Good, Bad, Ugly? The Opportunities of AI in Finance

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Abstract

Artificial Intelligence (A.I.) has become increasingly popular due to emerging technologies, including generative AI, big data, deep learning, etc. It can provide insights from data that are hard to determine from a human perspective. Artificial Intelligence (A.I.) in finance helps to provide more personal and safer experiences for customers and develop cutting-edge solutions for a company. This paper surveys the challenges and opportunities in applying Artificial Intelligence (A.I.) to finance. It provides a state-of-the-art review of financial technologies, algorithmic trading, and fraud detection. Also, the paper identifies two research topics. One is how to use generative AI in algorithmic trading. The other is how to apply it to fraud detection. Last but not least, this paper discusses the challenges posed by generative AI, such as the ethical considerations, potential biases, and data security.

1. Introduction

Artificial Intelligence (A.I.) has played a major role in business, finance, healthcare, science, engineering, etc.. In these fields, Artificial Intelligence (A.I.) can be studied, analyzed, and used to benefit society. Artificial Intelligence (A.I.) includes a wide range of new systems and techniques. However, these new techniques all bring forth their own opportunities and challenges. The main objective of this research is to describe how Artificial Intelligence (A.I.) is used in finance and to understand the unique challenges and opportunities.

This paper is organized as follows: basic concepts, how Artificial Intelligence is involved in finance, the challenges and opportunities associated with FinTech, algorithmic trading and how Artificial Intelligence is involved with it, financial fraud detection.

2. Basic Concepts

What is Artificial Intelligence (AI)? Artificial Intelligence (AI) is machines using mathematical functions and complex algorithms to perform tasks that humans perform.

What is Machine Learning (ML)? Machine Learning (ML) is computers learning from data instead of being programmed.

What is Big Data? Big Data is very large amounts of data being collected with a great variety of data types and a high rate of velocity.

What is finance? The essence of finance is three sentences: (1). One is to manage money for the rich and finance for the poor. (2). Second, in fact, there are three words: "credit", "leverage" and "risk". (3).The third is that finance serves the real economy, and if finance does not serve the real economy, it has no soul and is a meaningless bubble. In this sense, the financial industry is the service industry.

Artificial Intelligence have created meaningful insights, which has resulted in a rise in revenue in multiple disciplines. This paper focus on how Artificial Intelligence has developed in finance. Artificial Intelligence can allow for direct information that is diverse, reliable, and delivered fast. In the finance world, these Artificial Intelligence tools will allow for more predictive power. Artificial

Intelligence may include algorithms related to digital financial services, e.g., digital factoring, invoicing, and loan calculations. Furthermore, Artificial Intelligence may contain technologies that support digital investments, trading, crowdfunding, digital money, virtual currencies, and digital payments. This means that finance is shifting from traditional human traders and cash transactions to a virtual and safer environment. Artificial Intelligence has aided in the creation of FinTech, prevented fraud, and helped to develop ro-bo-advising. Artificial Intelligence has provided the resources for finance to take off in a whole new light.

The opportunities that Artificial Intelligence has provided for finance do not come without their challenges. Fraud protection, algorithmic trading, and robo-advising are unique outcomes that present improvements in the industry, but still produce negative outcomes.

3. AI in Financial Technology

Financial technology is the growing sector of automated banking, online payments, algorithmic trading, cryptocurrencies, etc.

FinTech is growing and so is the use of AI in the field. Companies are gathering so much data than they are able to process and learn from. These data help them to stay ahead of competitors and grow in their market. AI gives them the ability to collect, process, clean, analyze, model, and communicate the findings to be beneficial to their companies. AI helps to automate this process, make it fast, find trends that humans cannot, make employees more productive by eliminating some of their repetitive and time-consuming tasks, and help to protect the companies and clients.

AI in FinTech allows us to identify trends, make predictions, and gain insights. FinTech companies can leverage data science along with AI to implement successful changes in the companies. The two main technologies in FinTech that help to obtain meaningful information from data are artificial intelligence (AI) and blockchain.

AI can make future predictions, identify fraud, and give more accurate advice to customers. AI uses past historical and present data that have been processed and analyzed with data science tools to make future predictions. These predictions can involve future revenue, what price point that products should be sold at, or when a company should buy or sell stock. Past and present data that are being collected can be transformed in seconds into meaningful future predictions. AI is also able to find patterns in data that a human would not be able to find. These patterns lead to very insightful comparisons between past and present data sets that lead to insightful future ideas.

