

Application of Deep Learning Method in Financial Technology

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Abstract—With the rapid growth of credit card business, consumer loan business and P2P business in the market, there are more and more scenes and needs for personal credit evaluation. Personal credit evaluation is an activity for banks to evaluate the credit situation of borrowers. The most basic condition of a bank loan is credit. If the credit is good, it is easy to obtain bank loan support, and if the credit is poor, it is difficult to obtain bank loan support. The borrower's credit is composed of many factors, including the borrower's assets and liabilities, product economic benefits, market development trends, and so on. To have a unified, basic, and correct evaluation of the borrower's credit status.

Keywords— Deep Learning, Financial Technology, Credit Risks, Credit Evaluation.

I. INTRODUCTION

With the rapid economic growth, various consumer financial products began to emerge [1]. To provide residents with capital or credit support under their existing credit information to meet the growing material needs of residents. Personal credit evaluation is an activity in which the bank evaluates the borrower's credit status. The most basic condition of a bank loan is credit, good credit is easy to obtain bank loan support, and poor credit is difficult to obtain bank loan support. The borrower's credit is composed of many factors, including the borrower's assets and liabilities, product economic benefits and market development trends, and so on. To have a unified and basic correct valuation of the borrower's credit status, to correctly grasp the bank loan, it is necessary to assess the borrower's credit status. The coverage and accuracy of personal credit assessment also have higher and higher requirements. Finance is to solvent and loan demand of fund, personal credit assessment generally from two aspects, on the one hand, including a wider range of data sources, through technical means to get information from more platform, but inevitably involves personal privacy, due to technical stronger, not suitable for financial professionals. On the other hand, mainly lies in the optimization and application of the method, aiming at the existing data, through appropriate tools, continuous optimization method, improve the accuracy. In the industry, the two trends coexist, and the second direction is more meaningful in the undergraduate teaching of finance.

Credit investigation refers to the collection, sorting, and processing of personal credit data by third-party institutions, and then the assessment of personal credit rating, providing a reference for economic activities such as credit issuance [2]. As credit investigation data involves a lot of personal privacy, most of the open personal credit investigation data are old

analog data, and most of the methods are based on scoring cards and logistic regression, and other classical methods. In the face of the rapid increase in the magnitude of data in the era of big data, Python, a platform and tool for processing large-scale data, has been recognized by more and more users. Deep learning methods have been applied and promoted more and more, but different methods have different characteristics, so it is more important to comprehensively apply a variety of methods to evaluate and forecast data, and then compare and optimize data [3]. The scale and quality of bank credit business represent the operation strength and competitiveness of commercial banks. It can bring business benefits to commercial banks, but at the same time, there are many risks. Credit risk is one of the important risks faced by commercial banks.

The differences between the disposition of personal non-performing assets and the disposition of enterprise non-performing assets: (1) Different asset attributes. Enterprise loans are small in number and large in amount and generally have collateral. A large number of human loan households, a small amount, mortgage loans, also have credit loans. (2) Different stages of development. The history of bad assets management in China mainly revolves around the non-performing assets of enterprises, the industrial chain is mature and the legal framework is perfect. At present, there is no definition of personal bankruptcy in China and relevant laws need to be perfected. (3) Different disposal methods. The disposal methods of enterprise non-performing assets are diversified, including normal liquidation, lawsuit recovery, creditor's rights transfer, asset restructuring, debt-equity swap, asset securitization, etc., which requires a team with strong professional ability to carry out customized processing. Disposal methods of personal non-performing assets tend to be standardized, mainly including collecting and disposal of collateral. Technical means can be used to solidify the process and improve efficiency.

II. RISK MODEL

At the core, users' basic portraits and behavioral needs are used to extend to users' social activities to explore whether users have real and reasonable capital needs and whether they have good repayment willingness and ability, to establish a well-differentiated risk model.

