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The advantage of artificial intelligence application in financial risk assessment and management

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Abstract. The increasing perfection of artificial intelligence technology has brought subversive changes to the field of financial risk management. The application of artificial models such as neural networks, support vector machines, and mixed intelligence in financial risk management can improve the speed of data processing, provide deep insight into data analysis, reduce human labour costs, and hence improve the efficiency of financial risk control. Meanwhile, the increasing amount of data and the application of AI also bring new challenges to financial risk management, such as the risk of program error and information security. This paper introduces in detail the application status of three models, including Support Vector Machine, Support Vector Machine, and Large Language Model in risk management Based on this, this paper analyses the advantages of AI applications in promoting and reforming the financial industry. The goal is to provide an in-depth examination of present implementations and their respective benefits, as well as to investigate potential future advances in this sector.

Keywords: Artificial intelligence, Financial risk management, FinTech.

1. Introduction

FinTech is a portmanteau of "financial technology"[1]. Today, companies combine finance and new technologies to compete with traditional financial methods in providing financial services. Technological innovation aims to increase work efficiency and reduce production costs. FinTech includes mobile banking, investments, and cryptocurrencies, which aim to make financial services more accessible and convenient for the general public. Artificial intelligence (AI), blockchain, cloud computing, and Big Data are four critical areas of FinTech. With the rapid development of technology, FinTech is widely used to automate various financial services.

In today's financial system, risk assessment and management are cornerstone practices that ensure firms' and banks' stability and sustained growth [2]. Traditionally, risk management heavily relied on human expertise, complex mathematical models, and historical data. These factors require financial workers to have strong calculation skills and data processing capabilities. However, global financial markets have evolved significantly, becoming more interconnected and complex. There are increasingly complex databases and factors that investigators have to deal with. As a result, assessing financial risk is becoming increasingly difficult.

With the advancement of technology, the emergence of artificial intelligence (AI) is a transformative power reshaping various industry sector. AI possesses an unparalleled capability to handle extensive volumes of data efficiently, extract valuable insights from intricate patterns, and continuously acquire

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knowledge and adapt accordingly. This characteristic signifies a novel paradigm in the understanding and management of financial risks. No matter whether it involves enhancing the precision of creditworthiness predictions, increasing the efficiency of fraud detection systems, or optimizing portfolios in real time during periods of market volatility.

This report aims to investigate the utilization of artificial intelligence (AI) in financial risk management. The objective is to provide an in-depth analysis of the current implementations and their respective advantages and explore the potential future developments in this field. Meanwhile, it is crucial to recognize the challenges and ethical considerations that arise when integrating artificial intelligence (AI) into the sensitive finance domain.

2. AI current application in financial risk management

2.1. Artificial intelligence

Artificial intelligence (AI) is the intelligence of machines or software, as opposed to the intelligence of human beings or animals [3]. AI leverages computers and devices to mimic the problem-solving and decision-making capabilities of the human mind. Scientists improve machines to assume some capabilities typically thought to be like human intelligence, such as learning, adapting, and self-correction. The development of AI has a unique economic and social foundation. With the help of advanced internet and the rapid spread of network service, the speed of the processor and cloud service has become faster, which increases the computation capability. The advancement in technology also helps financial institutions to spend less investment in

On the other hand, the data in the financial market is growing exponentially, and financial institutions have to seek innovations in financial services in order to lower costs and increase their potential profit. Initially, people still had queries about AI; hence, AI application in the financial area was superficial and mainly focused on data analysis and processing. Nowadays, AI theory and technology have developed a lot. Many workers in the financial field have begun to accept and rely more on AI. People examine the possibility of AI applications in risk management and analysis. The result is quite successful. The following examples show that AI model prediction highly matches the real-world situation and has good feasibility and relatively high accuracy.

2.2. Artificial Neural Network (ANN) models

Artificial neural networks are a branch of machine learning models built based on principles of neuronal organization in the biological neural networks constituting animal brains. They are used to estimate or approximate mathematical functions [4]. A large number of artificial neuron connections calculates neural networks. In most cases, ANN can change the internal structure based on external information, and it is an adaptive system, which is generally said to have a learning function. Due to its strong learning capability, ANN is commonly used to predict and assess risks in finance. Wang Xuying combined ANN with BP (Back Propagation) algorithm to build up a risk assessment model for financial information systems, examining the risk level of the information system through the data provided by 60 financial institutions by the end of 2021 [5]. Xia Jiajia takes Anhui Province as an example, using a recurrent neural network (RNN) model with memory ability to evaluate and study financial risk [6]. Their models and results strongly suggest that ANN models can predict and stimulate real-world situations and give an accurate analysis of potential risks.

