

The Application of Artificial Intelligence in the Investment Field

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Abstract: The application of artificial intelligence technology in the financial sector has brought about significant transformations across the entire financial industry, giving rise to innovative financial services such as intelligent financial advisory, intelligent credit assessment and monitoring and intelligent customer service. However, the application of AI technology in financial sector also faces a series of challenges and difficulties. To enhance core research and development capabilities, it is necessary to integrate and utilize big data resources, build and improve a secure and widely shared data ecosystem, establish and optimize multiple risk prevention mechanisms, and improve the risk control level of AI technology. Reforms and improvements in financial regulatory mechanisms are needed to achieve comprehensive oversight of the application of AI technology in the financial sector, providing favorable conditions for promoting innovative and standardized development in the financial industry.

Keywords: artificial intelligence; finance; investment field

1. Application Background and Research Significance

The application of artificial intelligence technology in the investment field can be traced back to early computer-assisted trading systems. However, it was only in recent decades, with significant advancements in computing power and rapid development in data technology, that AI began to be widely applied in the investment field. The application background of AI in the investment field mainly lies in technological progress, the increasing complexity of financial markets, and the growing demand from investors for efficient decision-making.

(1) Promotion by Technological Advancements With the rapid development of information technology, the application of artificial intelligence in the financial sector has been widely promoted. Artificial intelligence technology, by simulating human intelligence and utilizing computer technology to achieve intelligent data processing and decision-making, can effectively enhance the efficiency and accuracy of investment decisions. The application of this technology plays a significant role not only in financial services and regulatory oversight but also in financial analysis, thereby promoting the intelligence and standardization of the financial industry.

(2) Investors' Demand Growth hope to obtain more accurate predictions and personalized investment advice in their investment decisions. Artificial intelligence technology can meet this demand by providing personalized asset allocation and risk management strategies. AI investment advisors collect and analyze investors' investment preferences, risk levels, and other data to propose personalized investment plans, helping

investors achieve better returns in the market.

(3) **Enhancing Investment Decision Efficiency** Artificial intelligence (AI) technology can quickly process large amounts of data, thereby improving the efficiency and accuracy of investment decisions. By utilizing machine learning and deep learning techniques, AI can automatically identify market trends and risk factors, optimize investment portfolios, and dynamically adjust portfolio weights, thus enhancing return on investment and risk management capabilities. For example, the application of deep learning in portfolio construction and optimization involves encoding and decoding financial market information to form an asset portfolio that meets the objective function. Experimental evidence has shown that its performance surpasses that of benchmark models.

In modern financial markets, intelligent investment systems, through their efficient data processing capabilities and predictive analysis, can quickly respond to market changes and provide investors with more accurate investment advice and strategies. This not only improves investment efficiency but also enhances risk management capabilities. For both individual and institutional investors, intelligent investment systems have significant practical application value and strategic importance.

(1) **Enhancing Investment Efficiency and Accuracy** Smart investment leverages artificial intelligence technologies such as machine learning and deep learning to efficiently process and analyze massive amounts of data, thereby establishing precise predictive models and improving the efficiency and accuracy of investment decisions. These technologies can extract nonlinear relationships from complex data, helping investors better understand market dynamics and predict market trends.

(2) **Reducing Investment Risk** Smart investment uses big data analysis and machine learning algorithms to monitor market changes in real time, assess investment risks, and provide corresponding risk management strategies. This approach effectively reduces uncertainties in the investment process, helping investors manage their risks more effectively.

In a dynamic market environment, more rational decisions can be made. Additionally, intelligent investment advisors further enhance the precision and risk management capabilities of investment decisions through automated trading and real-time market monitoring, thereby reducing the impact of human errors and emotional fluctuations on investment decisions.

(3) **Personalized Investment Advice** Smart investment platforms can provide personalized investment portfolio recommendations based on investors' risk preferences, investment goals, and time horizons. This feature significantly enhances investor satisfaction because the platform can offer customized investment solutions based on clients' diverse financial goals, effectively alleviating investment herd behavior caused by information asymmetry.

2. Artificial Intelligent Investment Strategies and Methods

2.1. The framework of Intelligent Investment Advisory

Markowitz's Mean-Variance Model is the cornerstone of portfolio theory, which selects the optimal investment portfolio by balancing expected returns and risk. Intelligent investing integrates Modern Portfolio Theory with machine learning algorithms to optimize investment portfolios, thereby maximizing returns or minimizing risks.

