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The Impact of Artificial Intelligence, Machine Learning, and Big Data on Finance Analysis

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Abstract: Some scholars believe our society has progressed into The Fourth Industrial Revolution as the digital revolution that is based on the confusion of the physical and digital world. The innovation of networks, Big Data, and Artificial Intelligence technology promote the digital revolution. Fin-Tech, the interdisciplinary in Finance and Technology, is being stimulated at the same time. Using the technology, many problems in the traditional financial industry can be improved, for example, the risk management with information mismatch, low upgrade speed, and high labor cost as well as the individualization services. By providing personalized, higher-quality products, and leveraging data to inform investment strategies, Fin-Tech can benefit consumers with limited credit history through credit analysis. This paper analyzes the application and impact of Artificial Intelligence, Machine learning, and Big Data in Finance. To be more specific, how to help the financial industry reduce costs and enhance productivity with improved services.

Keywords: artificial intelligence, Big Data, machine learning, financial industry, Fin-Tech

1. Introduction

Thanks to powerful computation, sophisticated hardware, and cutting-edge software advancements, digital technology is about to change in the financial industry. A comprehensive examination of fresh information is possible made by machines, developing high-dimensional, complicated models [1]. The cutting-edge technology that drives the financial industry's revolution is artificial intelligence and machine learning, which seamlessly alters the behavior of businesses and consumers. Task automation and fraud detection in the financial department are only two examples of what machine learning and artificial intelligence can do [2].

The COVID pandemic accelerates the trend of digitization, including the usage of artificial intelligence. Nowadays, artificial intelligence is increasingly being used in the financial sector such as in asset management, algorithm trading, and credit underwriting [3]. To support these functions, big data play a significant role which covers data collection, storage, resource management, computing framework, analysis, mining, visualization, etc. Artificial intelligence can be considered as the combination model of computer systems and machines with human intelligence. AI incorporates machine visualization, natural language processing, and an expert system. The job of AI is to let the computer make decisions, solving problems with the conceptions of the human mind. One

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type of artificial intelligence (AI) is machine learning, which enables a software program to predict outcomes accurately [2].

In history, the first stage of technology that empowers finance is IT finance, mainly from the 1950s to the 1990s. The financial industry began to use computers to process financial operations, such as credit cards and ATMs. It was also during this stage that computers began to be used instead of paper documents to record financial data. The second stage was Internet finance, mainly from the 1990s to the beginning of this century, which gave birth to many Internet banks and the emergence of Internet insurance and other businesses. The third stage is the last decade or so, represented by intelligent investment advisors, big data credit, intelligent customer service, etc.

Through the analysis, this paper may provide the financial practitioner with some new perspectives, different business models and the interaction of the technology and risks will be displayed.

2. The Banking Industry

Artificial intelligence and machine learning are built on the principle of learning from past data. Naturally, ML and AI are revolutionizing the banking industry. In the long run, we take credit evaluation as the authorization of who is available to own the credit card [4]. However, this standard can only make people have the card or not, which is not an advantageous thing for the business. Using AI and ML, the banking department can collect the loan repayment habit data and other related history. Based on these facts, banks can set different interest rates for different people to make sure most of them can use credit cards, which makes the financial institution more meaningful. Thinking about how the world works and solutions from thousands of personal financial records, AI is a data-dependent, data-driven monster that can review countless records and suggest loans and credit products [5].

Banking risks result from both financial and non-financial operations, such as loan agreements, mergers, acquisitions, credit products, as well as new legislation. A key principle of risk management in the banking sector is to build a solid understanding of potential risks so that regulators can manage risks for worst-case scenarios and prevent banks from suffering unexpected losses as a result of their risk-taking behavior [6].

For banks and financial institutions, fraud is a big issue. The losses of fraud can achieve billions of dollars every year. Financial institutions frequently keep numerical data online, which raises the possibility of a security breach. As a result, technological advancements have made financial fraud a significant hazard to data. The earlier versions of fraud detection systems were based on a set of guidelines that today's con artists may easily go around. Thus, machine learning is being used by more and more businesses to identify and stop illegal financial activities.

ML has a comparison with other data points for example customers' consumption history or IP addresses to make sure whether the marked transaction is defrauded. The algorithm can then automatically select to buy or reject the refund as a reminder for people, depending on the nature of the transaction. Apart from that, AI innovations and approaches provide easier access for bank users [4]. AI starts to provide individualized services to customers, for example, the chat-box robot to reduce the workload of the institution. Today, virtual managers are providing smarter services to customers for many kinds of transactions, such as checking balances, scheduling payments, checking account activity, etc.

Big data technology and graph computing can improve banks' risk management. The predictive analysis of a customer's risk can be divided into multi-dimensional assessment systems such as the fraud model, identity verification model, prepayment ability model, repayment ability model, repayment willingness model, and stability model. Moreover, based on graph relationships, it can

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provide insight into AML risks, accurately identify AML customers, gain insight into the purpose as well as nature of customer transactions, and track the flow of funds.

Overall, artificial intelligence will revolutionize the credit system of banks and produce huge changes in the collection and mining analysis of data. The technology revolution makes the model and data of banks become more open and shared under encryption. Also, the ability of banks to predict and avoid risks independently becomes stronger while the scale of supervision is also more accurate.

3. The Insurance Industry

As Accenture (2018) stresses, the factors that promote machine learning in the insurance industry are below. First, the smart everything style makes the companies find any applicable methods to achieve department automation, like diagnostic or maintenance [7]. Along with the growth of the data, machine learning and other open source model help the insurance industry to manage the big data, so the data set and velocity play a big role in the supervision and working. Also, machine learning is good at talking back and facial respect, creating more value.