2.3. Support Vector Machine (SVM)

In machine learning, support vector machines are supervised learning models with associated learning algorithms that analyze data for classification and regression analysis [7]. SVMs are particularly good at solving binary classification problems, which require classifying the elements of a data set into two groups. An SVM algorithm aims to find the best possible line, or decision boundary, that separates the data points of different data classes. SVMs are helpful in analyzing complex data that a simple straight line cannot separate. Lang Zhang built up a credit risk assessment model based on SVM for small and

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medium enterprises in supply chain finance [8]. Based on SVM, Song Ying analyses the loan default risk prediction of small and micro enterprises, aiming to enhance the risk control capability of loan businesses to small firms [9]. Their results show that the SVM holds promise for improving accuracy and precision in predicting financial vulnerabilities.

2.4. Large Language Model (LLM)

A large Language Model is a type of artificial intelligence model designed to understand and generate human-like text based on the input it receives, such as OpenAI's GPT series [10]. ChatGPT can not only mimic a human conversationalist but also provide a variety of services. For example, ChatGPT can write and debug computer programs, answer test questions, generate business ideas, and summarize text. Based on research released by OpenAI, ChatGPT 4 has earned high marks in many exams, such as the SAT and GRE. ChatGPT is almost scoring almost 90% among test-takers [11]. These results suggest that compared to many people, AI has more vital mathematical and intelligible capabilities, which are highly required in financial industries. This power can help financial workers build up analysis process models and find the procedure's feasibility.

3. Advantages of AI application in risk management

3.1. Efficiency and automation

The incorporation of AI-driven automation in the financial realm represents a paradigm shift from traditionally manual, often tedious processes to a landscape characterized by swiftness and precision. Automation, facilitated by AI, transcends the limitations of human speed and accuracy, effectively executing tasks that were once prone to human error and delay. This advantage not only leads to a significant reduction in operational costs of financial institutions but also ensures that decision-making is prompt and precise [12]. For instance, real-time trade settlements or instantaneous fraud alerts, once aspirations, are now realities. Beyond mere task execution, the efficiency brought by AI allows financial institutions to channel human resources to more strategic, value-driven roles, fostering innovation and strategic growth. Moreover, this efficiency is not static; AI's inherent learning capabilities mean that these automated processes become even more refined over time, adapting to new data and challenges. Ultimately, AI-driven efficiency and automation do not just optimize processes; they redefine what is possible in the financial industry, setting higher benchmarks for service delivery, customer experience, and operational excellence.

3.2. Enhanced predictive capabilities

With its intricacies and volatile nature, the financial sector necessitates foresight that goes beyond conventional analytics. Traditional financial models, though rigorous, often grapple with dynamic, unforeseen market changes. AI's enhanced predictive capabilities come to the fore in this context, providing an edge that is both profound and transformative. With the power of machine learning and deep learning, AI delves into vast datasets, uncovering intricate patterns and correlations that might elude human analysts. These patterns are rooted in historical data and draw insights from real-time market fluctuations, global events, and even nuanced indicators like public sentiment. As a result, financial institutions equipped with AI-driven predictive analytics can anticipate market shifts, customer behaviors, or potential risks with unparalleled accuracy. This predictive acumen enables initiative-taking decision-making, allowing organizations to strategize, innovate, and adapt long before challenges manifest or opportunities dissipate. The enhanced predictive capabilities offered by AI transform financial institutions from mere market participants to visionary leaders, shaping their destinies in an unpredictable financial landscape.

3.3. Improved credit scoring

Credit scoring is pivotal in determining lending risks. Historically, this assessment was bound by a narrow set of parameters — often past financial behaviors and existing liabilities. However, this method

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often overlooked various facets of a borrower's financial profile, potentially leading to erroneous judgments. The advent of AI in credit scoring introduces a transformative paradigm. With AI, credit assessment is not confined to conventional data points; it seamlessly integrates non-traditional indicators, such as online behavioral patterns, utility payments, or social media trends. By amalgamating a more comprehensive set of indicators, AI paints a richer, more holistic picture of an applicant's creditworthiness. This nuanced evaluation offers twofold benefits: financial institutions achieve a sharper, more accurate understanding of lending risks, and applicants benefit from a fairer, more transparent assessment of their financial profile. In the grander scheme, AI-driven credit scoring fosters more informed lending practices, reducing default risks and promoting financial inclusivity.

3.4. Advanced Fraud Detection

In a world where financial fraud constantly evolves, static security measures quickly become outdated. Static security measures are often a step behind these evolving tactics, leading to significant losses and eroding trust. Unlike conventional systems that depend mainly on known patterns, AI utilizes machine learning to adapt continuously, learning from every transaction, no matter how innocuous. The learning ability ensures that even novel, previously unseen fraudulent tactics are identified by spotting anomalies and suspicious patterns in real time.

Furthermore, AI does not just react to fraud that it predicts. By analyzing vast datasets and understanding emerging trends, AI systems can proactively identify potential vulnerabilities and offer solutions before they can be exploited [13]. This combination of rapid detection, adaptability, and predictive prowess considerably narrows the window for fraudulent activities, safeguarding assets and reinforcing customer trust in financial institutions. In an age where digital transactions are omnipresent, AI's role in fraud detection is not just beneficial but indispensable.

