

# Artificial Intelligence in Finance and Investments

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**ABSTRACT:**The 21st century has witnessed accelerating growth in the utilization of digitized financial services. There is a consistent effort to simulate, augment, enhance, and replicate human intelligence using artificial technologies, to form intelligent machines. Artificial intelligence, which has its foundations in computer science, linguistics, psychology, mathematics, and philosophy has proved to be a powerful tool in financial services. Firms are now utilizing analytical tools such as machine learning and ANN to analyse data collected over time. AI enhances adaptive pattern recognition using modern statistical methods and large volumes of data to provide the 'best guess' answer to any specific and narrowly-defined problem set. AI has a high potential for positive impact when deployed with care, prudence, and diligence. This paper seeks to expound on the application of AI tools in finance and the implications of implementation to financial stability. Important considerations for AI use include benefits to clients and firms, data privacy and protection, elimination of human capital, and sustainability of financial services.

**KEYWORDS:**Artificial Intelligence, AI in Finance Sector, Fintech and Investments, Software Engineering in Finance.

## I. INTRODUCTION

The adoption of artificial intelligence in the finance industry results from demand factors such as demands of financial regulation, competition with other firms, and profitability needs, and supply factors such as the availability of financial sector infrastructure and data and technological advances. Artificial intelligence is in the process of making a series of breakthroughs in the finance industry, including the creation of applications that are capable of disrupting the industry. As such, it is hypothesized that AI can not only replace human capital partly or wholly but also improve performance beyond the human threshold. In the evaluation of the improved performance, it is crucial to consider the implications of this development on financial stability. This paper provides a discussion on the application of AI in financial services, particularly in improving insurance services, algorithmic trading, fraud and money-laundering detection, text mining, credit scoring, and the potential effects of each of these applications.

## II. APPLICATIONS AND IMPLICATIONS OF AI IN FINANCE

### A. Algorithmic Trading

This application involves the use of proprietary algorithms to incorporate information about price levels and changing market conditions and execute quick, automated trades. The speed with which the trades are executed led to their reference as high-frequency trading (HFT). Essential HFT strategies include directional trading on order flow, news releases, and other high-frequency signals, high-frequency average-value trading, and acting as a formal and informal market maker [1]. Financial institutions, specifically proprietary trading houses and hedge funds, have used this technology for the past decade. The benefits of algorithmic trading include faster trading at best possible prices, which benefits the clients and the firm, through the reduction in the number of errors with emotional and psychological causes, enhancement of automatic survey of multiple markets simultaneously, and improvement of accuracy (fewer mistakes). Humans are incapable of processing information in such short periods, which has made the algorithmic system the best option. Chan et al. (2017), note that algorithmic trading must operate under high levels of regulatory scrutiny since they could induce flash crashes, similar to those experienced during and after the global financial crisis.

### B. Uses and Potential Applications in Insurance

The insurance industry has lagged in the adoption and utilization of digital technologies such as AI. Most finance professionals suggest that AI could phase out the need for life insurance agents and brokers. Forbes observes that the ability to acquire and develop life insurance portfolios, monitor policies, and facilitate underwriting can be managed by a robo-life-agent [4]. Most insurers have been keen on the automation of significant system interactions and

augmentation of insurance agents with robotic automation processes. This automation is the penultimate step on the journey to the full implementation of AI.

AI in the insurance industry takes the form of third-tier technology, such as the elimination of 34 employees and the adoption of the Watson Explorer Program (IBM) by Fukuoku Mutual Life Insurance. It also presents first-tier augmented intelligence such as Allstate Business Insurance Expert chatbot by Allstate (Chan et al. 2017). Many insurers are also investigating Robotic Process Automation (RPA) systems that apply software in handling workflow and high-volume business processes. RPAs are trainable to communicate with other systems, trigger responses, manipulate data, automatically manage transactions, and learn specific procedures. An example of implementation of RPA is by Davies Group in 2016, where it enabled four employees to process 3,000 claims reports every day (Chan et al. 2017). An estimation of the task without RPA shows that the team would need twelve people, which proves how AI systems are filling traditional human roles.

### C. Credit Evaluation/Credit Scoring Applications

Credit-scoring tools that utilize machine learning seek to increase the speed of lending decisions while controlling incremental risk. For long, lenders depend on credit scores to reach lending decisions for retail clients and firms. Traditionally, most credit scoring systems relied on payment history and transaction data provided by financial institutions [6]. However, there has been a shift by banks and other lenders to additional, semi-structured, unstructured, sources of data including text message and mobile phone use activity and social media usage to establish a more accurate and comprehensive assessment of creditworthiness for customers seeking credit [2]. For instance, the use of big data for scoring could evaluate factors such as the timely settlement of utility and phone bills and non-credit bill payments. The incorporation of machine learning algorithms to this data pool has improved the evaluation process to capture qualitative factors such as willingness to pay and consumption behaviour. Machine learning allows lenders to leverage more data, which enhances quicker credit decision, and cheaper, faster, and higher classification of borrower quality. The implementation of such data analysis processes, however, leads to issues of data protection and privacy. Another critical AI tool in the evaluation of credit scores is the use of artificial neural networks (ANN). ANN is more accurate in bankruptcy prediction and credit evaluation, which makes it an important tool in making lending decisions.

