

Artificial Intelligence on Financial Decision Making

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ABSTRACT

Artificial intelligence (AI), powered by machine learning algorithms, is capable of extracting information efficiently from big data and, therefore, has great potential for improving financial decision-making. Firstly, AI algorithms and machine learning techniques augment the velocity and precision of financial analyses, thereby enabling swift and well-informed decision making. These capabilities empower financial professionals to make more accurate and data-driven decisions. Secondly, AI technologies hold the potential to mitigate the impact of human biases, which frequently influence financial decision making. By relying on objective algorithms and data-centric models, AI systems can alleviate cognitive biases such as overconfidence or herd mentality, thereby fostering more rational and unbiased decision making. These AI-driven tools offer personalized recommendations, address customer queries, and aid in portfolio management, thereby enriching the overall customer experience and satisfaction. Nonetheless, the integration of AI in financial decision making presents certain challenges and ethical considerations. Matters such as algorithmic transparency, data privacy, and regulatory compliance demand meticulous attention to ensure responsible and ethical utilization of AI in the realm of finance. However, it is crucial to recognize the significance of ethical considerations to ensure the responsible and transparent deployment of AI in the financial domain. The aim of this working paper is to provide a brief introduction to artificial intelligence and highlight specific potential applications in financial and investment decision making. On the one hand, it is about where AI is already being used today in many areas of the financial industry.

Keywords: Artificial intelligence, Algorithmic Transparency, Data Privacy, Regulatory Compliance.

INTRODUCTION

The Artificial intelligence (AI) has been the subject of real hype ever since the San Francisco-based company OpenAI LP launched its ChatGPT product in November 2022. Just two months later, the application generated around 100 million monthly visitors, and within a year it had reached 1.5 billion. ² With this growth, ChatGPT not only quickly entered the top 20 most used websites worldwide, but also became the fastest growing online application in history.³ Therefore, after about more than one year, it seems interesting to take a closer look at what AI can really do - especially for financial and investment decisions. 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-like behavior. The aim of artificial intelligence is to give machines and computers the ability to learn, solve problems, make decisions and perform tasks that would normally require human intelligence. ⁴ The truth is, however, that

following the general hype, many applications that were previously referred to as classical mathematics or conventional programme logic are now referred to as AI.

OBJECTIVE OF THE STUDY

To understand the artificial intelligence on financial decision making.

LITERATURE REVIEW

Jarrahi, (2018), AI algorithms possess the capacity to analyze market trends, identify lucrative investment opportunities, and optimize portfolio management strategies. By leveraging AI's prowess in processing and scrutinizing extensive datasets, financial decision- makers can make more enlightened investment choices, bolster portfolio performance, and maximize returns. The profound impact of AI on financial decision- making is undeniable. The realm of asset and investment management has entered a phase of growing receptiveness towards the adoption of decision intelligence, which paves the way for exploring and implementing various promising use cases. Among these, one particularly notable application involves harnessing alternative data sources, such as weather forecasts, online sentiment regarding companies, media coverage, and more. The objective is to enhance the process of making investment decisions and refining hedging strategies. Riikinen, Saarijärvi, Sarlin, & Lähteenmäki, (2018) assimilation of AI technologies has truly revolutionized these domains, facilitating more precise and efficient decision- making processes. By meticulously scrutinizing vast volumes of data, AI systems possess the remarkable ability to discern intricate patterns that might otherwise elude human perception. The utilization of AI algorithms plays a pivotal role in constructing robust models that aid in the identification of deceitful behavior, thereby ensuring heightened levels of accuracy and effectiveness.

