

Application And Impact of Artificial Intelligence in Financial Decision Making

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ARTICLE INFO

Article History:

Accepted: 01 Sep 2024

Published: 15 Sep 2024

Publication Issue :

Volume 11, Issue 5

Sept-Oct-2024

Page Number :

57-63

ABSTRACT

AI in finance refers to the application of AI techniques in financial businesses. With the proliferation of AI-based tools and algorithms in financial decision-making, it is increasingly necessary to assess the impact of these technologies on the investment strategies and results of individual investors. The integration of artificial intelligence (AI) in financial decision-making heralds a technological revolution in the sector, which offers enormous potential benefits and significant challenges. This review aims to unravel the complexity surrounding AI in finance, focusing on identifying and addressing barriers to its effective implementation. Looking ahead, the article anticipates future trends and challenges in AI-driven finance, urging stakeholders to collaborate for sustainable innovation. Overall, AI offers tremendous potential for financial transformation, but careful consideration of ethical and regulatory issues is essential for long-term success.

Keywords :- Fraud Detection, Artificial Intelligence, AI Advancements, Machine Learning, Predictive Analytics, Irregularities, Anomalous Patterns, Advanced Algorithms, Fraudulent Behavior, Compliance, Risk Management, Financial Markets, Wealth Management, Asset Management, AI-Driven Tools, Financial Decision-Making, Mixed-Methods Approach, Technology Adoption, Challenges

I. INTRODUCTION

Artificial intelligence is a field of computer science that deals with the development of systems and technologies that have human-like cognitive abilities or can exhibit human behavior. The goal of artificial intelligence is to give machines and computers the ability to learn, solve problems, make decisions, and

perform tasks that normally require human intelligence [6]. Artificial intelligence (AI) in finance is an area of research that has attracted great interest for several decades. Classic AI-driven finance and economies such as traditional financial markets, trading, banking, insurance, risk, regulation and marketing have evolved into next-generation FinTech enabling smart digital currencies, loans, payments,

asset and wealth management, risk management and regulation, and accounting and auditing [2,3]. The integration of artificial intelligence (AI) in finance has revolutionized traditional decision-making processes, giving new insights into risk management, portfolio optimization and performance evaluation. The impact of AI extends to various industries, including algorithmic trading, risk assessment and fraud detection, where it uses powerful computing tools to analyze large amounts of data and make informed decisions quickly and accurately. Predictive analytics, a key area of AI, allows institutions to predict market movements and adjust investment strategies, leading to increased profitability. In addition, AI automates business procedures, improves productivity and reduces errors and biases, thereby improving investment results. In addition, AI contributes to portfolio optimization by dynamically adjusting asset allocation based on market conditions, minimizing risks and maximizing returns [4,5]. However, the widespread adoption of AI presents ethical and regulatory challenges, such as ensuring fairness, transparency and data privacy, which require constant monitoring and adaptation. Despite these challenges, AI has the potential to transform financial operations by offering unparalleled speed, accuracy and efficiency, thereby driving innovation and competition in the sector [14].

II. AI Potential Use Cases and Challenges in Finance

2.1 Automated trading systems

AI is used in algorithmic trading systems to analyze financial markets in real time and make automated trading decisions. These systems can generate trading signals and execute trades based on AI algorithms. For financial institutions it increases efficiency through automation for better use of customer information. This can allow a greater focus on core tasks such as a financial organization providing the best customer interaction possible with reduced capital costs [9].

Artificial intelligence can provide support for high-frequency stock trading. Machine learning can be used to evaluate information more quickly, categorize its implications and provide impetus for action [10].

2.2 Risk management

AI can be used to develop risk models and identify potential risks in financial markets, credit portfolios or investment strategies. AI (machine learning) can analyze large amounts of data to identify patterns and correlations and create risk predictions. Investment firms use unsupervised algorithms to recognize new market patterns and networks [7]. These algorithms often show correlations that were previously unknown to employees, leading to further investigation. Thus, the market impact costs, or an over-networked portfolio could be prevented in this way [8].