(1) Processing of time series

(a) Pre-loan

Credit business obtains credit investigation report through user authorization, understands user's credit history based on the credit investigation report, and understands user's real cash flow demand by analyzing user's behavior sequence. Common credit inquiry includes credit card approval, loan approval, etc. Such inquiry represents the user's capital demand at that time. By matching the loan issuance in the credit investigation report with the loan query application time, the user's capital use and credit behavior can be analyzed.

The traditional financial industry often uses processing logic based on sliding Windows of different times to make statistics, including the number of credit investigation reports in the past one month, three months, six months, twelve months, twenty-four months, the number of loans issued in the past one month, three months and other indicators. The credit investigation report also includes the change of the user's company address, the change of provident fund, and other information. By dividing the above information based on the time axis, the credit demand and credit usage of the user in a period can be characterized and analyzed. Degree of grain full depth using a neural network to analyze, by recording the time point, the time point of the type of action, the action, and the action of multiple eigenvalues, to convert each Item as input for LSTM units, access to the unit output at the same time as the next time sequence of input, constantly learning to get better information.

(b) In loan

Behavioral data in credit loans are mainly used for the modeling of CARD B. In the whole customer life cycle, users constantly borrow money and pay back the money. Based on this, in the time slice of each action, features such as total amount, remaining principal, type of this action, amount of this time, number of days to the next repayment date, the amount payable on the next repayment date, the amount payable on a remaining day, times of repayment in advance, times of overdue can be generated, and these features can be organized into Item. The capability of the B card can be significantly improved through various RNN networks.

(2) Text data processing

In addition to structured data, there are also a lot of unstructured data, such as text data. A lot of data in traditional finance are numerical data, such as income level and other variables. These data generally have the characteristics of high confidence and strong resolution, while Internet data has the characteristics of large data scale, messy data, and weak resolution. The traditional text processing method generally sorts text features and constructs a full-connection-layer deep network DNN. This processing method is strongly dependent on the order of text and has defects such as sparsity and weak generalization ability.

(3) Associated network

Graphs are widely used in fintech. In our associated network architecture, the use of a graph computing engine can help us quickly realize the storage and calculation of massive graph data. As fintech providers reach a certain scale, graph databases are the best way to present and query these relational data, and the ability to understand and analyze these

graphs will be our core competency. However, the combination of the three methods can significantly improve the risk identification ability of the model.

III. APPLICATION AREAS

The wave of artificial intelligence technology and industry represented by deep learning is surging. New algorithm technologies emerge one after another. Intelligent tasks such as image recognition and machine translation are approaching the level of human beings. The application of deep learning in the financial field mainly includes the following aspects:

(1) Algorithmic Trading

Algorithmic trading refers to buying and selling decisions based entirely on intelligent models, which may be based on simple rules, mathematical models, optimization processes, or machine learning and deep learning [4]. Deep learning applied to algorithmic trading is most commonly combined with some time-series price prediction models to achieve the purpose of market timing, such as price regression through LSTM, RNN, etc. In addition, some independent algorithmic trading models focus on the dynamics of trading itself by optimizing bid-ask spread, limiting order analysis, position size, and other trading parameters, such as some studies on high-frequency trading and pair trading.

(2) Risk Assessment

Another area that deep learning studies in finance are risk assessment, which identifies the risks of assets, companies, individuals, products, banks, etc. Some specific applications such as bankruptcy prediction, credit score, credit evaluation, loan/insurance underwriting, bond rating, loan application, consumer credit termination, corporate credit rating, mortgage choice decision, financial distress prediction, corporate crisis prediction, etc.

In this context, it is crucial to correctly identify the risk profile, as asset pricing is highly dependent on these risk assessment measures. Most risk assessment studies focus on credit scoring and bank distress classification, however, there are also some applications of mortgage default probability, risk transaction detection, and crisis prediction.