A survey found that insurance claims are the most unsatisfactory part of the whole insurance product consumption process. Because in the claims process, the audit requires a lot of detailed materials. If a dispute arises, multiple investigations and verification are required, which the complex process will consume customers' energy also reduce customers' experience. At the same time, there are many cases of unreasonable claims in today's insurance. On the one hand, it is because the policyholder is rash in signing the contract and does not understand the terms and conditions thoroughly. On the other hand, some insurance companies also suffer from misleading sales and lax underwriting. Compared with traditional manual claims, intelligent claims can be quickly viewed, accounted for, and fixed, which can save a lot of time and improve the efficiency of claims processing. For example, in 2017, artificial intelligence was used in the assessment of images to make claims. After checking the image of the damaged car, AI can assess it within a few seconds, reviewing and authorizing it to make sure the whole process is accurate and efficient [8].

In terms of risk control, the current fraudulent means have become increasingly specialized, team-oriented, and diversified. With the year-on-year growth of the insurance business, insurance fraud means evolving year by year, the traditional insurance risk control is facing more and more challenges. At the same time, traditional insurance risk control has huge data barriers, which may lead to incomplete anti-fraud insurance. Intelligent risk control models, in addition to general anti-fraud and customer identification monitoring, can also effectively perform gang fraud identification and reduce the occurrence of large-scale fraudulent insurance practices. For example, the annual loss caused by the fraudulent claim is estimated at $30 billion, and the insurance company in the US paid out in excess motor vehicle injury claims between $5.6 billion and $7.7 billion [8].

Process issues contribute to the maintenance of high operational costs and low profitability. However, AI can be used to assess various types and quantities of data in less time, aiding in the solution of the burdensome distributed data by dealing with human data generation and gathering, so the costs, time, input errors, bad price choices, and underwriting procedures can all be decreased as a result. An optimal pricing model will discriminate risks and provide fair pricing by combining various data and variables. By doing so, the business can outperform its rivals and prevent the risk of adverse selection [8].

AI can transform the depressing customer experience into on-demand, which is more beneficial. If the insurance company utilizes AI on their valuable data, there will be more and more flexible insurance choices for the public to choose from. Due to the technology, the insurance company can

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better understand what their customers want and need, which will also encourage more business interactions.

4. The Stock Market

The first ETF in the world to use artificial intelligence for investing is the AI Powered Equity ETF (AIEQ), which debuted on the New York Stock Exchange in 2017. This AIEQ uses the cognitive and big data processing capabilities of IBM's Watson to analyze investment opportunities in U.S. stocks, which is more rational and does not have mood swings compared to human stock speculation. On top of that, it can run 24 hours a day, year-round, while analyzing more than 6,000 U.S. listed stocks. Every day, billions of dollars are traded on the stock market around the world in order to make money [9]. As a result, stock market forecasting is a popular topic for academic study. The application of artificial intelligence in A-share investment has solved some of the challenges that analysts were unable to solve and has improved the effectiveness of investment. With the changes in the A-share market and the increased speed of information technology, we are experiencing an era of data explosion, and analysts can be stretched to the limit in the face of massive amounts of data, especially analyzing large amounts of data in a short time can be an impossible task. The movement of asset prices depends on the response to a variety of information, and traditional financial analysis relies on the judgment of analysts, who need to collect, filter and analyze the massive amount of information. With the help of artificial intelligence speculation, analysts can quickly solve investment problems to make decisions effectively.

The technical breakthrough of artificial intelligence in natural language has largely solved the difficulty of obtaining, extracting, and analyzing information for human analysts. After using natural language technology to transform unstructured data into structured data that can be stored and analyzed, machine learning algorithms will analyze the processed data to make investment decisions. Because the machine can operate 24/7, AI can predict and monitor risk through models in a more timely and effective manner. Capital markets may sometimes be hit by "black swan" events, which can cause a systemic crisis in a short time, and intelligent quantitative systems can automatically execute operational instructions to make timely responses, thus effectively avoiding investment losses.

The stock market may be the most sophisticated technique. A person exchanges shares for stocks with an entrepreneur and gets some cash back in the meanwhile. Following this mode will be a potential investment strategy. However, in this stage, the cost and the liquidity are not stable. Machine learning is a kind of equipment to encourage us to achieve what we want. ML has different techniques and methods to implement the prediction framework, for example, fundamental analysis, technique analysis, market computation, etc. The use of artificial neural networks, namely recurrent neural networks, which effectively implement machine learning, is the most obvious and promising technique [10].

The world's leading hedge fund AQR has a research report on AI stock speculation, which concludes that AI is currently in a very early stage of research and application in the investment field. Future development is incremental, rather than disruptive. It will be difficult to completely replace human investors for a long time to come. The technology will develop to surpass people, but there is a long process to reduce the cost to the extent that ordinary people can afford it.

5. Conclusion

The goal of combining artificial intelligence with the financial sector is to improve the efficiency of the system, not to entirely replace the current financial system. Indeed, some jobs in the financial industry such as banking, insurance, and stock markets have changed due to the advent of science and

technology. However, it cannot be ignored that the development of artificial intelligence still has problems and the technology still needs to be perfected. But all in all, intelligent finance will become the core competitiveness of the financial industry. And this article focuses on describing the application scenarios of technology in different financial sectors.

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