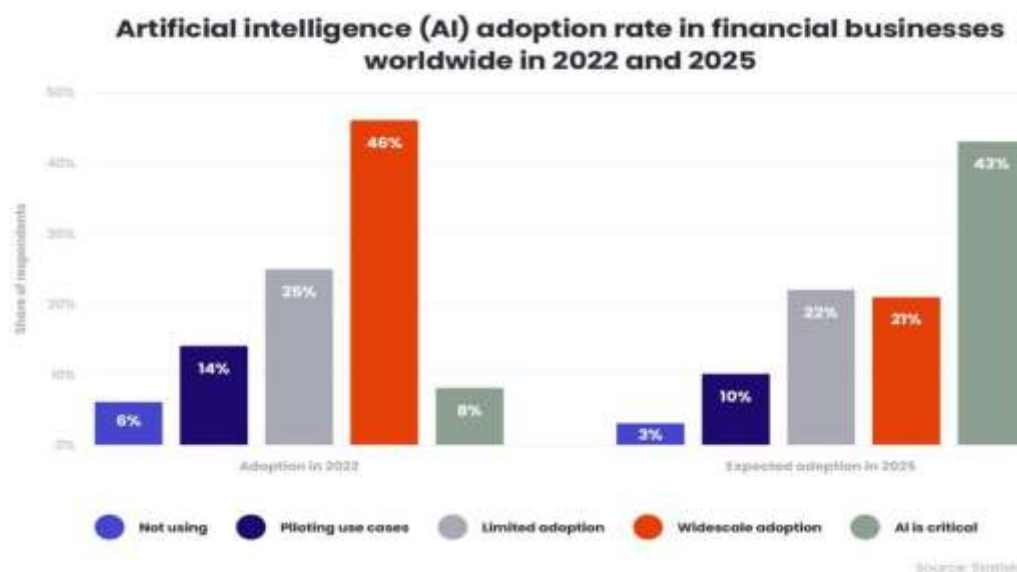
addressed throughout the implementation process of this transformative technology. Davenport & Ronanki, (2018) the significant costs associated with the adoption of AI solutions. The intricacies inherent in AI technologies demand a workforce equipped with the expertise to effectively execute and manage these intricate systems. It becomes imperative for organizations seeking to leverage the boundless potential of AI to ensure the presence of a readily accessible pool of such adept professionals within the marketplace. The impact of AI on financial decision making transcends a singular facet and encompasses a myriad of dimensions.

According to Tambe, Cappelli, and Yakubovich (2019), one area of significant influence lies in the realm of automating routine tasks and processes. The introduction of this automation paradigm can substantially enhance operational efficiency, enabling financial institutions to streamline their workflows and allocate resources with heightened efficacy. Furthermore, AI algorithms possess exceptional pattern recognition capabilities, which empower them to discern trends and predict market behaviors.

Reinking, E., & Becker, M. (2023). By meticulously analyzing historical data alongside real-time market conditions, AI systems can generate highly precise forecasts that serve as indispensable aids in making informed investment decisions. Financial professionals can effectively harness these AI-driven insights to optimize their investment strategies, mitigate risks, and maximize returns. Another profound consequence of AI on the landscape of financial decision making is its invaluable role in bolstering fraud detection and prevention measures. AI algorithms exhibit an unparalleled ability to expeditiously scrutinize massive volumes of transactional data, adeptly identifying anomalous patterns that serve as potential markers of fraudulent activities.

DATA ANALYSIS

AI can analyze large volumes of financial data, while at the same time data needs to be fed into the system in a less structured way. Structures and correlation analyses are created automatically and are less subject to human interference. This factor in particular can reveal new impulses or patterns that are not recognized by conventional analysis methods, including historical price data, balance sheets, annual reports and news. By using algorithms and machine learning, AI can recognize patterns, trends and correlations that may be relevant for investment decisions.²³ Even though AI in finance is surely a dynamically growing trend, there are hardly any solutions that rely on the technology fully. Artificial Intelligence is still treated more as a component of a solution, not a solution itself. Take a look at this chart showing last year's (2022) and predicted (2025) AI adoption rates in financial companies:



