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Analysis of Machine Learning in Finance

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Abstract: In the era of different digital technologies, the financial field holds a great importance in the real world. It is an integral part of our life and handles tremendous amount of data. Most of the financial companies nowadays are trying to maximize their profits and there arises a dog-eat-dog situation between them. Companies with help of data-driven machines, survives in the battle while others fail and results in total loss of their company. Analysing the historical data provides a best method to overcome many challenges including financial crisis of the companies Data scientists now may speak that analysing the behaviour of market is not a big deal. While, technology is growing day-by-day, machine learning has successfully built up within finance. One of the main purpose of this technology is to forecast the future behaviour of the finance domain. With the help of various predictive technologies machine learning holds a great impact on the finance industry. The techniques can be implemented in risk free investment banking, payments and market forecasting etc. depicting the analysis on the impacts and facts of machine learning in finance.

Keywords: ML, AI, IBM, SVM, Bookkeeping, Trail Balance Document

I. INTRODUCTION

The management of a huge amount of money by companies or by the means of government can be termed as finance. People make income from business while the business are supported by the money from capital markets. Machine Learning (ML) is in fact a vast field and is rising up to a new level each day. When described in simple terms, machine learning is a study that provides computer systems the capability to learn without the need to feed data explicitly. This technology came up in 1950 when Arthur Turing published a paper on "Computer Machinery and Intelligence" based on the topic Artificial Intelligence (AI). Later on in 1952, Arthur Samuel, pioneer of machine learning, developed a program that provided an IBM computer to play checker's game and it had undergone various developments after that and now this technology is a subset of AI. Different techniques and predictive algorithms now ease the effort made by mankind and provide error-free analysis of the future financial marketing. Analysing huge amounts of data is quite a difficult task for human beings, meanwhile with the help of machine learning algorithms, it only takes a second to go through it by saving the time. It allows to increase the productivity and also replace manual works. Machine Learning has various applications within the finance domain. Some of them include like process automation, fraud detection, algorithmic trading, loan and insurance underwriting, customer service, network security etc. As time goes by, this technology is making a significant mark in the history of finance. In the present world, financial companies and banks have the right to access the information related to a customer. A common threat that banks and financial companies are facing are the rising number of fraudsters. Machine Learning helps to beat fraudsters by scanning through the transactions made by the customers and identify or suspect unusual behaviour using machine learning algorithms. It reduces costs and also at the same time maximize the productivity presenting a good outcome.

II. ADVANCEMENT OF FINANCE DOMAIN

Gone are the days where traders and brokers used to rush around the stock market for placing their orders and not to mention the security problems, the problems they faced were too tough to handle. With the invention of computer machines, lead to the rise of the financial machines, which turns out that traders/employers now require technical strategies. Individuals need to analyse the historic data, plot the graphs and also must use various formulas to predict the stocks for the future. But now, Machine Learning algorithms are applied to huge number skills. With the advent of digital technologies such as Artificial Intelligence (AI), various prediction techniques can be used to predict the behaviour of a market, leading to the growth of financial markets. Stock Market prediction remains a tedious task until today**.** It involves identification of trends and exact time for buying or selling stocks and also best investment of data sets, resulting in smooth and precise results in just a fraction of time.

A. Finance Before Machine Learning: Before the invention of computers and different technologies, insurance companies and banks used to write bills and perform transactions manually. Security breaches and money laundering were common those days. A method called bookkeeping were done by people which included individuals keeping a record of every financial transactions in a journal that a company had made. This resulted in many errors. While banks

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introduced a Trial Balance Document which balances the transactions made in a day. If the transactions does not balance then the accountants have to check each transaction made until it turns correct. Moreover, they have to keep the records safe from theft. Problems were more common those days and were too tough to handle. Accountants have to go through many records to identify and correct errors during that time. Payment methods were too at risk. Financial crisis were common and many banks have been bankrupted. There was no method to predict such things and thus problems piled up at that time.

A. Finance Now : The financial sector plays a vital role in the economic growth of each nation. Financially developed countries tend to develop faster much more than other countries. Over the period of time, finance have developed way too far. Companies have developed from limited to advanced method which provides risk-free operations. The main challenge is that customers expect companies and banks to understand and provide them services as per their needs. Banks and finance companies need to understand each of their client and their needs. Each customer may have different needs from the firm. For example, one may need to apply for a loan while other may have to open a new account. It is the duty of the firms to identify and understand these requests and implement them. Other than these tasks, banks and other finance oriented companies need to target offers and most importantly predict financial crisis. Poor decisions and incorrect transactions result in financial failures. When technologies invaded the world, these problems have been solved up to a limit. Many financial models have been developed to forecast the bank from being bankrupt. Machine Learning techniques such as Logistic Regression, Neural Networks and Decision trees have been developed as a tool against bankruptcy since 1990. A study based on improvement of ML in prediction accuracy, used a data from a time period of 1985 to 2013, on the firms from North-America shows that when compared with traditional financial models, such as bookkeeping, Machine Learning showed an average of approximately 10% more precision on the results obtained. The models used in this test were bagging, boosting and random forest models and with all possible predictive variables in this models, the technique on random forest presented a 87% accuracy, while using logistic regression, it gave 50% more accuracy and 50% accuracy on linear discriminant analysis, in the sample that was tested[2]. This shows us that it is more convenient to use such technologies as it eases the effort made by the humans. Nowadays, systems with early warning systems have been developed to detect the financial behaviour and losses. Support Vector Machine (SVM), a supervised learning technique is used to classify tasks and analyse regression