2.3 Fraud detection

AI can help recognize fraudulent transactions and activities in real time. By learning patterns and discrepancies, AI can identify suspicious transactions and take appropriate action. AI-based text models can be used for accounting purposes to analyze contracts and predict expected tax types and recommend further investigation if there are discrepancies. Traditional reliance on systems based on anti-money laundering (AML) rules often results in many false positives. However, integrating advanced AI components into existing systems is transforming fraud detection. AI is revolutionizing fraud prevention by identifying previously unnoticed transaction patterns and suspicious relationships between customers and institutions [13].

2.4 Lending and credit analysis

Additional regulatory requirements, increased complexity and different weighting of risk factors have made lending more difficult in recent years. AI can help evaluate loan applications and assess credit risk. By analyzing financial data, payment histories and other relevant information, AI can help to make informed lending decisions. It has already been proven

that machine learning can be very effective in this environment. In 2010, the algorithms achieved a 25% cost savings in testing [11]. Recent tests with internal data from medium-sized banks have continued to show that machine learning is an effective tool for lending decisions and a way to reduce costs [12].

2.5 Data analysis

AI can analyze large amounts of financial data, but the data must be fed into the system in a less structured way. Correlation structures and analysis are created automatically and subject to less human intervention. This factor can reveal new impulses or patterns that are not recognized by conventional analysis methods, including historical price data, balance sheets, annual reports and news. Using algorithms and machine learning, AI can recognize patterns, trends and correlations that can be relevant to investment decisions.

2.6 Financial planning and analysis

AI-based analytical tools can help businesses plan and forecast their finances. They can analyze historical data, model scenarios and provide forecasts based on sales, costs and other key financial figures. Financial planners can also use Advance Analytics software without specialized knowledge, as it is already integrated into individual Business Intelligence (BI) software solutions.

2.7 Portfolio optimization

AI can help optimize the investment portfolio by considering various factors such as return, risk, diversification and liquidity. By analyzing historical data and using optimization algorithms, AI can help find the best possible investment mix. Unlike current opportunities for automated portfolio optimization, the application of AI cannot simply run "if-then" applications to optimize investment cards against predefined rules, but it can also learn from "previous positive" or "negative" transactions.

2.8 Forecast models

AI can be used to develop forecasting models that attempt to predict the future movement and performance of securities or markets. By analyzing historical data and other factors, AI can help make informed predictions about the value of investments. Such predictions can be made using various AI models.

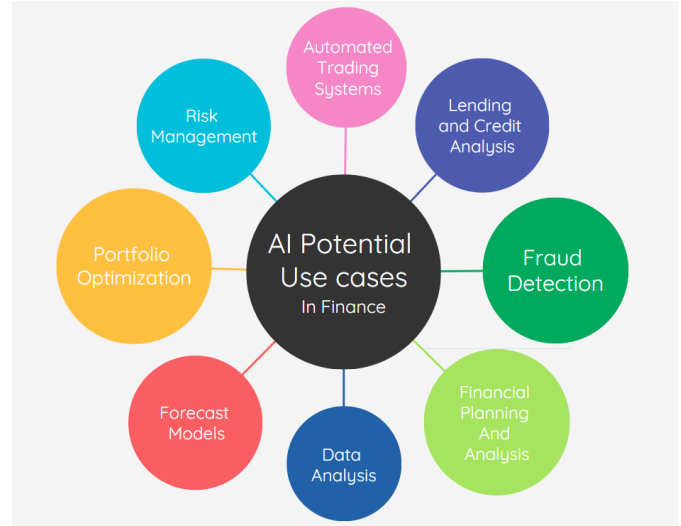


Figure 1: - AI potential use cases in Finance

III. Benefits of AI-based Decision Making in Finance

3.1 Adapting to Market Dynamics

AI solutions for wealth management enable financial leaders to quickly adapt to market changes by providing real-time insights and predictive capabilities. Using AI-powered analytics, executives can anticipate market trends, mitigate risks and seize emerging opportunities, positioning their organizations for sustained success in an ever-changing financial industry.