The core technologies of intelligent investment advisory include machine learning, deep learning, and natural language processing. These technologies generate personalized investment recommendations by analyzing customers' historical transaction data, market conditions, and risk preferences. For example, machine learning algorithms can be used to predict the price fluctuation trends of financial assets, thereby helping customers formulate investment portfolios that meet their risk-return requirements. In addition, deep learning technology further enhances the accuracy of investment decision-making by simulating the working process of human brain neurons. Natural language processing technology [1] is applied in the field of intelligent customer service, where it improves the efficiency and satisfaction of customer service through functions such as voice recognition and semantic understanding [2].

In intelligent investing, artificial intelligence technologies analyze a variety of information sources, such as historical transaction data, market news, and social media trends, to predict market trends and the performance of

specific assets. These predictive models employ complex algorithms, such as random forests, support vector machines, and deep learning, to capture complex patterns and relationships in the data, thereby making more accurate predictions. By analyzing big data to understand customers' risk preferences and investment goals, personalized asset allocation plans are provided to meet individual needs. Using machine learning methods, intelligent investment advisory can dynamically track market changes and adjust investment portfolios in real time.

The service model of intelligent investment advisory has shifted from traditional face-to-face consulting to online automated services. This transformation not only reduces operating costs but also significantly improves service efficiency. Through big data and artificial intelligence technologies, intelligent investment advisory can offer personalized asset allocation recommendations and real-time market analysis to better meet the diverse needs of customers. In terms of customer experience, intelligent investment advisory significantly enhances the personalization and convenience of services through intelligent customer service and user profiling technologies.

Intelligent customer service, leveraging natural language processing and voice recognition technologies, can quickly respond to customer needs. User profiling technology, by analyzing customer behavior data and transaction records, creates more accurate customer profiles, thereby providing investment advice that is more in line with customer needs [3].

2.2. Intelligent Financial Advisory Strategies

Currently, the strategies of intelligent financial advisory mainly come in two forms: investment strategies based on machine learning and dynamic asset allocation strategies. Investment strategies based on machine learning widely apply algorithms such as support vector machines, random forests, and deep learning in financial investment, capable of handling high-dimensional, non-linear financial data and capturing complex relationships in the market. Reinforcement learning methods learn optimal investment strategies through interaction with the environment, making them suitable for multi-period, multi-objective investment decision-making. Dynamic asset allocation strategies automatically adjust investment portfolios based on market conditions and asset information to respond to market changes, aiming to maximize profits or minimize losses. By real-time monitoring of investment portfolios and dynamically adjusting asset proportions, risks can be reduced, and returns can be increased [4].

The hybrid model of intelligent investment advisory, which combines artificial intelligence and human expertise, offers a more comprehensive investment advisory service. This model has been widely applied and recognized both domestically and internationally because it strikes a balance between the convenience and low cost of digital platforms and the personalized guidance and human touch of traditional wealth managers. This balance appeals to investors who wish to combine the convenience of technology with human expertise.

2.3. Intelligent Investment Methods

The application of deep learning in investment primarily lies in its outstanding performance in asset price prediction and allocation. Models such as LSTM and Convolution Neural Networks can extract better features from time series data, thereby improving prediction accuracy. Deep learning also has applications in portfolio optimization, where it helps build a theoretical framework for deep asset allocation to optimize portfolio performance. Additionally, quantitative investment methods have excellent applications in the investment field. Quantitative investment leverages computer technology to establish mathematical models, realizing the process of investment philosophy and strategy. It is characterized by discipline and efficiency. Based on summarizing historical patterns in the securities market, quantitative investment analyzes and formulates strategies and models that can be repeatedly applied, achieving optimal investment.

Intelligent investment strategies, through high-level mathematical modeling and machine learning methods, analyze massive amounts of historical and real-time data to automatically identify and predict investment opportunities. This approach can effectively identify market patterns, predict market trends, and adaptively adjust the asset portfolio without human intervention to achieve optimal risk management and profitability. For example, companies can use machine learning methods to comprehensively analyze multiple dimensions, such as social media, market sentiment, and economic indices, to better grasp the short-term market conditions and

long-term value of the stock market.

Compared with traditional investment strategies, intelligent investment strategies show significant advantages in dealing with nonlinear and non-stationary characteristics. Traditional statistical models often have difficulty in coping with these complex features, while artificial intelligence methods can better capture market dynamics and provide more precise support for investment decision-making. Research shows that an increasing number of scholars are using artificial intelligence as a support for solutions to optimize the management of investment portfolios and risk control.

