Study of data science in the managerial decision-making of enterprises

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Abstract. Big data has played an increasingly important role in global manufacturing, circulation, distribution, and consumption activities. The management mode based on data is remolding the management mode of enterprises. In the management control of enterprises, data science has become an important supporting tool for decision-making. It could help managers of enterprises to better understand and hold changes within and outside the environment of the enterprise so as to establish effective management strategies through data to excavate and discover correlations among mass data to predict management forms in the future. Firstly, this paper analyzes the difference between machine learning and deep learning from the technical level. Secondly, taking Zara for example to analyze how Zara takes advantage of data science to obtain competitive edge in the fashion industry. At last. This thesis has discussed advantages of data science in prediction and decision-making in the finance field through the method of literature review.

Keywords: data science; decision-making; Zara; financial field.

1. The key differences between Machine Learning and Deep Learning

Machine learning refers to a model that can provide accurate decisions and predictions by identifying its training data's patterns. Scientists can provide large amounts of data, and feed the machine to achieve the purpose of training it. By using the data, the machine can follow a series of rules which is called algorithm to analyze and draw inferences. One of the functions that Music APP has which can recommend the music that you probably like is one example we're familiar with which apply this model. Each time the user adds a song to their library, the algorithm will learn their preferences and update them to offer more accurate personalized recommendations. This means the more data, the better performance. Deep learning represents a progression from machine learning, which is designed to be modeled after the human brain. It can layer computing units and algorithms into artificial neural networks, much similar to how human brains process information. AlphaGo is the most famous example that applies this model. It can play against numerous iterations of itself thousands of times, learning from its mistakes, becoming so great that can defeat the world champion. Both of them utilize data for learning purposes, but they diverge in their distinct methods of processing and acquiring knowledge from it. The key differences are reflected in the following five aspects:

1.1. Time

Train a deep learning system to make accurate predictions by utilizing data that is extensive, and potentially lasts a few months. At the same time, due to the complexity of the deep learning model, the inference time or the time required for the model to generate the predictions normally is also substantial. In comparison, machine learning systems require less training time and less inference times. Meanwhile, machine learning has a rather simple algorithm structure, while deep learning structure is based on an artificial neural network, which is similar to the intertwined and complex human brain. This results in a lower ability of machine learning to generate results. In a word, machine learning systems can be swiftly established and operational, but the outcomes may exhibit limited efficacy, whereas deep learning systems require more time for setup but can generate instantaneous and powerful results.

1.2. Human Intervention

Machine learning demands greater ongoing human intervention for obtaining results, when it makes mistakes, generally need human to correct them, whereas deep learning entails a more intricate setup process but necessitates minimal intervention thereafter. Through repetition, it can improve the outcomes by itself. Once the programs are in place, no need to rely on humans.

1.3. Approach

In general, machine learning typically relies on structured data and uses traditional algorithms such as linear regression. When dealing with a problem, the system first needs to break it down into several small parts, each part needs to be applied to specific algorithms. while deep learning leverages neural networks and is designed to handle extensive amounts of unstructured data. For solving a problem, a deep learning network can combine the two steps and perform together, generating a more holistic solution.

1.4. Applications

Because of the interpretability of machine learning algorithms, it has already been extensively deployed in various industries, such as email boxes, doctor's offices, and banks. Deep learning can achieve more complex programs, like autonomous industry: self-driving cars or robot operation systems. However, due to their "black box" nature, in some industries in which interpretability is essential, their superior performance will be overshadowed, such as in finance or healthcare.

1.5. Hardware

Deep learning systems need an extensive dataset, much more than machine learning systems to function properly due to the more complex and multi-layer structure. It leads to machine learning algorithms that can generally run on conventional computers, but more powerful hardware is required to run the deep learning algorithms.

Take the Tesla company as an example to further discuss the difference between these two learning systems. When company Tesla uses a machine learning algorithm for its cars to recognize STOP signs, the software engineer needs to select the relevant features and tell them to the machine, then it can distinguish different signs. But if Tesla applies a deep learning algorithm, the artificial neural network can identify the relevant properties of these STOP signs, like detecting different edges, and differentiating different colors, and its learning outcome can make it gain the ability to recognize these signs.