Source: <https://techreport.com/statistics/ai-statistics/>

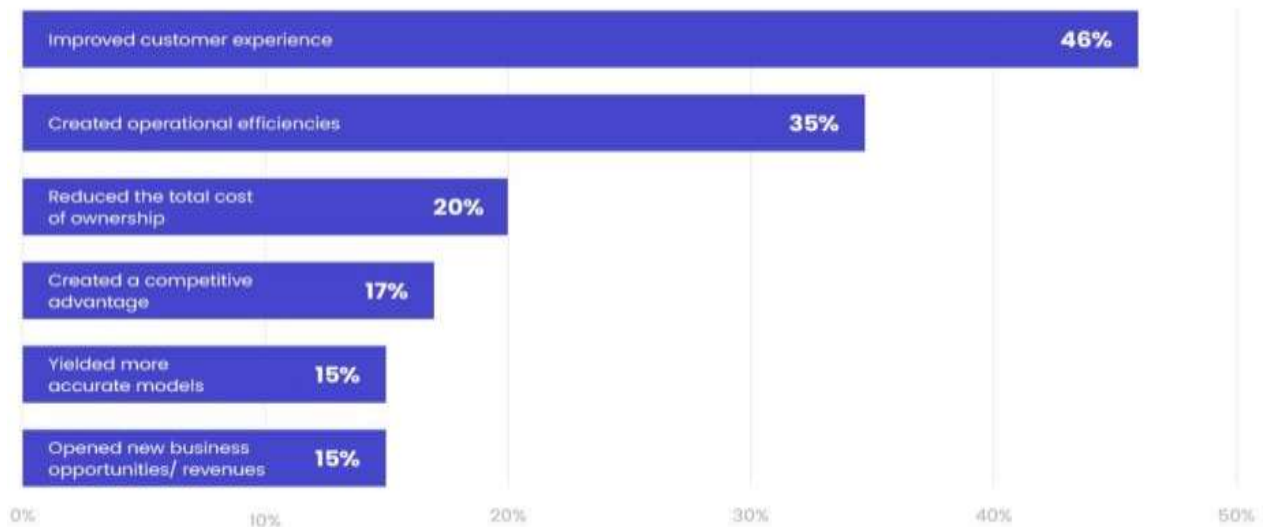
As you can see, back in 2022, 54% of financial companies had a widescale adoption of AI or considered it a critical asset. Worth mentioning here is the fact that in 2022, solutions such as GenAI hadn't been so popular, since ChatGPT was published on November 30, 2022. The predictions are that in 2025, a higher percentage of companies will consider AI critical to their business than just a supportive element.

Chatbots and voice bots are a perfect example of how recent advances might completely change interaction with clients. A new generation of chatbots and voice bots are capable of having a natural conversation with clients and understanding their needs and requests without asking for hardcoded options. Banks more and more commonly introduce AI-powered chatbots for their customers, but it is important to tightly control their behavior and leverage Generative AI wisely, as Large Language Models may provide customers with the wrong information or suggestions, which can have severe consequences in this sector. That's why, usually, the dialog flows must be monitored and managed to keep the communication at the expected but also safe level.

How is AI used in finance: NVIDIA report

Earlier this year, NVIDIA published a report showing the top applications for AI in finance (excluding China). Interestingly, of the 21 different use cases analyzed in the survey, ten are used by over 20% of respondents, which shows big potential for future development:

How has AI improved your business operations? (all respondents)



Source: NVIDIA, State of AI in Financial Services: 2023 Trends

Source: <https://resources.nvidia.com/en-us-state-ai-report>

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 forecasts.

Investment firms are already using unsupervised algorithms to recognize new patterns and market networks. These algorithms often also show interconnections that were not previously in the awareness of the employees, which leads to a deeper investigation. Market impact costs or an over-networked portfolio could be prevented in this way.

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 transactions based on AI algorithms. For financial institutions: Increasing efficiency through automation for higher quality utilization of customer information. This could enable a stronger focus on core tasks as a financial organization while at the same time ensuring the best possible customer interaction at reduced capital costs. Artificial intelligence can provide support for high-frequency share trading. Machine learning can be used to evaluate information more quickly, categories its implications and provide impetus for action.

Lending and credit analysis

Additional regulatory requirements, increased complexity and the different weighting of risk factors have made lending more difficult in recent years. AI can support the evaluation of credit applications and credit risk assessment. By analyzing financial data, payment histories and other relevant information, AI can help to make informed decisions about the granting of loans.¹⁵¹⁶ It has already been proven that machine learning can be very effective in this environment. In 2010, algorithms were able to lead to cost savings of 25% in tests. Recent tests with internal data from medium- sized banks continued to show machine learning as an effective tool for credit decisions and a way to save costs.

