SELECTING BUSINESS UNITS ON THE BASIS OF TIME TAKEN AND COST OF TRANSPORT USING DECISION TREE CLASSIFIER

Dr. M. RAJESWARI,
Assistant Professor, Department Of B. Com Business Analytics,
PSGR Krishnammal College for Women, Coimbatore, India.
rajeshwarim@psgrkc.ac.in

RATHIPRABHA.K
UG Scholar, Department Of B.Com Business Analytics
PSGR Krishnammal College for Women, Coimbatore, India.
rathikarthi234@gmail.com

ABSTRACT

This study has been undertaken to select the business units for shipping the products according to the time taken and cost of transport using clustering. The cost of transport and time taken is calculated by finding which business unit has highest level of demand. Here, the initial finding is which business unit has highest demand. With the help of the finding, the business unit which has low cost of transport and also the less time for the products to be shipped can be calculated.

Key words – demand, stock level, cost, time, supply, inventory.

I. INTRODUCTION

Inventory optimization is none other than having the right inventory to meet target service levels while having a minimum amount of capital in inventory. To achieve this, one need to account for both supply and demand volatility. It is aimed at reducing inventory costs in the supply chain. Determine the level of inventory to be maintained based on demand, lead time and previous stock levels. To prepare load planning for the inventory based on the demands for various business units using kmeans and decision tree algorithms. Python Jupyter Notebook is used for the study. KMeans Algorithm and Decision tree Classifier Algorithm are used for analysis.

II. OBJECETIVE

The objective is to select the business units on the basis of cost of transport and time taken for shipping of goods from warehouse. The attributes such as Product Order Quantity and Business Unit ID are used to identify the high demand business unit. K – Means clustering has been used to find the result. After this process, the attributes such as Cost of Transport and Time taken are used to find the business unit which has low cost of transport and also less time for shipping of goods from the warehouse.

III. RELATED WORKS

Logistics is an integral part of our everyday life. “Logistics” was originally use as a military term which defined as “a branch of military science having to do with producing, maintaining and transporting material, personnel and facilities.” in Oxford English Dictionary. However, with the times goes by, in the modern days, it is used in a business term [9]. Logistics and supply chain management are now firmly established as critical business concerns [10]. Today it influences more than ever a large number of human and economic activities. The term logistics, which comes from the French word "logis" meaning dwelling, originally designated the art of organizing the transportation. Resupplying, and housing of the troops of an army (that of Napoleon) [3].

Increasingly, supply chain management is being recognized as the management of key business processes across the network of organizations that comprise the supply chain [6]. According to the popularities of supply chain and ecommerce, the LSPs recognize importance of the information technology (IT) in their business as real time monitoring tools. The customer’s satisfaction must be more important than before and critical in leading competitiveness of companies through the IT [7]. We researched the relevant literature on the maritime shipping industry in order to find out what factors are generally accepted as main 6 drivers of variability in cargo transit time, how to handle to get a better view on the Machine Learning methods [4].

In everyday life, millions of transport units are monitored and managed worldwide with limited or even a lack of control and knowledge of their status in the real-time environment [5]. Mentzer et al. (2001) define SCM as “the systemic, strategic coordination of the traditional

business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole" [2].

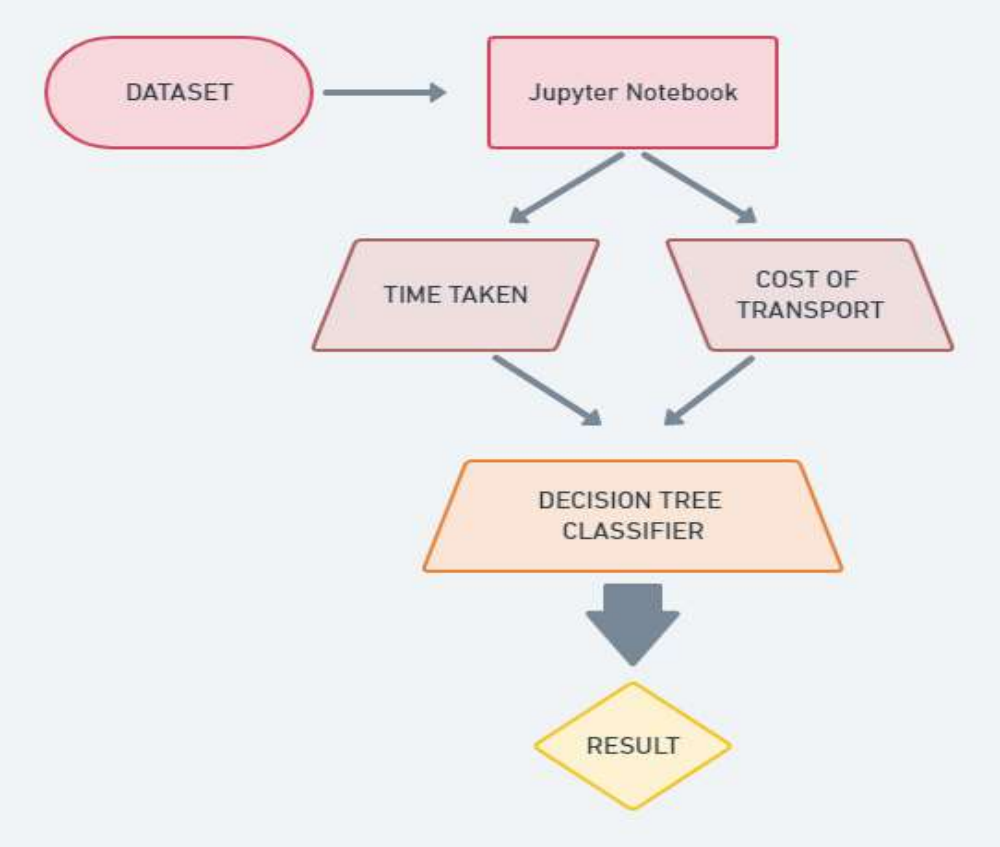
Sales order processing is accomplished in each business by its distribution channel consisting of distributors, wholesalers, retailers and customers. It acts as a powerful tool for increasing productivity and enhancing customer service [1].

