DemandEst - AI Powered Food Demand Forecaster

Abstract

Forecasting is crucial to supply chain management because of the increased amount of corporate competition, and a company's survival is frequently reliant on how well its projections are made. Demand projections are more important than all other strategic and planning choices in any retail firm since they have a direct impact on the profitability and market share of the enterprise. To assist analysts in predicting demand, a number of methodologies are available. Although these methods differ greatly from one another, they have the following traits:

- They often presume that the factors that have influenced demand in the past will continue to do so,
- forecast accuracy declines as the forecasting horizon lengthens,
- and aggregated forecasts for product groupings are more accurate than predictions for individual products.

Such forecasts of demand quantify the impacts of pricing and overall spending on the demand for food. This information helps stakeholders understand the trend and manage the inventory accordingly. The main aim of this project is to create an appropriate machine learning model to forecast the number of orders to gather raw materials for the next ten weeks.

Literature Survey

S.No	Author	Abstract
1.	Claudimar Pereira Da Veiga, Cássia Rita Pereira Da Veiga.	This article aims to compare the performances of **ARIMA** and Holt-Winters models for the prediction of a time series formed by a group of perishable dairy products. This paper concluded that the HW model performs better than ARIMA.
2.	Elcio Tarallo, Getúlio K. Akabane, Camilo I. Shimabukuro.	This paper uses a **Support Vector Machine** to improve the sales management effectiveness of computing products that are highly replaceable and subject to dramatic changes in demand. It confirms the benefits of Machine Learning for technology businesses with short life cycle products, by improving a computer retailer's sales forecasting accuracy and inventory management.
3.	N. de P. Barbosa, E.da S.Christo, and K. A. Costa.	This paper works with methods to forecast the demand for products of a food industry, which directs its sales to the food service market, in order to base the short to medium term production planning. It uses **Exponential Smoothing**. The forecasts are evaluated using the error measure MAPE and compared to the demand currently considered.
4.	Takashi Tanizakia,Tomohiro Hoshinoa ,Takeshi Shimmurab ,Takeshi Takenaka.	In this paper, demand forecasting in restaurants using machine learning is proposed. Demand forecasting methods using internal data such as POS data and external data. **Bayesian Linear Regression, Boosted Decision Tree Regression, Decision Forest Regression and Stepwise method** as the demand forecasting method.
5.	Jakob Huber a, Alexander Gossmann, Heiner Stuckenschmidt	This paper proposes a DSS(Decision Support System) that supports day-to-operations by providing hierarchical forecasts at different organizational levels based on most recent point-of-sales data. It identifies article clusters that are used to extend the hierarchy based on intra-day sales patterns. It uses **multivariate ARIMA models** to forecast the daily demand to support operational decisions.

6.	Ishtiyaq Otudi , Abdulaziz Almaktoom.	This paper shows how demand forecasting affects inventory replenishment decisions by the retailers, and production decisions by the supplier under different forecasting methods. There are multiple models such as **Naïve Approach, moving averages, weighted moving averages and exponential smoothing**. Analyses of the simulation output indicate that the selection of the forecasting model influences the performance and demand patterns faced by retailers.
7.	Emily J. Fliesa, , Barry W. Brooka, Linus Blomqvist.	This paper shows a systematic review of the food demand literature—including a meta-analysis of papers reporting average global food demand predictions—and test the effect of model complexity on predictions. Indeed, time-series and **simple income-based models** often make similar predictions to integrated assessments, despite having different underlying assumptions and mechanisms.
8.	Güzin Tirkeş, Cenk Güray, Neş'e Çelebi	This article aims to compare the performances between **Trend Analysis, Decomposition and Holt-Winters** (HW) models for the prediction of a time series formed by a group of jam and sherbet product demands. The HW and Decomposition models obtained better results with respect to performance metrics based on this paper.
9.	Juliana C. Silva1, Manuel C. Figueiredo2, Ana C. Braga	This paper is based on a research project aiming the development of demand forecasting models for a company that operates in the food business, more specifically in the delicatessen segment. It uses a combination of **Exponential Smoothing Models and ARIMA(Auto-regressive Integrated Moving Average)**.
10.	Jakob Huber , Heiner Stuckenschmidt	This article shows the possibility of formulating a classification instead of a regression problem. An empirical comparison with established approaches reveals the superiority of machine learning methods, while classification based approaches outperform **regression-based approaches**. The classification approach is a suitable method for density forecasts.