Food Demand Forecasting for Food Delivery Company Using IBM Cloud

Submitted in complete fulfillment

of the requirement

by

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1 Introduction

1.1 Overview

A food delivery service operates in a dynamic and challenging environment where efficient management of perishable raw materials is crucial for success. With the constant flow of ingredients and supplies, accurately forecasting daily and weekly demand becomes the most critical factor for such a company. Maintaining an optimal inventory level is a delicate balance. On one hand, too much inventory sitting in the warehouse increases the risk of wastage, leading to financial losses and environmental concerns. On the other hand, inadequate inventory levels can result in out-of-stock situations, disappointing customers, and potentially driving them towards competitors. Given that the majority of raw material replenishment occurs on a weekly basis, procurement planning takes center stage in ensuring the availability of fresh ingredients for the business. The perishable nature of these raw materials amplifies the significance of accurate demand prediction, as it directly impacts the company's ability to meet customer needs and maintain a competitive edge. Therefore, employing effective forecasting models and methodologies becomes paramount for predicting the demand for the next 10 weeks, enabling the food delivery service to optimize procurement decisions and cater to customer expectations efficiently.

1.2 Purpose

The main goal of this project is to develop a suitable machine learning model that can accurately predict the number of raw material procurement orders over the next 10 weeks. To achieve this goal, it is important to collect relevant information about distribution centers, including regions, cities, and other relevant factors. In addition, detailed food information such as food category, subcategory, price, and specific discounts offered during a particular week are important inputs to the predictive model. By leveraging this comprehensive dataset, various classification algorithms can be used to predict the amount of raw materials required per week. The project also includes developing a user-friendly web application that seamlessly integrates with the trained predictive model. This web application serves as an actionable decision-making tool for food delivery services to optimize procurement plans and ensure ingredients are available in a timely and efficient manner.

2. Literature Survey

2.1 Existing problem

Existing problem in the existing system, resources that are needed on a weekly basis are replenished regularly. However, since these resources are perishable, it is crucial to have effective supply planning in order to avoid shortages or wastage. Another important aspect is center staffing, where accurate forecasting of staffing needs can greatly assist in efficient management. Currently, these forecasts are generated through a manual process, which may be time-consuming and prone to errors.

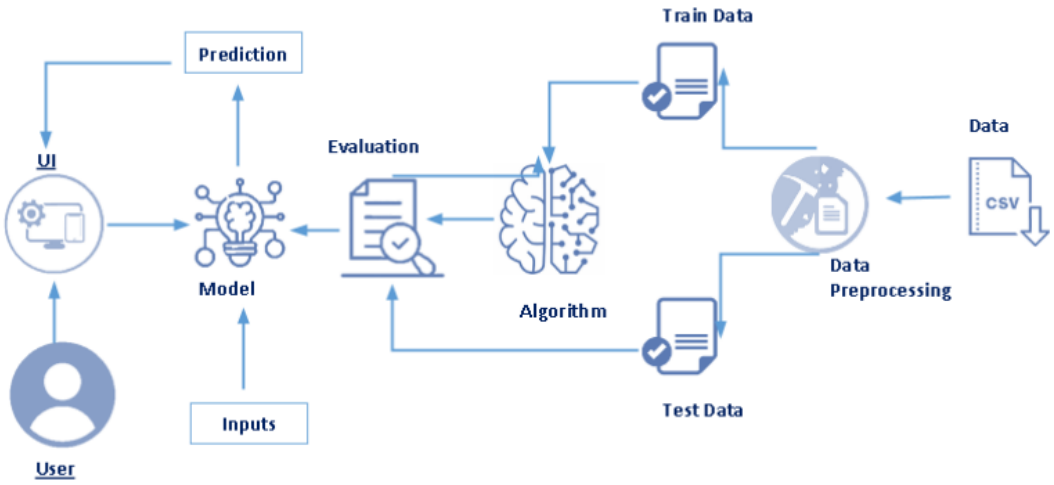
2.2 Proposed solution

To address the aforementioned challenges, a proposed solution involves the utilization of a machine learning model to predict the demand for the next 10 weeks (Weeks: 146-155) for different center-meal combinations. By leveraging machine learning techniques, the aim is to develop a predictive model that can automate the forecasting process and provide accurate predictions.

