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A study on the usage of Machine Learning in Finance and Banking Sector

Ms. V. Poornima

Introduction:

In today's era of digitization, staying updated on technological advancements is a necessity for businesses to both outsmart the competition and achieve desired business growth.

The recent years have seen a rapid acceleration in the pace of disruptive technologies such as AI and ML in Finance due to improved software and hardware. The finance sector, specifically, has seen a steep rise in the use cases of machine learning applications to advance better outcomes for both consumers and businesses.

Until recently, only the hedge funds were the primary users of AI and ML in Finance, but the last few years have seen the applications of ML spreading to various other areas, including banks, fintech, regulators, and insurance firms, to name a few. Right from speeding up the underwriting process, portfolio composition and optimization, model validation, Robo-advising, market impact analysis, to offering alternative credit reporting methods, the different use cases of Artificial Intelligence and Machine Learning are having a significant impact on the financial sector. The finance industry, including the banks, trading, and fintech firms, are rapidly deploying machine algorithms to automate time-consuming, mundane processes, and offering a far more streamlined and personalized customer experience.

What is machine learning?

Machine learning is a branch of **artificial intelligence** (AI) that allows machines to learn through algorithms. These algorithms learn from real data with which a model is generated. This model allows predicting what class or what type is a new data. Machine learning is important because it gives enterprises a view of trends in customer behavior and business operational patterns, as well as supports the development of new products. Many of today's leading companies, such as Facebook, Google and Uber, make machine learning a central part of their operations. Machine learning has become a significant competitive differentiator for many companies.

TYPES OF MACHINE LEARNING:

Machine Learning Algorithms can be classified into 3 types as follows –

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning

1. Supervised Learning:

Supervised learning is that the machine learning task of learning a function that maps an **input** to an **output** supported example input-output pairs. In Supervised Learning, the dataset on which we train our model is **labeled**. There is a clear and **distinct mapping** of input and output. Based on the example inputs, the model is able to get **trained** in the **instances**.

An example of supervised learning is **spam filtering**.Based on the **labeled data**, the model is able to determine if the data is **spam** or **ham.** This is an easier form of **training**. Spam filtering is an example of this type of **machine learning algorithm.**

2. Unsupervised Learning:

Unsupervised Learning may be a machine learning technique during which the users don't have to **supervise the model**. Instead, it allows the model to figure on its own to get **patterns** and **knowledge** that was **previously undetected.** It mainly deals with the **unlabeled data.** In Unsupervised Learning, there is no labeled data. The algorithm identifies the **patterns** within the **dataset** and **learns** them. The algorithm groups the data into **various clusters** based on their **density.** Using it, one can perform **visualization** on **high dimensional data.** One example of this type of Machine learning algorithm is the **Principle Component Analysis.**

Furthermore, **K-Means Clustering** is another type of Unsupervised Learning where the data is clustered in groups of a similar order. The learning process in Unsupervised Learning is solely on the basis of **finding patterns** in the **data.** After learning the patterns, the **model** then makes **conclusions.**

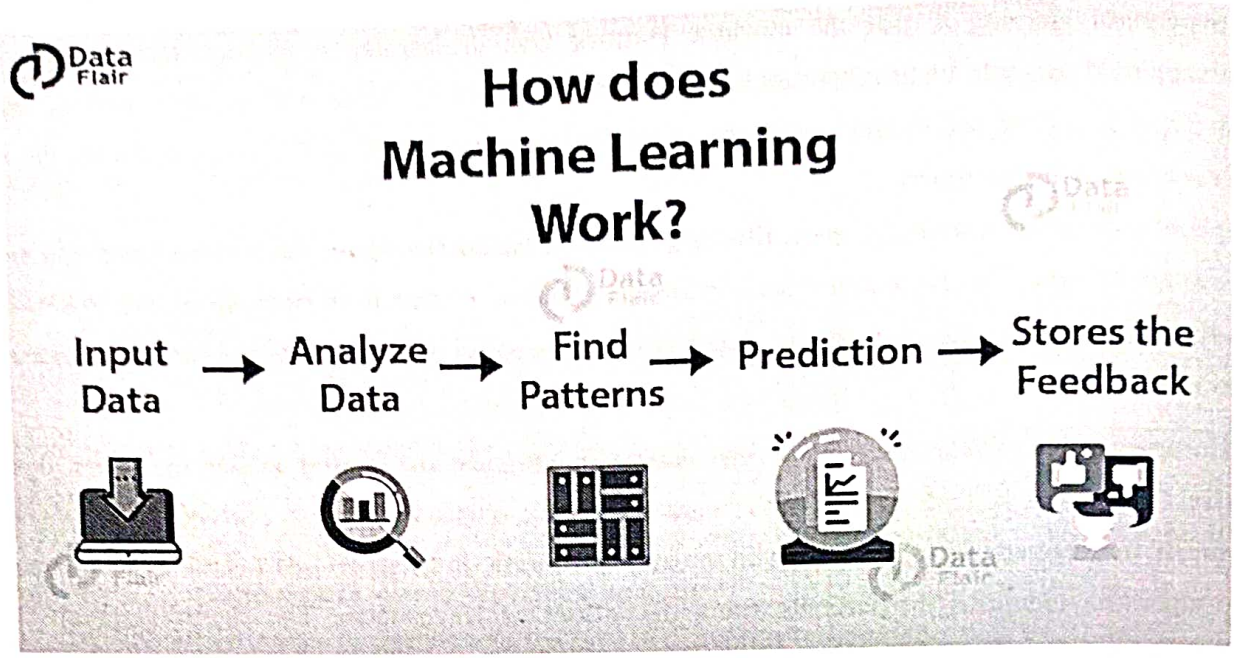
3. Reinforcement Learning:

Reinforcement learning is one among three basic machine learning paradigms, alongside supervised learning and unsupervised learning. Reinforcement Learning is an **emerging** and **most popular** type of Machine Learning Algorithm. It is used in various **autonomous systems** like **cars** and **industrial robotics.** The aim of this algorithm is to reach a goal in a **dynamic environment.** It can reach this **goal** based on several rewards that are provided to it by the system. It is most heavily used in **programming robots** to perform **autonomous actions.** It is also used in making **intelligent self-driving cars.** Let us consider the case of **robotic navigation.** Furthermore, the **efficiency** can be improved with further **experimentation** with the agent in its environment. This is the main principle behind **reinforcement learning.**

Phases in Machine Learning:

These are some of the necessary phases to identify and carry out a project based on machine learning:

- **Data acquisition**: images, numerical data, existing databases, etc. Large amounts of data are required.
- **Creation of the dataset** from the data obtained. For the creation of the dataset it is necessary to carry out the labeling of all the data (supervised learning). Usually this task is done manually and is quite tedious.
- **Model training.** The model is trained with part of the data from the dataset.
- **Evaluation of the model.** To obtain the behavior of the model, it is evaluated with new data that have not been used during training.



Source: Data-flair

Machine Learning in finance and banking sector:

Machine Learning works by extracting meaningful insights from raw sets of data and provides accurate results. This information is then used to solve complex and data-rich problems that are critical to the banking & finance sector. Further, machine learning algorithms are equipped to learn from data, processes, and techniques used to find different insights.

Here are some of the reasons why banking and financial services firms should consider using Machine Learning despite having above-said challenges –

- Enhanced revenues owing to better productivity and improved user experience
- Low operational costs due to process automation
- Reinforced security and better compliance

Usage of Machine Learning in finance and Banking Sector:

We have already found out that the subject of discussion is an indispensable tool for the FinTech industry today. It should be noted that AI technologies can be widely used both for more generally applicable functions in business from detecting spam to document categorization, and for more specialized needs of financial companies from stock technical analysis to credit scoring. Let's explore the uses of machine learning in banking and finance:

1. Machine learning for customer experience in financial services:

The highest level of customer support is the main marker of the quality of the financial services provided. And this is exactly the factor in which leading financial companies are fighting for leadership. ML helps organizations to improve customer experience, services, and to optimize budgets. Process automation replaces routine manual work in most cases, automates tasks, and makes their realization more productive. Among the most striking examples of automation of processes to increase customer service level in the field of finance are the automation of paperwork, automation of call centers, and the use of chatbots.

2. Customer onboarding:

Customer onboarding is the complete process that users go through when they act as clients of a bank or FinTech company. Onboarding experience can truly determine the customer's current relationship with the organization. To visualize the results of applying ML in the direction of client onboarding, try to look at the interface of any of the popular social networks. Any smallest change in the start page's design or an application shortcut on your desktop, any change in the algorithm, and innovation in the optional is not just happening and not at the developers' whim. Artificial intelligence studies the patterns of users on the web, and based on the analysis of the behavior of millions of customers, changes and improvements are created.

3. Fraud detection and prevention:

As far as the number of transactions, real clients, and integrations grows, security threats come along. This is when machine learning algorithms come in handy when banks and other institutions require special fraud detection. Banking organizations can use it to monitor a considerable amount of transaction parameters at once for every account in real time. The algorithm examines historical payment data and analyses every cardholder's action. Such models can be highly prominent and prevent some suspicious behavior with a rather big precision. A global payment system Payoneer provides financial services and online money transfers worldwide. Accordingly, the company's customer database is estimated in millions. Since the company is a registered MasterCard provider worldwide, transaction security would fail without ML use cases in banking.

