

Problem statement:

Optimized Warehouse Management of Perishable Goods for a Food Delivery Company

Description:

A food delivery service has to deal with a lot of perishable raw materials which makes it all, the most important factor for such a company is to accurately forecast daily and weekly demand. Too much inventory in the warehouse means more risk of wastage, and not enough could lead to out-of-stocks - and push customers to seek solutions from your competitors. The replenishment of majority of raw materials is done on weekly basis and since the raw material is perishable, the procurement planning is of utmost importance.

Solution :

Most businesses are beset by numerous challenges today such as shorter customer tolerance times, high-quality expectations, short product life cycles, uncertain demand and supply, high costs. What can help them succeed amidst these challenges is to execute ***demand forecasting***, which can help business from procurement and inventory and warehouse management to distribution management. Making accurate forecasts has always been a pain point for businesses. But with ***artificial intelligence (AI) and machine learning (ML)***, they can make specific predictions.

When ML is applied to demand forecasting, it not only analyzes statistical input, such as historical sales order data, but also considers internal and external causal factors that affect demand. Figuring out what data are needed for a specific product or feature is the first and most important step in scoping data requirements.

Some of the important data we are working to build an effective Machine Learning model are as follows:

i) ML can predict future ***weather patterns*** at the local level and identify how it connects to local demand patterns. ML can also determine if a lag exists between the weather changes and the demand of products on a real-time basis.

Weather has the biggest influence on consumer behavior. It affects consumers' emotional state, drives their purchase decisions, and dictates how much they are willing to spend.

Weekly increase in sales when
temperature is 1° F hotter

- 2% soft drinks



Weekly increase in sales when
temperature is 1° F colder

- 2% Soup



The data analytics and machine learning algorithms, such as random forest classification, are used to predict weather conditions. However, the trained ML model works on a physics free approach for the forecasting process. Google's new machine learning research for weather forecasting would enable speedy local weather predictions using satellite images, with no time lag.

ii) Companies can use ML and big data to examine tweets and posts on websites and social media to understand customer sentiments about their products.

Social media monitoring is one of the more traditional tools for businesses looking to manage their social media accounts. Some platforms like Twitter and Instagram have built-in analytics tools that can measure the success of past posts, including number of likes, comments, clicks on a link, or views for a video. Third-party tools like *Iconosquare* (*for Instagram and Facebook) can also provide similar social media insight and management services. These tools can also tell businesses a lot about their audiences, including demographic information and the peak times when their followers are most active on the platform.

Sentiment Analysis for Social Media Marketing:

Sentiment analysis, also called opinion mining or emotion AI, is judging the opinion of a text. The process uses both natural language processing (NLP) and machine learning to pair social media data with predefined labels such as positive, negative, or neutral. Then, the machine can develop agents that learn to understand the sentiments underlying new messages.

Businesses can apply sentiment analysis in social media and customer support to collect feedback on a new product or design. Similarly, businesses can apply

sentiment analysis to discover how people feel about their competitors or trending industry topics.

Tech behind: In order to download tweets a web scraper is written in python programming language. At the first step a web search query will be made by a python library called selenium. In the second step the HTML contents will be stored to driver's page source of a web browser. In the third step a python library called BeautifulSoup is used to organize and extract the required data from the HTML source. At the last step the tweets will be saved as a comma separated version (CSV) file and then stored in a MySQL database to ease the data management.

Similarly, **Image recognition** uses machine learning to train computers to recognize a brand logo or photos of their products, without any accompanying text. This can be useful for businesses when their customers upload photos of a product without directly mentioning the brand or product name in a text. These social monitoring ML models can help the companies to predict the future demand.

Novelty:

While traditional demand forecasting methods using statistical records of sales largely ignore external factors, ML goes beyond a firm's immediate context when analyzing demand. When ML is applied to demand forecasting, it not only analyzes statistical input, such as historical sales order data, but also considers internal and external causal factors that affect demand. This improves forecast accuracy.

Technology used:

Python 2 or 3, IBM Watson Studio, IBM Cloud for Deployment, Tensor flow framework.

Business Impact:

Unlike traditional statistical forecasting techniques, the above mentioned ML models can make predictions over and above random demand patterns. It also ensures that sales opportunities aren't lost due to stockouts, reduces premium freight costs, and improves perfect order fulfillment and cash-to-cash cycle time.