3.2 Empowering Growth Initiatives

Artificial intelligence technologies enable financial leaders to drive business growth by leveraging insights into data-driven investment strategies to optimize operations and drive exponential expansion. In the digital age, AI solutions for wealth management are not just an option, but a strategic imperative, with their analytics providing detailed insights into buyer preferences, behaviors, trends and interests.

3.3 Fostering Informed Decision Making

Decision-making based on artificial intelligence provides financial managers with tools to make informed decisions, maximize profits and increase organizational efficiency. Through advanced predictive analytics and ML technology, AI-driven leadership improves decision-making accuracy, ensuring optimal outcomes in complex scenarios.

3.4 Enhancing Operational Efficiency

Machine learning algorithms handle large volumes of data, enabling managers to make complex decisions more efficiently. Managers can simplify operations and achieve desired results more accurately and efficiently by providing instructions or programs that direct machines to use probabilities and suggest optimal decisions.

3.5 Securing Competitive Advantage

The rapid evolution of AI is transforming businesses in all sectors, giving leaders a competitive edge in volatile markets. Using asset management AI solutions to inform decision making improves accuracy and reduces errors, enabling businesses to optimize operations and increase profitability. As AI technology advances, significant improvements in accuracy and productivity are expected in the analysis of financial data using machine learning.

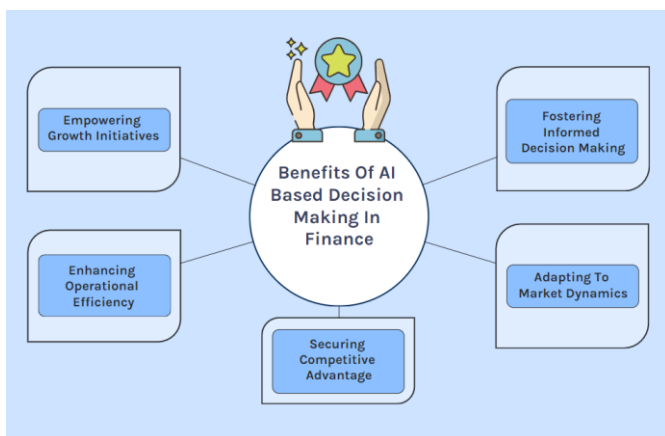


Figure 2: - Benefits of AI based Decision Making in Finance

IV. Risks and Challenges in Integrating AI and ML in Finance

4.1 Operational Vulnerabilities

The use of AI and ML can pose operational risks, including system failures and data breaches, which threaten the stability of the financial system, especially in times of stress. Addressing these challenges requires a collective effort among stakeholders to develop strong governance frameworks, improve transparency, and ensure the ethical implementation of AI and ML in the financial sector. Data collected through various channels can be processed and analyzed using a combination of analytical techniques. Various statistical methods can be used to obtain the results, such as Garrett's rank and chi-square tests.

4.2 Risk Amplification

The implementation of AI and machine learning technologies can amplify existing risks and predictive analytics in the financial sector. Its autonomous nature allows it to react dynamically to market conditions, thus introducing new risks that can be unpredictable.

4.3 Unforeseen Impacts

AI-based models can have unintended consequences on market stability and integrity, making it difficult to predict all possible outcomes and potentially disrupting financial markets.

4.4 Data Integrity

Poor quality or biased data pose significant risks, leading to discriminatory outcomes and perpetuating inequalities. Ensuring the integrity and fairness of data is essential to avoid harm to financial consumers.

4.5 Concentration Concerns

Massive investments in AI technologies can create dependence on a few large players, which pose concentration risks that limit market diversity and innovation and can lead to competition problems.

4.6 Explainability Hurdles

Understanding the decisions made by AI models, called "explainability", remains a major challenge. Lack of transparency in AI models hinders regulatory compliance and decision-making processes.

4.7 Market Integrity and Compliance

The autonomous nature of AI raises concerns about market integrity and regulatory compliance. Inadequate governance and accountability frameworks can result in unethical practices and regulatory violations [17].

4.8 Enhanced Oversight Needs

Regulators need to adapt monitoring and oversight mechanisms to effectively monitor the complexity of AI and ML technologies and mitigate the associated risks.