4. Portfolio management :

Portfolio management is an online wealth management service that uses statistical points of the issue as well as automatized algorithms to optimize the performance of client assets. Customers fill in their financial goals, for example, to save some amount of money during a certain period of time. The robot advisor then assigns current assets to investment variants and opportunities. Portfolio management involves creating and overseeing selected investments that align with the investor's long-term financial goals and risk tolerance.

5. Assessment and management of credit risks :

Credit risk is the economic loss that emanates from counterparty's failure to fulfill its contractual obligations or from the increased risk of default during the term of the transaction. The increased complexity of assessing credit risk has opened the door to deep learning in finance. This is evident in the growing credit default swap market where there are many uncertain elements involving determining both the likelihood of an event of credit default and estimating the cost in case a default takes place. The other side of ML implementation in risk management is the term of security. The ML solution compares all the possible data points in current and preceding transactions to detect suspicious transactions with compliance concerns.

6. Customer churn prediction :

Customer churn forecasting is one of the most popular big data use cases in business. It lies in detecting customers who can cancel the regular subscription. The scope of implementation of the methods is enormous — from sales funnels in commercial mailings to tailoring various loyalty programs for customers. Any large telecommunications company or mobile operator can be cited as an example of machine learning's practical application in predicting customer churn. This category includes almost any business that sells subscriptions. Video

streaming giant Netflix had a total net income of over 1.86 billion U.S. dollars in 2019, whilst the company's annual revenue reached 20.15 billion U.S. dollars. The number of Netflix's streaming subscribers worldwide has continued to grow in recent years, reaching 167 million in the fourth quarter of 2019.

7. Asset valuation and management :

Asset management for digital assets or distributed industrial assets are applications where voluminous data about the assets is already being recorded, making them ripe for automation through AI. Asset and wealth management firms are exploring the potential AI solutions for improving their investment decisions and making use of their troves of historical data. In fact, approximately 13.5% of the AI vendors in banking are for wealth and asset management solutions.

8. Stock market forecasting :

Predictions of stock market fluctuations are often underestimated in the trading sector and even considered pseudoscientific. Though, businesses today have an opportunity to make estimated guesses and informed forecasts based on the information we have in the present and the past regarding any stock. An estimated guess from past movements and patterns in stock price is called stock technical analysis, and it is used to predict a stock's price direction. At the same time, the most prominent technique involves the use of artificial neural networks and algorithms.

9. Algorithms and their usage in the stock market and trading :

Financial machine learning helps to solve tasks with the winning trading decisions in the algorithmic trading sphere. A mathematical model monitors the latest updates of the market information and trade results in real time. A special algorithm was created in order to detect patterns that can impact the dynamic of stock prices in their increasing or decreasing course. It can then act proactively to sell, hold, or buy stocks, using factual information related to forecasts. Machine learning algorithms can analyze tons of data sources and market conditions simultaneously. And, understandably, human traders cannot possibly achieve it physically, because of the huge amount of information.

10. Underwriting and credit scoring :

The so-called credit scoring system assesses a person's creditworthiness and credit risks, based on numerical statistical methods. This technology is often used in fast lending for small amounts, when registering consumer express loans in real stores by credit companies, in the business of mobile operators or insurance companies. Scoring is the assignment of points by filling out a certain questionnaire developed by credit risk assessors. Based on the results of the points gained, the system automatically decides to approve or refuse to issue a loan. The data for scoring systems is obtained from the probabilities of loan repayment by individual groups of borrowers, which was received from the analysis of the credit history of thousands of people. It's believed that there is a correlation between certain social characteristics of a particular client, including having children, marital status, the level of education, and the conscientiousness of the borrower.

CHALLENGES WHILE IMPLEMENTING MACHINE LEARNING SOLUTIONS :

While developing machine learning solutions, financial services companies generally encounter some of the common problems as discussed below –

1. **Lack of understanding**

   Financial services companies want to exploit this great opportunity, but owing to unrealistic expectations and lack of clarity on how AI and Machine Learning works (and why they need it), they often fail in this aspect.

2. **High cost of R&D**

   Financial services companies often struggle with data management having fragmented chunks of data stored at different locations such as reporting software, regional data hubs, CRMs, and so on. Getting this data ready for data science projects is both time consuming and an expensive task for companies.

CONCLUSION:

Machine Learning today plays a crucial role in different aspects of the financial ecosystem from managing assets, assessing risks, providing investment advice, dealing with fraud in finance, document authentication and much more. While ML algorithms are dealing with a myriad of tasks, they are constantly learning from the volumes of data, and bridging the gap by bringing the world closer to a completely automated financial system. For most of the financial companies, the need is to start with identifying the right set of use cases with an experienced machine learning services partner, who can develop and implement the right models by focusing on specific data and business domain after thorough understanding of the expected output that is going to be extracted from different sources, transform it, and get the desired results.

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