The machine learning algorithms utilized in credit evaluation and scoring have significantly improved access to credit. Traditional scoring models required large amounts of historical credit data for potential borrowers to be subjected to the scoring process. When such data is unavailable, scoring is impossible, and potential creditworthy borrowers lack a chance to build a credit history or obtain credit. Thus, the application of machine learning algorithms and alternative sources of data will enable lenders to process formerly impossible credit decisions. While this is highly beneficial in reducing financial exclusion observes that it could result in non-sustainable rises in bad debts, especially in countries with deep credit markets. Research shows that the past few years have been marked by the emergence of a host of FinTech credit firms targeting customers excluded by the traditional lending system[2].

Another point of concern in the use of machine learning algorithms in credit scoring is the "black box" aspect that denies customers transparency on credit decisions. The use of these algorithms makes it difficult for lenders to provide supervisors, auditors, and consumers explanations on decisions relating to credit scores and the subsequent decisions. The "black box" also raises concerns about the possibility of bias in credit decisions that utilize non-traditional data and online tendencies. Consumer advocacy groups claim that these algorithms can derive combinations that point to the customer's gender or race, which might influence the decision. Such decisions flout fair lending laws. Chan [3] propose an AI evaluation model that solves the "black box" issue. They identify the main concerns of vetting boards to include the type of bias present in the model and the model's dependency on specific outputs. Other factors include how the model handles non-synchronized or missing data, its processes of monitoring and guaranteeing consistency of output, and the type of metadata to back up the output. Lastly, the board should examine the confidence intervals of the model's output and the ability of the training set to handle the complexity of the data.

### D. Text Mining

Another utilization of AI in finance is in text mining, syntax (semantic) analysis, and news. AI is a useful tool for automatically reading and analysing texts such as news, reports, and social media content or activity. According to Zavadskaya [7], this application will transform investment services as AI machines will read all the relevant news and information in seconds. This task would initially take humans several hours and still not cover all the necessary information that could influence stock performance. Data mining techniques are vital in the analysis of price levels, forecast activity, and market trends. Besides, it can assist in the prediction of institutional and regulatory changes and simulate the outcome. In trading, ANN is a better prediction tool compared to the traditional linear regression model, since stock markets chaotic and dynamic [1].

A company that benefits from the use of this technology is Data miner, which deploys algorithm to scan through posts on social media platforms such as Twitter to identify trending news items and forward actionable alerts to subscribed investors before the news is officially released [7]. Another company that implements data mining is AlphaSense, a search engine targeting finance professionals. The company uses linguistic search algorithms to assist individuals in locating desired information in a shorter span compared to other search engines. The search process involves the use of natural language processing (NLP) to identify the most relevant information. An essential feature of AlphaSense's algorithms is that they are self-learning, which means that they learn from their past errors and refine the next search to increase efficiency [7].

Furthermore, a company known as Kensho utilizes data mining in the provision of advisory services. Kensho uses NLP systems capable of reading posted questions and examine appropriate information to provide quick answers or recommendations. The algorithm can recognize the correlation between stock prices and specific events and recommend investment decisions that people could easily miss in their analyses. The firm's clientele comprises of investment firms and individual investors. Kensho's business model is a threat to financial advisors that work together with big banks and require vast amounts of compensation and require extended periods to provide recommendations. Kensho and similar companies accomplish the tasks these advisors could do in 40 hours, in just a few minutes, relieving clients of undesired obligations such as sick days, bonuses, salary, and maternity/paternity leaves.

#### E. Fraud/Anomaly Detection

AI is a vital tool in fraud/anomaly detection. Pattern recognition assists in the identification of behaviour that differs from standard patterns. For example, it can be essential in the identification of fraudulent insurance claims, fraudulent use of cash cards and credit cards, illegal financial schemes and transactions, security threats, money laundering, transfer scams, and illicit transactions [5]. Mastercard utilizes this through the Decision Intelligence service introduced in 2016 [7]. The service applies artificial intelligence to detect fraud, particularly the use of algorithms to identify normal and abnormal purchase locations, client shopping patterns, typical price range, and shopping time for clients. These algorithms enhance quick identification of strange behaviour and block accounts until customers provide clarification.

The banking industry could benefit from the deployment of AI tools in their anti-money laundering (AML) and anti-fraud detection management [3]. For the longest time, banks have relied on a rule-based approach to control the risks of sanctions, money laundering, and fraud. This approach is also known as a risk-scoring or risk-based approach. Companies use this model to execute a formal money-laundering risk evaluation and then identify the risks they face, depending on their business lines, products, and customers. Upon completion of the assessment and risk documentation process, companies submit the possible risk scenarios to the regulators for approval after which AML processes begin. Risks and uses of AI explained well in AI in Software Engineering [8].

This traditional method is expensive and can generate false negatives or positives. Chan [3] suggest that banks can utilize AI to run two parallel approaches: one that deploys AI tools in pattern recognition and another one that reliant on an intelligence-based model that uses big data. These models can utilize data from transactions and customer personal and business details, where each bank uses its dataset. Since this gives rise to issues of data privacy, banks can integrate a distributed ledger system known as Blockchain that makes transaction-level information anonymous. This way, banks remain competitive and protect their customers while contributing to efforts to control money laundering and fraud in the industry.

### III. CONCLUSION

In conclusion, the financial industry is experiencing a gradual evolution due to the impact of automation technologies and AI. The adoption of AI in financial systems is increasing at an exponential rate, causing a wide range of positive and negative effects. This paper provides a discussion of the tasks that apply AI in the financial industry and the effects caused by the implementation. AI is continually evolving at a rapid rate, firms and professionals in the finance industry need to adapt to the changes to ensure that they benefit from the emerging tools that are increasing convenience.



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