(3) Asset Pricing and Derivatives Market

The accurate pricing or valuation of assets is a basic research field in finance [5]. There are many ML models in banks, corporations, real estate, derivatives, etc. However, deep learning has not yet been applied to this particular area, but there is no denying that deep learning models can help asset pricing researchers or valuation experts in some areas where this is possible. For example, options pricing, hedging strategy development, options financial engineering, futures, forward contracts, and other research can benefit from the development of a deep learning model.

(4) Fraud Detection

Financial fraud is one area where governments and institutions are struggling to find permanent solutions. Some common financial frauds include credit card fraud, money laundering, consumer credit fraud, tax evasion, bank fraud,

insurance claim fraud, and so on [6].

These are also among the most widely studied areas of finance in machine learning research, and there are many related papers. In machine learning, most of these types of research can be seen as anomaly detection or as some classification problems. Among them, some researches, such as credit card fraud detection by deep learning models are applied to parliamentary expenditure in Brazilian elections and financial fraud, and money laundering in export tax declaration of Brazilian companies.

(5) Portfolio Management

Portfolio management is the process of selecting various assets in a portfolio over a predetermined period. Including portfolio optimization, portfolio selection, and portfolio allocation [7]. Portfolio management is an optimization problem, identifying the process by which the best returns are likely to be selected for the best-performing assets over a given period. Therefore, many researchers have developed several EA (evolutionary algorithm) models for portfolio optimization. There are also a lot of achievements in applying deep learning to portfolio management, such as stock selection. For example, a researcher divided stocks into low momentum and high momentum according to expected return, used a deep RBM (restricted Boltzmann machine) coded classifier network, and achieved high returns.

(6) Financial Sentiment Analysis and Behavioral Finance

One of the most important components of behavioral finance is the analysis of investor sentiment. More recently, advances in text-mining technology have made it possible to extract investment sentiment from the masses through social media [8]. There is growing interest in financial sentiment analysis, especially for trend forecasting and the development of algorithmic trading models. Therefore, the use of the deep learning model for sentiment analysis of financial forecasting is a hotspot of current research. For example, some researchers made use of Reuters news to predict emotions and used these emotions for price prediction. Many researchers also used sentiment classification (neutral, positive, and negative) and predicted the opening or closing prices of stocks through LSTM. The results were compared with SVM and the overall performance was higher.

(6) Cryptocurrency and Blockchain Studies

Over the past few years, cryptocurrencies have been talked about for a short time due to their incredible price volatility [9]. Although price forecasting dominates the main research area, some other studies exist, such as cryptocurrency algorithmic trading models. At the same time, blockchain is a new technology that provides a distributed decentralized ledger system that fits well into the world of cryptocurrencies.

Cryptocurrency and blockchain are highly coupled, although blockchain technology has a larger span and various implementation possibilities need to be studied. It's still in the early stages of development, so there's a lot of potential. Some deep learning models have emerged for cryptocurrency research, mainly for price forecasting or trading systems.

(8) Financial Text Mining

With the rapid spread of social media and the emergence of real-time streaming news, text-based instant information retrieval has become a tool for financial model development. Therefore, financial text mining research has become very popular in recent years [10] [11]. Many studies are interested in the retrieval of news, financial statements, disclosure, and other contents by analyzing the text context.

In finance, the use of text has focused on sentiment analysis, using Google's search index and lexicography-based labeling of sentiment words. In the current research field of text data, people mainly focus on the qualitative research of point data, while the quantitative analysis of text data in time series is less. There are two main reasons for this: First, text data is stored in unstructured form and historical data is of large scale, which is difficult for traditional statistical analysis to deal with. Second, it is difficult to obtain text data, which requires a long time of accumulation. If there is no accumulation in the early stage, it is difficult to obtain data for a long enough time for time series analysis in a short period.

IV. CONCLUSION

In this paper, personal credit evaluation is an activity for banks to evaluate the credit situation of borrowers. The most basic condition of a bank loan is credit. In addition, three different risk models are introduced. Finally, the application of deep learning in the financial area mainly includes the different aspects.

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