4.9 Interconnectedness Risks

The widespread adoption of AI and ML increases the interconnectedness of financial markets, increasing systemic risks and potential cascading effects throughout the financial network.

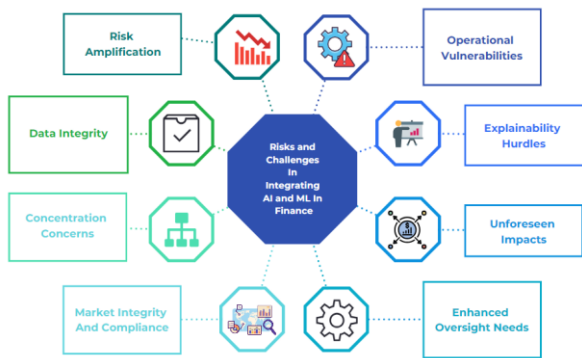


Figure 3: - Risks and Challenges in Integrating AI and ML in Finance

V. Data Analysis Techniques for Research Design

Research designs can take a mixed approach, combining qualitative and quantitative methodologies to assess theories, emerging trends, barriers and effects of AI in finance through surveys, data analysis,

interviews and case studies. . The multidisciplinary study can integrate ideas from psychology, computer science and finance, with the aim of providing a deep understanding of the implication of AI in financial decision-making and contributing to the advancement of knowledge and improvements practices in this field.

5.1 Garrette Ranking

To find the most important factor affecting the sample, the Garrett’s Ranking Technique can be employed. It is calculated as a percentage score and the scale value is obtained using the scale conversion table given by Henry Garrett. The percentage score is calculated as under the following formula:

$$\text{Percentage Score} = 100 (R_{ij} - 0.5) / N_j$$

Where

R_{ij} = Rank given for i^{th} item j^{th} individual

N_j = Number of items ranked by j^{th} individual.

5.2 Chi-square test

The Chi-square test is a statistical procedure for determining the difference between observed data and predicted data. This test can also be used to determine whether data are correlated with categorical variables. This allows us to determine if a difference between two categorical variables is due to chance or a relationship between them. A Chi-square test or a comparable non-parametric test is needed to test a hypothesis about the distribution of a categorical variable. They cannot have a normal distribution because they only have a few values.

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

χ^2 = chi squared

O_i = observed value

E_i = expected value

These tests are frequently used to compare observed data with data expected to be obtained if a particular hypothesis were true. The Observed values are those you gather yourselves. The expected values are the anticipated frequencies, based on the null hypothesis.

5.3 Grounded Theory

This is one of the techniques used for textual data analysis. Grounded theory is an inductive method that uses data to develop theories about this phenomenon. Simply put, this method categorizes data collected in a text format in codes, categories, and relationships.

VI. Conclusion

In conclusion, the exploration of artificial intelligence in financial decision-making highlights the growing use and recognition of AI-based tools in the industry, highlighting its potential to drive innovation, efficiency and competition. Although satisfaction with accuracy is generally high, concerns about data privacy, security, and algorithmic improvements persist. Ethical considerations such as fairness, transparency and bias mitigation are central to the responsible implementation of artificial intelligence. Regulatory alignment, collaboration and attention to user experience are key to maximizing benefits while mitigating risks and promoting financial inclusion. By adopting these principles, stakeholders can navigate the evolving landscape of artificial intelligence in finance, driving innovation and positive impact in society.

