms, AI can construct predictive models to predict stock prices, market trends, and asset values [20]. For example, AI systems such as AlphaGo use deep neural networks to learn market data and achieve high-precision prediction of financial markets.

### **3.2.2. Automated and algorithmic trading**

AI technology can achieve automated and algorithmic trading. By setting trading rules and algorithms, AI can automatically execute trading operations when the market changes, reducing human interference and errors. This trading method can quickly respond to market changes in a short period of time, and improve trading efficiency and accuracy [21]. Many financial institutions and investors use AI-driven algorithmic trading platforms to achieve fast trading and asset allocation.

### **3.2.3. Personalized portfolio optimization**

AI technology can optimize investment portfolios and achieve optimal asset allocation based on investors' risk preferences, return goals, and asset allocation requirements. By analyzing market data through algorithms, AI can recommend diversified investment portfolios for investors to diversify risks and increase returns. Some intelligent investment advisory platforms utilize AI technology to provide users with personalized asset allocation plans and investment portfolio management [22].

### **3.2.4. Risk management and hedging strategies**

AI technology can be applied to risk management and the formulation of hedging strategies. Through in-depth analysis and prediction of market data, AI can assess investment risks and develop corresponding hedging strategies to reduce investment risks. AI can also monitor market fluctuations and abnormal situations and issue timely risk warnings to help investors adjust investment strategies and risk management measures in a timely manner [23].

### **3.2.5. Intelligent investment research and market analysis**

AI technology can improve the efficiency and accuracy of investment research. AI can deeply mine and analyze market data, identify investment opportunities and risk points, and provide investors with comprehensive market analysis reports [16]. At the same time, AI can also automatically collect, organize, and analyze various financial news and events, providing investors with timely market dynamics and investment advice.

In summary, artificial intelligence plays an important role in the investment side of the financial field. Through data analysis, automated trading, personalized portfolio optimization, risk management, and intelligent investment research, it improves investment efficiency and accuracy, providing investors with more intelligent and convenient investment services.



### **3.3. The application of artificial intelligence in the financing end of the financial field**

Artificial intelligence (AI) technology is playing an increasingly important role in the financing end in the financial field. The application of AI not only improves financing efficiency, but also reduces risks and brings more convenience to financial institutions and borrowers. The following are specific applications and detailed examples of AI in the financing end of the financial field.

#### **3.3.1. Loan approval and risk assessment**

AI technology can conduct in-depth analysis of borrowers' credit history, financial status, industry prospects, etc. through machine learning algorithms to quickly and accurately assess loan risks. Compared to traditional manual approval, AI approval is more objective and efficient, and can process a large number of loan applications in a short period of time. For example, some banks have automated loan approval using AI technology, greatly improving approval efficiency and reducing the risk of human intervention [24].

#### **3.3.2. Customer segmentation and market positioning**

AI can help financial institutions more finely segment customer groups, identify the needs and behavioral characteristics of different customers, and thus develop more targeted financing products and services [25]. For example, some fintech companies use AI technology to analyze customer data and develop loan products targeting specific customer groups, such as credit loans for small and micro enterprises and personal consumption loans for consumers.

#### **3.3.3. Intelligent recommendation and asset allocation**

AI technology can intelligently recommend the most suitable financing products and asset allocation plans based on the borrower's needs and risk tolerance. This can not only improve the satisfaction of borrowers, but also help financial institutions optimize their asset portfolios and reduce risks. Some online lending platforms use AI algorithms to recommend personalized financing solutions to meet the diverse needs of different users.

#### **3.3.4. Automated credit scoring and anti-fraud**

AI technology has the capability to construct precise credit scoring models that can automatically assess the creditworthiness of borrowers [2]. Additionally, AI can be utilized for anti-fraud detection to recognize and prevent potential fraudulent activities. For instance, many financial institutions employ AI algorithms to authenticate the identity information of borrowers, guaranteeing the lawful utilization of loan funds and decreasing the possibility of fraud.

#### **3.3.5. Dynamic Pricing and Risk Management**

AI technology can adjust the pricing of financing products and risk management strategies in real-time based on market conditions and risk changes. This helps financial institutions better cope with market fluctuations and improve profitability. Some financial institutions use AI technology to predict market interest rates in order to adjust loan interest rates in a timely manner and achieve optimal pricing strategies.