2. How Zara uses data science to gain a competitive niche in the fashion industry

Zara is a mammoth fashion retailer and a famous fast fashion brand. Unlike the traditional fashion industry, which operates on a seasonal or bi-annual basis, fast fashion brands' value is to bring the trendiest trends and the latest designs into the market, ideally, as soon as they gain popularity on the catwalk. Here are the main ways in which Zara uses data science to enhance its operations and gain its niche:

2.1. Zara uses data science to analyze consumer demands and preferences

Zara uses customer preferences to determine the fabrics and styles of their design. They collect data on what their customers browse, search for, and buy from the website and also analyze the returned goods to understand the reason why customers don't like them. Through this method, Zara possesses the capability to design and source clothing that will strongly resonate with customers. Meanwhile, Zara analyses the data of sales in real-time. They will order more of one product or design

relevant products when they find one item is quickly sold out. At the same time, pull or give a discount for one item if the sale is lagging. It helps to make room and increase the sales.

2.2. Zara uses data science to manage their inventory

With the help of an RFID microchip tagged on every item, Zara can easily track the goods until they are sold to customers. This kind of precise data analysis helps Zara to determine the optimal production quantities and distribution of each product to meet customer demand accurately at each store and more importantly, at the right time. The implementation of RFID also expedites the inventory management process significantly, resulting in an impressive 80% reduction (Uberoi, 2017) in the time required for stock replenishment and location identification. What's more, since the overproduced goods usually need to be sold at a discount, making the profit decrease, this technology contributes to minimizing excess stock to a certain extent, reducing inventory waste and ensuring profitability.

2.3. Zara uses data science to minimize returns and accelerate response to trends

According to the survey, because concerning fit, 35% of German online customers aborted potential purchases (Thomasson, 2013). By applying data science, and analyzing past return data, Zara can provide personalized size recommendations for each customer, which helps them make more informed choices when purchasing, at the same time minimizing the occurrence of returns attributed to sizing discrepancies. On the other hand, data science empowers Zara to identify trends effectively so they can know what type of elements need to be applied to their design. Then they can quickly respond to it, and finish all the processes related to design, manufacture, and distribution within two to three weeks. This rapid response also contributes to ensuring their customers remain continuously interested in their products.

3. How data science could be applied in the financial field

Several positive advantages can be considered for using data science for predictions and decisions in the financial field, some of which will be addressed in the following parts. I reviewed some previous studies and added my ideas about their applications highlighted in blue font.

3.1. More accurate credit risk evaluation

Uusing probabilistic studies and soft computing, we can include financial statements, the history of credit, and market trends (Hassani et al., 2020 a, b). These data can help us predict credit limits accurately, decreasing potential losses and improving lending decisions.

3.2. More efficient management of inventory

Data science approaches such as inventory optimization and demand forecasting can be employed to assess market trends, sale history, and external parameters (Bala et al., 2012; Namir et al., 2022). The stock levels, therefore, can be optimized, decreasing costs and providing a more efficient supply chain.

3.3. Well-optimized pricing strategies

The market data, including customer behavior and competitors' prices, can be analyzed to improve pricing strategies. Databases can include customer segmentation, demand elasticity, and market dynamics (Chan et al., 2011). Data science methods can improve customer satisfaction, revenue, and profit.

3.4. Preventing and detecting fraudulent data

Unuspected trends in transactions can be evaluated by machine soft computing methods, such as deep learning (Roy et al., 2018) and machine learning (Jaculine Priya & Saradha, 2021), to check

fraudulent data. I believe these methods can decrease financial losses and protect the assets, maintaining the operation integrity.

Therefore, utilizing data science methods in finance is helpful for businesses to make accurate decisions, optimize their operations, and improve overall performance. Data analyses can be more efficient for predicting cash flows, credit risk, and inventory.

4. Conclusion

To sum up, data, as a new factor of production, has gradually affected all aspects of business development. In data science, traditional management decision-making activities have also undergone profound changes. Taking the business decision-making practice of Zara Company as an example, this study analyzes the application of data science in management decision-making. It discusses the advantages of data science in financial field. In the future, how to manage data resources and tap the management decision-making value contained in data will be the direction of enterprise transformation and upgrading.

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