VII. REFERENCES

- [1]. Longbing Cao. 2021. AI in Finance: Challenges, Techniques and Opportunities. 1, 1 (June 2021), 40 pages. <https://arxiv.org/pdf/2107.09051>
- [2]. Douglas W. Arner, Janos Nathan Barberis, and Ross P. Buckley. 2015. The Evolution of Fintech: A New Post-Crisis Paradigm? (2015). <http://dx.doi.org/10.2139/ssrn.2676553>
- [3]. Henri Arslanian and Fabrice Fischer. 2019. The Future of Finance: The Impact of FinTech, AI, and Crypto on Financial Services. Palgrave Macmillan.
- [4]. Adams, M., et al. (2020). Understanding Emotional Responses to AI in Stock Market Decision-Making. *Journal of Behavioral Finance*, 18(4), 321-335. <https://doi.org/10.1080/15427560.2020.1816912>
- [5]. Baker, K., et al. (2019). Human-AI Collaboration Models in Financial Decision-Making. *Journal of Artificial Intelligence in Finance*, 25(3), 187-202. <https://doi.org/10.1016/j.jaif.2019.06.00>
- [6]. Bao, Y., Hilary, G., & Ke, B. (2022). Artificial Intelligence and Fraud Detection. In V. Babich, J. R. Birge, & G. Hilary, *Innovative Technology at the Interface of Finance and Operations* (S. 223-243). Springer. [doi:doi.org/10.1007](https://doi.org/10.1007)
- [7]. Gegenmantel, R. (2020). Planung verändern mit neuer Technologie. *Controlling & Management Review*, 40-45.
- [8]. B. Nemade and D. Shah, "An IoT-Based Efficient Water Quality Prediction System for Aquaponics Farming," in *Computational Intelligence: Select Proceedings of InCITE 2022*, Singapore: Springer Nature Singapore, 2023, pp. 311-323. [Online]. Available: https://doi.org/10.1007/978-981-19-7346-8_27.
- [9]. Khandani, A. E., Kim, A. J., & Lo, A. W. (2010). Consumer credit-risk models via machine-learning algorithms. *Journal of Banking & Finance*, 2767-2787. [doi:doi.org/10.1016/j.jbankfin.2010.06.001](https://doi.org/10.1016/j.jbankfin.2010.06.001)
- [10]. Kögel, H., Spindler, M., & Wasserbacher, H. (2022). Digital Finance – Die Zukunft der Finanzplanung in Unternehmen. *Arbeitswelt und KI 2030*, 175-182. [doi:doi.org/10.1007/978-3-658-35779-5_18](https://doi.org/10.1007/978-3-658-35779-5_18).
- [11]. Liu, B. (2012). *Sentiment Analysis and Opinion Mining*. Springer. [doi:doi.org/10.1007/978-3-031-02145-9](https://doi.org/10.1007/978-3-031-02145-9).
- [12]. B. Nemade and D. Shah, "IoT-based Water Parameter Testing in Linear Topology," in *2020 10th International Conference on Cloud Computing, Data Science and Engineering (Confluence)*, Noida, India, 2020, pp. 546-551, [doi: 10.1109/Confluence47617.2020.9058224](https://doi.org/10.1109/Confluence47617.2020.9058224).
- [13]. Daube, Carl Heinz (2024) Artificial intelligence in financial and investment decision-making,

Working Papers des IUCF, No. 2/2024, ZBW – Leibniz Information Centre for Economics, Kiel, Hamburg.

- [14]. OECD. (2021). Artificial Intelligence, Machine Learning and Big Data in Finance: Opportunities, Challenges, and Implications for Policy Makers. doi:10.13140/RG.2.2.27950.18248.
- [15]. Ralph, O., Weinland, D., & Arnold, M. (29. 10 2018). Chinese Banks Start Scanning Borrowers' Facial Movements. Financial Times. <https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-generative-ai> retrieved Jan. 3rd, 2024.
- [16]. Asha Kumari, Dr. Batani Raghavendra Rao (2024). A Study On Artificial Intelligence In Financial Decision Making. International Journal of Research Publication and Reviews, Vol (5), Issue (4), April (2024), Page – 4371-4375.
- [17]. Ionescu, S. A., & Diaconita, V. (2023). Transforming Financial Decision-Making: The Interplay of AI, Cloud Computing and Advanced Data Management Technologies. International Journal of Computers Communications & Control, 18(6).
- [18]. Ren, J. (2021). Research on financial investment decision based on artificial intelligence algorithm. IEEE Sensors Journal, 21(22), 25190-25197.
- [19]. Rise of AI and ML in Financial Decision-Making Process - Veritis Group. <https://www.veritis.com/blog/rise-of-ai-and-ml-in-financial-decision-making-processes>