3.5. Portfolio optimization

Portfolio management has always revolved around the intricate dance of maximizing returns while minimizing risk. Traditional methods employ historical data and rely on predefined metrics, which can sometimes be limiting in capturing the multi-dimensional nature of financial markets. AI dramatically reshapes this landscape. AI can analyze vast amounts of market data through machine learning algorithms, factor in global events, and even consider investor sentiment from various sources in real-time. It crafts investment strategies tailored to the investor's risk appetite and dynamically adjusts to ever-shifting market conditions. This nuanced and proactive approach ensures that the portfolio always aligns with optimal performance markers. Furthermore, AI's predictive analytics can forecast market shifts, enabling pre-emptive adjustments, thus enhancing the resilience of the portfolio against unforeseen market volatilities. AI-driven portfolio optimization is like having an ultra-informed, constantly vigilant financial advisor working round the clock, ensuring the investor's interests are constantly safeguarded and optimized [14].

3.6. Regulatory compliance

Financial regulations are complex, ever-evolving, and crucial for maintaining a trustworthy and stable economic system. Ensuring compliance traditionally demanded significant human oversight, a process prone to management and inefficiencies. With the integration of AI, the approach to regulatory compliance has experienced a paradigmatic shift. With machine learning algorithms, AI systems can meticulously scan vast repositories of transactional data, ensuring adherence to domestic and international regulatory standards. Unlike human auditors, who may be overwhelmed by the sheer volume of data or subtle discrepancies, AI can flag anomalies in real-time, ensuring immediate rectification. Beyond mere detection, AI's predictive analytics can anticipate regulatory challenges based on evolving market behaviors, enabling institutions to stay ahead of potential compliance breaches. Additionally, as regulations evolve, AI systems can be rapidly updated to reflect these changes, ensuring continuous compliance. In an environment where regulatory breaches can lead to significant reputational

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and financial repercussions, AI is a sentinel, ensuring that institutions navigate the regulatory maze with precision, agility, and foresight.

3.7. Enhanced customer experience

Today's financial customers are well-informed and discerning and expect services that are not only efficient but also personalized. Integrating AI into financial services has ushered in a new era of enhanced customer experience. AI-driven interfaces are designed to understand individual customer needs, preferences, and behaviors. Their capability allows for a tailored service delivery that often anticipates the customer's needs before they articulate them. For instance, AI can analyze users' spending patterns and provide insights, recommendations, or alerts about potential savings or investment opportunities. Additionally, with real-time data processing, AI ensures prompt responses, minimizing wait times and eliminating many traditional bottlenecks. The adaptive learning nature of AI means that the more a customer interacts with the system, the more refined and personalized their experience becomes. In an industry where trust and customer satisfaction are paramount, AI's capability to provide an intuitive, seamless, and proactive service makes it an invaluable asset, setting new standards for what consumers can expect from their financial service providers.

4. Conclusion

Artificial Intelligence emerges as both a catalyst and harbinger of transformative change in the ever-evolving financial industry. Its multifaceted applications—from enhancing predictive capabilities to crafting superior customer experiences—have not only streamlined financial operations but have fundamentally reshaped the very ethos of the industry. As institutions harness AI to extract deeper insights, make informed decisions, and offer bespoke solutions, the paradigm shifts from a one-size-fits-all approach to a dynamic, data-driven, and personalized financial service delivery model.

However, as people herald the achievements of AI, it is also crucial to introspect and recognize the paradigmatic shifts it introduces. AI is not merely a tool but an active participant that engages, learns, and evolves. Its capabilities of predicting, analyzing, and adapting make it an invaluable asset, capable of setting new industry benchmarks and defining novel pathways for growth and innovation.

Nevertheless, this meteoric rise of AI in finance is full of challenges. For AI models to function effectively, they need high-quality, accurate data. Inaccurate or outdated data can lead to incorrect predictions, which can have significant financial implications. Ensuring consistent data quality remains a persistent challenge, especially in real-time financial environments. Secondly, many AI models, profound learning algorithms, are perceived as 'black boxes,' meaning their decision-making processes are not easily understandable by humans. This lack of transparency can lead to distrust, especially in high-stakes financial decisions. Moreover, infrastructure costs exist. Implementing AI solutions, especially state-of-the-art models, can require significant infrastructure investments in hardware, software, and data storage. This can be a prohibitive cost for some institutions, especially smaller ones.

While the road ahead may be riddled with challenges, they are avoidable. With a collaborative approach that synergizes human intuition with AI's analytical capabilities, the financial sector can mitigate risks more effectively and carve out new pathways for growth, innovation, and customer satisfaction. The metamorphosis driven by AI in financial risk management is not just about technology; it is about reimagining how the industry operates, serves, and thrives in an increasingly interconnected and dynamic global landscape.

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