4. AI in Fraud Detection

AI can identify patterns more accurately and faster than humans. Within these patterns, these machines can identify anomalies that may be fraud. It is also helpful that AI is constantly learning and can learn what is fraudulent and what is not. There are many falsely flagged transactions that are thought to be fraud but are not. AI can learn and eliminate those falsely flagged fraudulent transactions. Artificial intelligence machines also help to monitor transactions at all hours. This increases the likelihood that fraud will be detected and responded to quickly.

AI can help customers in a variety of ways. AI chatbots (ChatGPT) can help customers online in a very productive way. They can answer questions just like a human would and can provide real-time help to customer issues. They can also provide answers in multiple languages and will not become flustered due to stress. AI can also increase customer engagement. AI can monitor what the customer clicks on and interacts with, and then they can provide more personable experiences for the customer. This results in happier customers and more sales for a company. Issues with AI in this regard are that it cannot understand and sympathize with a customer.

Generative AI has the potential to transform the finance industry in the coming years. It can automate tasks, improve decision-making processes, and enhance the overall efficiency in finance. Also, generative AI can power chatbots for customer service, answering questions, and providing information about financial products and services. It should be noted that generative AI poses some challenges, including ethical considerations and potential biases. It is crucial to deploy responsible generative AI in finance.

5. Financial Technology of AI

FinTech is going to continue to provide digital payments, peer-to-peer transactions, and international payments. It is going to continue to provide financial services faster and more efficiently with the help of technology.

Financial technology, which has made some customers' lives so much easier, does not come without its unique set of challenges. FinTech creates issues with regulatory compliance, financial inclusion, and data privacy/security.

5.1. Regulatory Compliance Issues

FinTech companies are developing and using the newest and best technology on the market. This technology is being delivered faster than frameworks for regulations are being developed. The concepts that a company may want to implement might not comply with existing regulations. Then, there is a gap in what the FinTech companies can provide and what the regulations allow them to provide. Getting the regulations updated and followed can be a time-consuming process. The regulations that a com-pany must abide by also vary depending on the country.

5.2. Financial Inclusion Issues

FinTech can lead to certain populations being excluded from the benefits of the field. There are many issues with getting the technology needed for FinTech. Technology and Internet access can be expensive and complicated to use. It is difficult for certain populations to understand how to use technology correctly. There is also potential for biases in algorithms. This means that the existing FinTech algorithms are not always fair. These algorithms can discriminate based on race, gender, and income. FinTech can be exciting and helpful for many people, but it also excludes many people who do not have the resources for it.

5.3. Data Privacy/Security in Financial Technology

FinTech companies collect a lot of personal and financial information, such as names, addresses, social security numbers, bank account numbers, and personal bio-metrics that might be used to gain access to an account. All of this information is "gold" to hackers and makes these financial technology institutions vulnerable to ransomware, malware, phishing attacks, and data breaches. To protect customers' data, it is important to have encryption, multifactor identification, and firewalls. Since data might be shared with third parties, it is important for text to be encrypted into ciphertext, so that it is unreadable during the transmission of data. Multifactor identification can help to protect data security and privacy, because it means that more than a password and username is needed to access data. This means that there is a more in-depth security process to access sensitive data. Lastly, all FinTech companies should have firewalls to monitor traffic coming in or out of their network. This can help them to block and identify suspicious activity.

6. AI for Algorithmic Trading

Algorithmic trading is a way to execute orders with pre-programmed algorithms to automate trades, depending on the price, time, and volume. Algorithmic trading uses very complex mathematical calculations and rule-based algorithms to determine whether trades should be executed. Algorithmic trading uses machine learning to understand the past trading history and patterns. The accuracy and efficiency of algorithmic trading depends heavily on the analysis of data sets to determine the correct and best practices. A trading process includes five main stages: data access/cleaning, pre-trade analysis, trading signal generation, trading execution, and post-trade analysis. Developers use different approaches, including back-testing and optimization, to evaluate the effectiveness of the algorithms.

In the trading process, it is necessary to obtain market data first, including the stock price, trading volume, and other financial data.

Pre-trade Analysis

This includes the development of trading strategies and the setting of trading objectives, etc. Based on the results of the pre-trade analysis, traders generate trading signals indicating when to buy or sell a specific financial asset, according to the established trading strategy. Once the trade signal has been generated, the traders execute the actual trade. This involves executing buy or sell orders and ensuring that trades are carried out based on established strategies and rules. The outcome of the trading activity, such as the difference between the expected price and the final strike price and the profit and loss statement, is assessed.