Fraud detection

AI can help recognize fraudulent transactions and activities in real time. By learning patterns and deviations, AI can identify suspicious transactions and take appropriate action.

AI-based text models could be used for accounting purposes to analyze contracts and predict their expected tax types and recommend closer investigation in case of deviations. The UK Serious Fraud Office uncovered a case of corruption in this way. Artificial intelligence could translate, summaries and analyze up to 600,000 contracts a day.

However, this possible application of AI is not yet problem-free. Large and stable amounts of data are required to train algorithms. The cases of fraud recognized each year (e.g. credit card fraud) are not yet sufficient to apply machine learning consistently. In addition, fraud cases usually involve non-standardized approaches, which requires an even larger amount of data.

Financial planning and analysis

AI-driven analysis tools can support companies with financial planning and forecasting. They can analyze historical data, model scenarios and provide well-founded forecasts of sales, costs and other key financial figures. Financial planners can also use Advance Analytics software without expert knowledge, as it is already integrated into individual Business Intelligence (BI) software solutions - for example, Jedox since 2020.

Forecast models

AI can be used to develop forecasting models that attempt to predict future developments 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 achieved through different AI models.

Sentiment analysis

AI can analyze social media posts, news articles and other information to understand the sentiment of market participants. By capturing positive or negative sentiment, AI can help to better assess the impact of news and public opinion on the value of investments.

Portfolio optimization

AI can help optimize investment portfolios by taking into account various factors such as return, risk, diversification and liquidity. By analyzing historical data and using optimization algorithms, AI can help to find the best possible combination of investments. In contrast to the current possibilities of automated portfolio optimization, the application of AI can not only execute "if-then" applications to optimize investment portfolios against predetermined rules, but can also learn from previous "positive" or "negative" transactions.

Findings of the study and implications

- The machine learning model chosen for further development is the Artificial Neural networks over the Linear Regression models as the stock markets seldom behave in a linear way. Also, the curve fitting using linear regression is complex and not very accurate for higher order polynomials. The advantage of using artificial neural networks is that it automatically adjusts for the complex curves using the

“Hidden” Layer.

- The more efficient processing of information ensures that predicted stock prices are more
- closer to the real-time market value eventually may contribute to a more efficient financial system.
- Millions of Individual Investors can make their financial decisions on stocks using this system for a fraction of cost paid to corporate financial consultants.
- The applications of AI and machine learning by regulators and supervisors can help improve regulatory compliance and increase supervisory effectiveness.
- Applications of AI and machine learning could result in new and unexpected forms of interconnectedness between financial markets and institutions, for instance based on the use by various institutions of previously unrelated data sources.
- Network effects and scalability of new technologies may give rise to third-party dependencies. This could in turn lead to the emergence of new systemically important players that could fall outside the regulatory perimeter.
- As with any new product or service, it will be important to assess uses of AI and machine learning in view of their risks, including adherence to relevant protocols on data privacy, conduct risks, and cybersecurity. Adequate testing and, training“ of tools with unbiased data and feedback mechanisms is important to ensure applications do what they are intended to do.
- Machine learning neural networks can revolutionize virtually every aspect of financial and investment decision making. Financial firms worldwide can employ neural networks to tackle difficult tasks involving intuitive judgement or requiring the detection of data patterns which elude conventional analytic techniques. Unlike other types of artificial intelligence, neural networks mimic to some extent the processing characteristics of the human brain. As a result, neural networks can draw conclusions from incomplete data, recognize patterns as they unfold in real time and forecast the future. They can even learn from past mistakes!

CONCLUSION

The finance and accounting sectors are undergoing significant transformations as they incorporate AI technologies into their operations. This integration of AI holds tremendous potential for reaping numerous benefits, including heightened efficiency, enhanced accuracy, and more informed decision-making processes. To fully harness the value inherent in data, organizations must embrace AI wholeheartedly and, in certain instances,

minimize human involvement in the decision-making process. By entrusting data processing to machines and amalgamating human judgment, cultural insights, values, and contextual understanding with the generated decision options, we can significantly augment financial decision-making processes. AI empowers us to make well-informed choices, optimizing outcomes, and maximizing the potential of the available data.

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