For many researchers, Python is a first-class tool mainly because of its libraries for storing, manipulating, and gaining insight from data. Several resources exist for individual pieces of this data science stack, but only with the Python Data Science Handbook do you get them all—I Python, NumPy, Pandas, Matplotlib, Scikit-Learn, and other related tools [8].

IV. METHODOLOGY

A. WORK FLOW

The programming language used in the project is python. Python is an integrated high-level object-oriented programming language. It enables code readability with its significant use of whitespaces. The next part of the flow diagram is the objectives used for evaluation. The project is done using K- Means clustering algorithm and Decision tree classifier. K- Means clustering groups similar kinds of items in form of clusters. It finds the similarity and groups them into the clusters. K- Means clustering is a method which originally aims from signal processing, that aims to partition observations into clusters in which each observation belongs to the mean serving as a prototype of the cluster. A Decision tree classifier is a flowchart diagram with the terminal nodes representing classification outputs/decisions. The decision tree classifier has a classification style by building a decision tree. Each node in the tree has a test on an attribute, each branch descending from that node corresponds to the values for that attribute.



B. IMPLEMENTATION

- The k-means is used to perform clustering on the basis of lead times and demand quantity.
- Decision tree is used to identify the inspected product results and also to identify the business unit on the basis of cost, time and demand quantity.

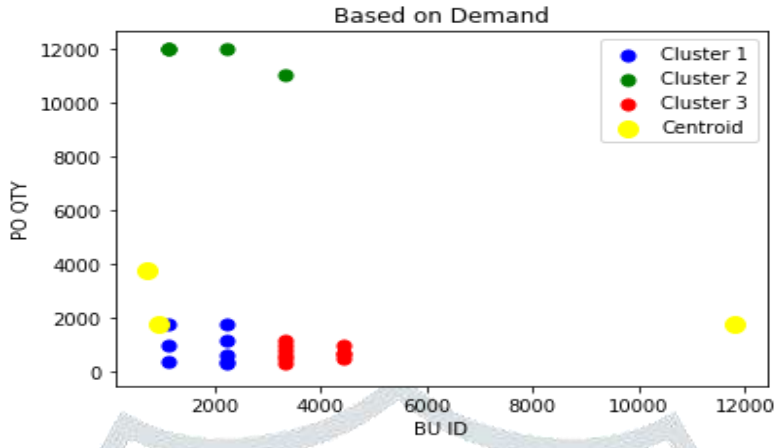


Fig 3.1

Fig 3.1 explains the business unit which has the highest demand for the products to be shipped

EXPLANATION

Import pandas. From sklearn import KMeans clustering and import packages such as matplot library for plotting and viewing the result as image format. The attributes such as Product Order Quantity and Business Unit ID are used to identify the high demand business unit. K – Means clustering has been used to find the result. After this process, import decision tree classifier from sklearn and import the required packages. Here, the attributes such as Cost of Transport and Time taken are used to find the business unit which has low cost of transport and also less time for shipping of goods from the warehouse.

V. RESULT

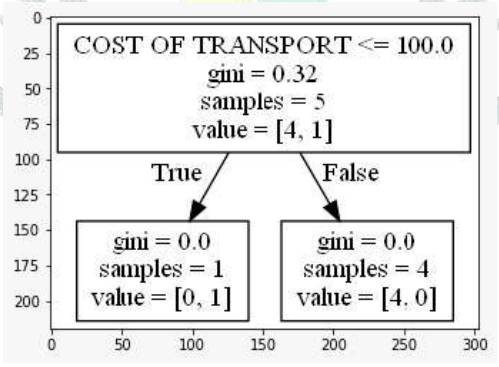


Fig 4.1 predicted value for Cost of transport

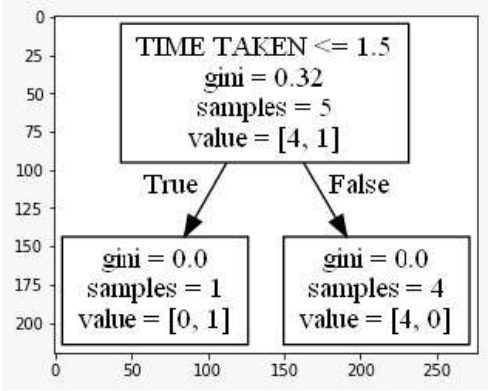


Fig 4.2 Predicted value for Time Taken

According to Fig 4.1, the cost of transport is less than 100 for only one business unit and the cost of transport is more than100 for four business units. According to Fig 4.2, the time taken for the supply of goods is less than 1.5 is for only one business unit and more than 1.5 is for four business units. Here, the conclusion is that the above figures explains about the business units which have lower cost and less time for the supply of goods from the warehouse.

VI. CONCLUSION AND FURTHER WORK

The result of this study helps in inventory optimization and load planning with reduction in cost, time and manpower. KMeans Algorithm and Decision Tree Classifier are used to perform clustering and prediction. The final output are stock levels (overstocked, understocked), reorder period, inspection result, clustering of demand, business unit to which product is to be loaded.

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