The proposed solution would involve collecting historical data on center-meal combinations, including factors such as resource usage, perishability, staffing levels, and any other relevant variables. This data would serve as the training dataset for the machine learning model. The model would then learn patterns and relationships from the historical data to make predictions about future demand.

3. Theoretical Analysis

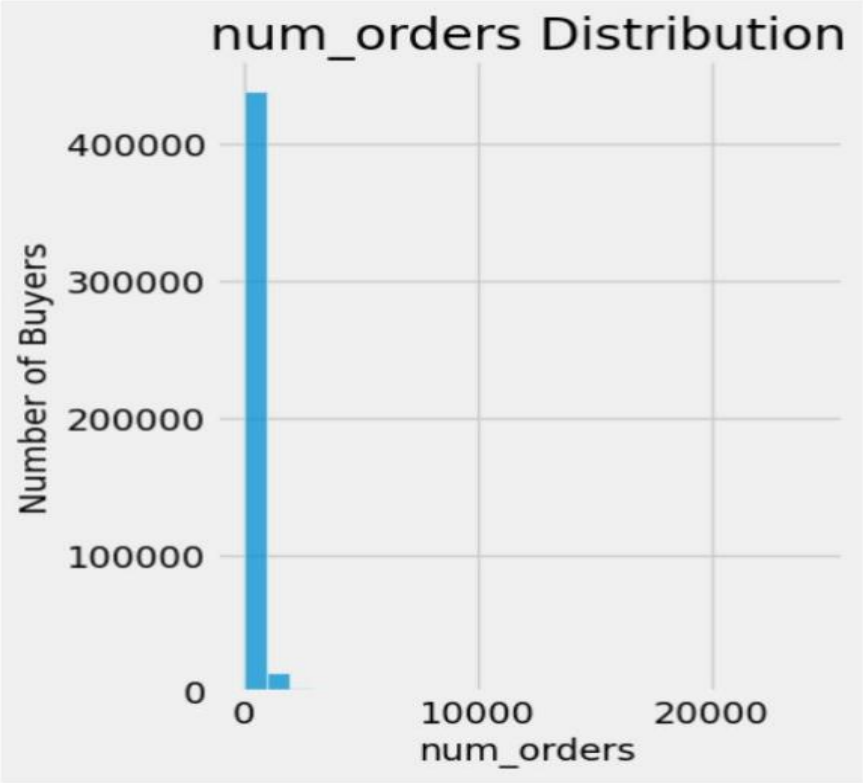
3.1 Block Diagram



3.2 Hardware/Software Designing

- Anaconda
- Jupyter Notebook
- Spyder IDE
- Pandas
- Numpy
- Matplotlib
- Seaborn
- Sklearn/scikit-learn
- Flask

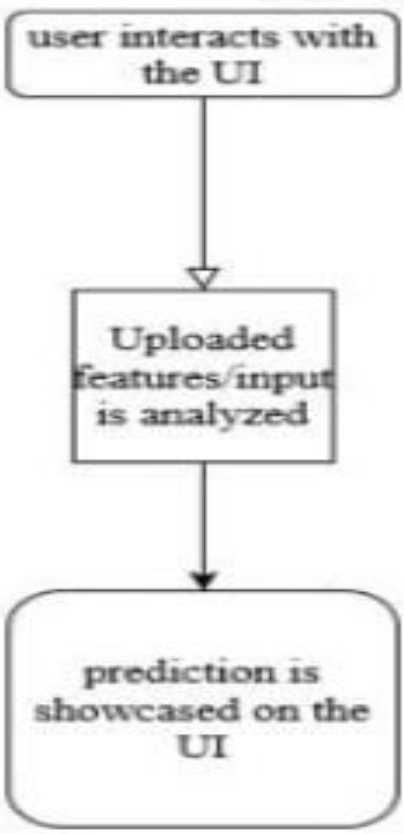
4. Experimental Investigations



5. Flowchart

Project work Flow:

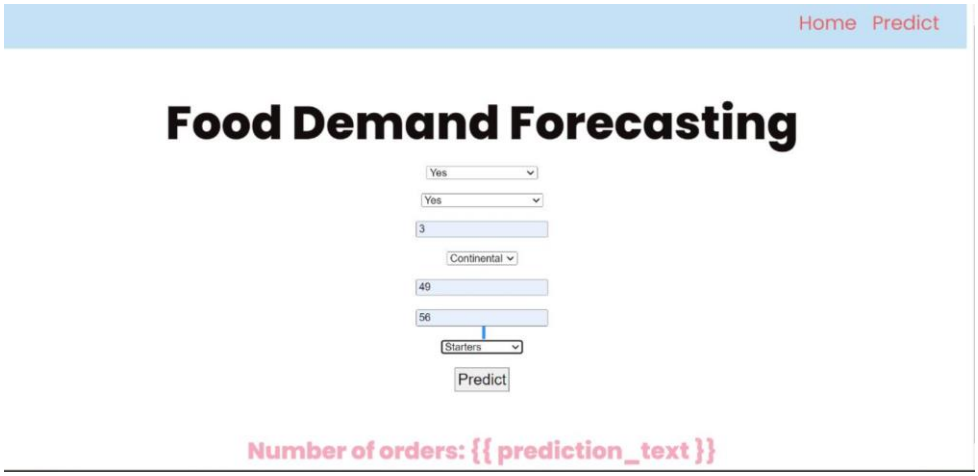
- The user interacts with the UI (User Interface) to upload the input features.
- Uploaded features/input is analyzed by the model which is integrated.



6. Result

Home page

Upload page:



Prediction:

7. Advantages and Disadvantages

Advantages:

- Seamless integration with multiple data sources for comprehensive forecasting.
- Real-time insights for agile decision-making.
- Collaborative features for effective teamwork and model refinement.
- Enhanced customer satisfaction through efficient procurement planning.

Disadvantages:

- Requires maintaining dataset and regular update and testing.

8. Applications

In the context of a meal delivery company, accurate demand forecasting is crucial for optimizing operations and ensuring efficient resource allocation. By applying machine learning techniques, such as demand forecasting models, the company can achieve the following benefits:

Inventory management: Accurate demand forecasting enables the meal delivery company to optimize its inventory levels. By predicting the demand for different meals and center combinations, the company can ensure

they have the right amount of ingredients and resources on hand to fulfill customer orders. This helps minimize waste and reduce costs associated with overstocking or stockouts.

Supply chain optimization: With demand forecasting, the company can plan its supply chain operations more effectively. By predicting future demand, they can work with suppliers to ensure a steady and timely supply of ingredients, reducing the risk of shortages or delays in production. This enables smoother operations and better customer satisfaction.

9. Conclusion

In this project, we successfully implemented food demand forecasting for a food delivery company using IBM Cloud. By leveraging machine learning techniques and historical data on center-meal combinations, we developed a predictive model that can accurately forecast demand for the upcoming weeks. This allows the company to optimize inventory management, streamline supply chain operations, efficiently plan staffing, optimize delivery routes, and enhance the overall customer experience. By automating the forecasting process and leveraging data-driven

insights, the company can make informed decisions and improve operational efficiency.

10. Future Scope

While the current implementation has provided valuable insights and improved forecasting accuracy, there are several areas for future improvement. One potential area is to enhance the user interface (UI) and user experience (UX) of the forecasting system. By creating a more intuitive and user-friendly interface, the company can enable easier interaction with the forecasting tool and enhance user satisfaction.

11. Bibliography

- https://smartinternz.com/ibm-build-a-thon-2021
- https://www.kaggle.com/kannanaikkal/food-demand-forecasting?select=fulfilment_center_info.csv

Appendix

A. Source Code

https://colab.research.google.com/drive/1NftOm9rEnUE8yRnrBql4edoPIafA4WUg?usp=sharing