For algorithmic trading to be beneficial, computers need to comprehend data sets that represent events in our fast-paced and changing world. Autoregressive models have past values that can predict what future values will be. Back-testing, which involves testing a strategy or algorithm using historical data, is how algorithmic traders can see how their strategies would have performed in the past. AI helps to make back-testing successful by collecting historical data, testing the performance of the trading strategy, finding ways

to make improvements to the strategies, and evaluating successes and issues with the back-tested trading strategy. Algorithmic trading is expected to continue to grow.

Algorithmic trading presents both positive and negative impacts. The future of algo trading can provide benefits by increasing the trading efficiency, introducing risk management techniques, and reducing the amount of work for traders. On the other hand, the challenges are still prevalent with market volatility issues, a lack of transparency, compliance with multiple regulations, ethical issues, and the possibility of data breaches and system failures.

Opportunities with Algorithmic Trading: Increasing Trading Efficiency; Risk Management Techniques; Reduce the Amount of Work for Traders; Reduce Workload for Traders; Machine Learning for Market Movement Prediction.

Challenges with Algorithmic Trading: Market Volatility; Lack of Transparency; Regulation Compliance Difficulties; Ethical Issues.

7. AI for Fraud Detection

Fraud is becoming increasingly common in all areas of the world. Fraud in finance can occur through phishing, ransomware, identity theft, stolen cards, and in-sider attacks. Phishing is a way that attackers manipulate people to share private information with them. They perform this by sending legitimate looking emails, messages, and websites and obtaining passwords and banking information through them. Whaling is a type of phishing attack, but it is targeted at high profile people, such as CEOs. Pharming is when attackers use social engineering to redirect users to malicious websites, even when they accurately type in the web address. Card testing is when a criminal tries to determine whether a stolen card is still activated and will make small transactions on the card. Lastly, identity theft is when a person's personal information is stolen and is being used by a criminal for fraudulent activities. Fraud detection is vital to protect customers and companies. Fraud detection will help to detect any suspicious activity that may be fraudulent early on, hopefully before damage is done. Other than early detection, fraud detection allows for financial protection, builds customer trust, provides cybersecurity, and prevents insider threats.

How Is Fraud Detection Performed? Fraud detection can be performed with biometrics, authentication and authorization, and with AI. AI is a massive help for fraud detection, especially for financial institutions. AI provides real-time monitoring, predictive modeling, and pattern recognition. These techniques allow large volumes of data to be analyzed and studied to prevent fraud. Real-time monitoring is the continuous and constant monitoring of data. Predictive modeling is a way to predict risk through certain activities and transactions. These predictions can create a risk score and then help to identity fraud. AI can detect patterns that humans cannot. These patterns can show legitimate transactions but also detect fraudulent transactions. Pattern recognition allows for anomaly detection in data sets. Anomaly detection is a AI technique that flags transactions or activities that largely deviate from a user's history.

Fraud detection is slowing the amount of cybercrime, but it is not able to identify it all. Fraud detection provides a wide array of positive opportunities, such as minimizing financial risks and allowing for more personal security.

8. Conclusion and Future Work

AI is becoming increasingly popular in multiple fields, due to its ability to extract meaningful insights from data. Particularly in the finance sector, data science has allowed the financial technology industry to soar. AI is allowing financial technology companies to collect, analyze, clean, and draw insights from data, which allows them to better serve customers. AI in finance has allowed for algorithmic trading, robo-advising, fraud detection, etc. Also, it has applications in credit scoring, loan approval, and mortgage rate forecasting. We plan to explore these topics in the future.

The opportunities that AI has created in these areas have been immense. AI has allowed us to use digital and international payments. It has allowed for algorithmic trading to be more efficient and have lower risks. Overall, it provides a more personal, safe, and efficient way for financial tasks to be completed. However, the challenges can be difficult to manage. The ways that AI has helped with FinTech, algorithmic trading, and fraud detection have also created issues with regulatory compliance, personal security, ethics, and financial inclusion. There are plenty of benefits to AI in finance; however, there are still challenges that hinder people from fully supporting or using the resources that AI in finance provides. Information and data are gold, and it is important to mine the gold, using AI to understand its value.

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