In summary, the application of artificial intelligence in the financing end of the financial field not only improves financing efficiency and risk management level, but also brings more convenience and opportunities to financial institutions and borrowers. In the future, with the continuous development

and improvement of AI technology, its application in the financing end of the financial field will be more extensive and in-depth.

In summary, the application direction of artificial intelligence in the financial field is extensive and far-reaching, covering various sections from the consumer end to the investment end, and then to the financing end. With the continuous advancement of technology and the expansion of application scenarios, artificial intelligence will bring more intelligent, efficient, and personalized service experiences to the financial field.

#### 4. Challenges and Future Prospects

Artificial intelligence has had a significant impact on the financial field, changing the way of life and bringing revolutionary changes to the financial industry. However, although AI brings many advantages, it also brings some challenges while being widely applied. Firstly, data privacy and protection is an important challenge, as AI applications in financial services require the collection, storage, and processing of large amounts of sensitive personal and corporate data. Thus how to protect user privacy and prevent data leakage or malicious use while collecting and using this data is currently a major challenge faced by AI applications in the financial field [26]. Secondly, the interpretability and transparency of AI systems is also a major challenge. Although AI can provide important support in financial decision-making, such as credit approval, risk assessment, and investment advice, the decision-making process of these AI models is mostly opaque and referred to as the "black box" [27]. This makes it difficult for financial advisors and consumers to understand how AI makes these decisions, which may threaten AI's trust and acceptance in the financial field. Furthermore, the regulation and compliance of AI is also an important challenge [28]. Although some countries and regions have introduced relevant policies and guidelines, there are still difficulties in regulating these new technologies. Especially with the continuous development of AI technology and the expansion of its applications in the financial field, how to formulate more targeted regulatory policies to ensure the safety, fairness, and transparency of AI is a current issue that needs to be considered and solved.

Despite these challenges, the future development of AI in the financial field is still full of hope. It is expected that in the future, artificial intelligence will be more deeply integrated into various aspects of financial services. Moreover, as researchers deepen their understanding of AI, it is expected that more methods and technologies will be developed in the future to improve the transparency and interpretability of AI. For example, there are already some studies exploring how to build interpretable AI models, or how to help people understand the decision-making process of AI through visualization and other methods. In addition, with the continuous deepening and widespread application of AI in the financial field, it is expected that more regulations will be introduced in the future to regulate and guide the application of AI in the financial field. These regulations not only protect the rights of consumers, but also provide clearer guidance for financial institutions to better utilize AI technology and achieve innovation and optimization in financial services.

Overall, although the application of artificial intelligence in the financial field still faces some challenges, its future is still full of infinite possibilities. As long as these challenges can be properly addressed, the application of artificial intelligence in the financial field can be fully utilized, bringing greater value to society.

#### 5. Conclusion

This article conducts a comprehensive and in-depth study on the application of artificial intelligence in the financial field, with the aim of deepening the understanding of how to effectively utilize AI to improve financial services, enhance financial efficiency, reduce risks and provide better services, and providing strong support and inspiration for subsequent research. After sorting and analyzing a large



amount of literature, it was found that the application of artificial intelligence technology in the financial field has made significant progress. Artificial intelligence has not only deeply integrated with the financial field, but its application in the financial field is also becoming increasingly widespread and diversified, playing an important role in various application directions such as the consumer end. However, the widespread application of artificial intelligence has also brought some problems and challenges, such as data privacy, algorithm fairness, and transparency [29]. Although this article has provided a comprehensive overview and analysis of the application of artificial intelligence in the financial field, there are still many issues that have not been fully explored and resolved. For example, this study has not yet explored in depth how to fully utilize AI technology while ensuring data security. In addition, ensuring the fairness and transparency of algorithms when implementing the widespread application of AI technology is also an urgent problem that needs to be solved. For these issues, it is suggested that future research can focus on the combination of AI technology and financial regulation, optimization and innovation of AI algorithms, as well as ethical and moral issues related to AI technology. This paper comprehensively summarizes the development stages, application directions, challenges, and future development trends of AI in the financial field by reviewing a large amount of literature. It provides a comprehensive perspective for understanding the application of AI in the financial field and promoting its practical application. Moreover, while discussing the application of AI in the financial field, this article also clearly points out the problems and challenges it faces, which provides useful insights and directions for researchers to further explore the application of AI in the financial field.

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