III. THE WORLD OF MODERN FINANCE

The invasion of technologies have created many changes to the real-world. Even though in our daily life, we do not think or feel about how much these technologies or their applications have influenced the human life. Over the past few years, banks and many other financial companies have undergone many changes and have modernized to a new level. Machine Learning changed the finance sector in a way that in the future, it will soon turn out into a vital part of the real-world. The first and foremost thing about the application that ML provides is the risk management. Risk management is an important task in the business field. Machine Learning manages risk by assigning appropriate credit amount for a customer.

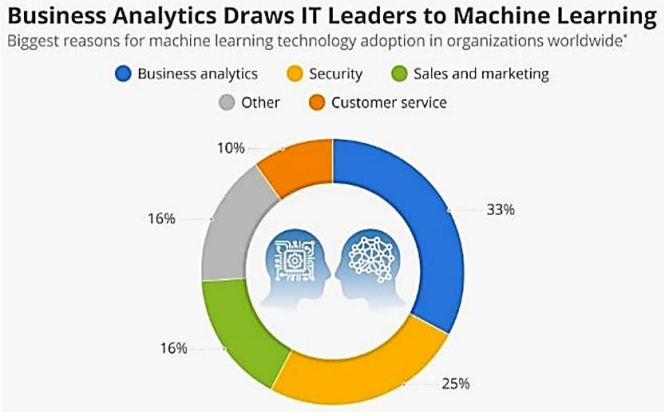

Fig 1. Impact of machine learning in business[3]

Another important application of ML is the ability to detect fraudsters. Trying to identify and suspect unusual transactions is manually impossible. Applying machine learning algorithms, to a millions of transactions, checks and determine which all transactions are fraud. Better trading decision are needed to sell or buy stock in the market nowadays. With the help of machine learning a technique named Algorithmic Trading is implemented in stock marketing trading for good prediction on the trades. It analyses a large amount of data sets simultaneously for predicting stocks. Compared to traditional investment models, managers can forecast market changes faster using this

technique. Using the patterns in the data it can foresee the future of financial markets and can handle incidents such as financial crisis etc. Goldman Sachs, a leading global investment bank uses Machine Learning in their Algorithmic Trading Department. In the present world, reputed companies and banks hire candidates that acquires Machine Learning skills. For an improved customer service, sophisticated ML techniques can be implemented for a company to analyse their client's behaviour such as needs and expectations on their companies and can also increase the profit. In the near future, Machine Learning will be used by almost every financial institutions and firms. The figure 1.1 depicts how much machine learning has an impact to various fields. As we can see the main reason for the usage of machine learning is for the analysing of business, as it holds 36% of the total area. Others include like security and marketing and the rest falls into customer services and many others.

IV. PRONS AND CONS OF MACHINE LEARNING IN FINANCE

As every coin has two sides, Machine Learning has its own advantages and disadvantages with different characteristics and features.

B. Advantages: The main advantage of machine learning is that it can easily understand trends and patterns without the intervention of human. It can recognize and review patterns and study the behaviour of financial markets. As each time we implement the algorithm, it gains experience with improvement in efficiency and productivity. The more data you feed the more accurate will be the results. Reducing human effort is another factor. Without the need for much expense, it provides services to the companies and banks with the aim of reducing cost. Machine Learning thus overcomes many challenges that was impossible with human.

C. Disadvantages: Although it has many advantages, Machine Learning isn't completely perfect. First of all it needs massive number of data sets to study on and operate. Ordinary persons cannot operate on these sets, it require experienced data scientists to work on it and also there can also be incidents where they need to wait for up to a time period (may be long) until a new data generates. Moreover, this technique needs resources and also time to study a data in order to generate a possible result. So this may lead to additional computer power requirements. The algorithms that we choose to implement this technique must be carefully done otherwise it may interpret the results. Since it is autonomous, there is a chance for errors. In order to correct these errors we must find the source of it which causes time wastage. It is an undoubtedly powerful technique, but must be used by the right person in exact ways.

V. CONCLUSION

As time travels, financial markets are constantly changing. With the advent of technologies such as AI and machine learning it is more convenient to use these methods for the competition nowadays to excel. It offers best customer services and personalization for good outcome. Almost 90% of global financial companies uses ML as a technique to predict and analyse the future. So it can be estimated that in the near future, this technology will be implemented by almost all financial firms and banks to forecast the behaviour of stocks and also customers. Even though, machine learning is a powerful tool to overcome the challenges in finance, there are managers and traders that still don't know about this technology as it not commonly accepted by everyone. It is a technology that is slowly developing in the real-world, by the time of late 2050, we can guess, will turn popular.

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