When evaluating the effectiveness of intelligent investment strategies, common metrics include cumulative return, Sharpe ratio, maximum drawdown, Alpha, and Beta. The cumulative return measures the investment outcome of a portfolio over a period of time. The Sharpe ratio reflects the extent to which the net asset value growth rate exceeds the risk-free rate on a per-unit-risk basis. The maximum drawdown describes the worst-case scenario that investors may face. The Alpha value measures the excess return obtained by the model compared to the benchmark model, while the Beta value assesses the systematic risk of the model relative to the benchmark.

Some research indicates that when using deep learning algorithms for stock price prediction, the LSTM model demonstrates high predictive accuracy in handling time-series data and can extract superior features from raw data. Moreover, ensemble learning methods, by aggregating expert predictions online, can enhance portfolio performance, offering higher Sharpe ratios and lower drawdown rates.

In practical applications, intelligent investment strategies play a vital role in enhancing the effectiveness of investment decision-making. Through automation and data analysis, intelligent investment strategies can maintain competitiveness in the complex and volatile financial markets, achieving optimized asset allocation and risk management.

Experimental data shows that portfolio optimization models based on machine learning have significant advantages in terms of prediction error and risk control. For example, using a hybrid prediction approach that combines models such as Random Forest, Support Vector Regression, and Long Short-Term Memory (LSTM) networks can effectively reduce prediction errors and improve returns and Sharpe ratios by constructing new portfolio models.

2.4. Application Cases of Intelligent Investment Advisory Strategies in the Stock Market

Betterment and Wealthfront are early representatives of global intelligent investment advisory services. They provide low-cost asset management services to investors through automated portfolio recommendations. Both Betterment and Wealthfront have played a significant role in democratizing access to professional investment advice and making sophisticated portfolio management accessible to a broader range of investors [5].

3. Challenges and Future Trends

Despite the broad prospects for the application of artificial intelligence in the investment field, some challenges remain, such as data security, algorithm transparency, and regulatory policies. Ensuring the security and privacy of large volumes of sensitive financial data is crucial when handling such information. Additionally, complex algorithms can sometimes be difficult to explain in terms of their decision-making processes, a problem known as the “black box” issue, which may affect the trust of investors and regulatory bodies.

(1) The limitations of technology application are significant, as investment fields heavily rely on data. The accuracy and reliability of AI models largely depend on the quality and completeness of the data. Acquiring high-quality, comprehensive, and reliable data is a major challenge. The issue of model with overfitting and generalization capability is evident; AI models may overfit during training, meaning the model excessively adapts to the training data, leading to a decline in predictive power for unknown data. At the same time, the generalization capability of the model is also a concern, referring to the model’s ability to maintain stable performance in different market environments [6].

(2) The issues of data privacy and security, financial institutions face risks of data leakage and tampering during the processes of data collection, storage, and transmission. Particularly in cloud computing and big data environments, the centralized storage and sharing of data increase the likelihood of information leakage, posing

serious threats to customer privacy and financial security. Technical risks and operational risks coexist, with the complexity of technical systems and high technical requirements increasing the difficulty of financial institutions in risk management. The contradiction between data privacy protection and regulatory requirements is becoming more pronounced [7].

(3) Market dynamics and uncertainties mean that AI applications rely on historical data, but financial markets change rapidly, affecting the timeliness of AI modeling and analysis due to the dynamic imbalance of data. Financial institutions are increasing their reliance on AI technology, while regulatory mechanisms are still incomplete, leading to greater market supervision risks.

The future development trends of intelligent investment may include broader applications of deep learning and reinforcement learning technologies, as well as enhanced the interpretability and operability of AI systems. As technology advances, AI will play a more significant role in investment decision-making, ranging from simple data analysis to complex asset allocation and risk management. Intelligent investment systems will become more intelligent and user-friendly.

4. Conclusions

Artificial intelligence technologies are gradually transforming the operation of the investment industry by enhancing data analysis capabilities and automating trading levels. Not only does AI improve investment efficiency, but it also strengthens risk control capabilities. Intelligent investment systems can quickly respond to market changes, providing more personalized and precise investment advice, which is of significant importance for enhancing investment returns and customer satisfaction. For investors, the key to adapting to this change lies in understanding and accepting the advantages of intelligent investment tools while paying attention to their potential risks. Investors should choose smart advisory services that align with their investment strategies and risk tolerance and remain attentive to market dynamics and technological advancements to make more informed investment decisions.

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