

Project Report

Food Demand Forecasting for Food Delivery Company using IBM Cloud



Table of contents

1 INTRODUCTION.....	2
1.1 Overview.....	2
1.2 Purpose.....	3
2 LITERATURE SURVEY.....	3
2.1 Existing problem.....	3
2.2 Proposed solution.....	3
3 THEORITICAL ANALYSIS.....	3
3.1 Block diagram.....	3
3.2 Hardware / Software designing.....	4
4 EXPERIMENTAL INVESTIGATIONS.....	4
5 FLOWCHART.....	5
6 RESULT.....	6
7 ADVANTAGES & DISADVANTAGES.....	6
8 APPLICATIONS.....	7
9 CONCLUSION.....	7
10 FUTURE SCOPE.....	7
11 BIBILOGRAPHY.....	7
APPENDIX.....	7
A. Source Code	

1. INTRODUCTION

1.1 Overview

Demand forecasting is an essential method for a business to function properly. It reduces the cost, effort and improves the operations of the business. Here, a food delivery service has to deal with a lot of perishable raw materials which makes it all the more important factor for such a company 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 project is about predicting accurately the number of orders a food delivery company can order using machine learning models and its

past data. A web application is also built to show the demand forecasting.

1.2 Purpose

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 next ten weeks. To achieve this, we should know the information about of fulfillment center like area, city etc., and meal information like category of food sub category of food price of the food or discount in particular week. By using this data, we can use any classification algorithm to forecast the quantity for 10 weeks. A web application is built which is integrated with the model built.

2. LITERATURE SURVEY

2.1 Existing problem

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. Secondly, staffing of the centers is also one area wherein accurate demand forecasts are really helpful. Given the information, the task is to predict the demand for the next 10 weeks for the center-meal combinations so that they stock the necessary materials accordingly.

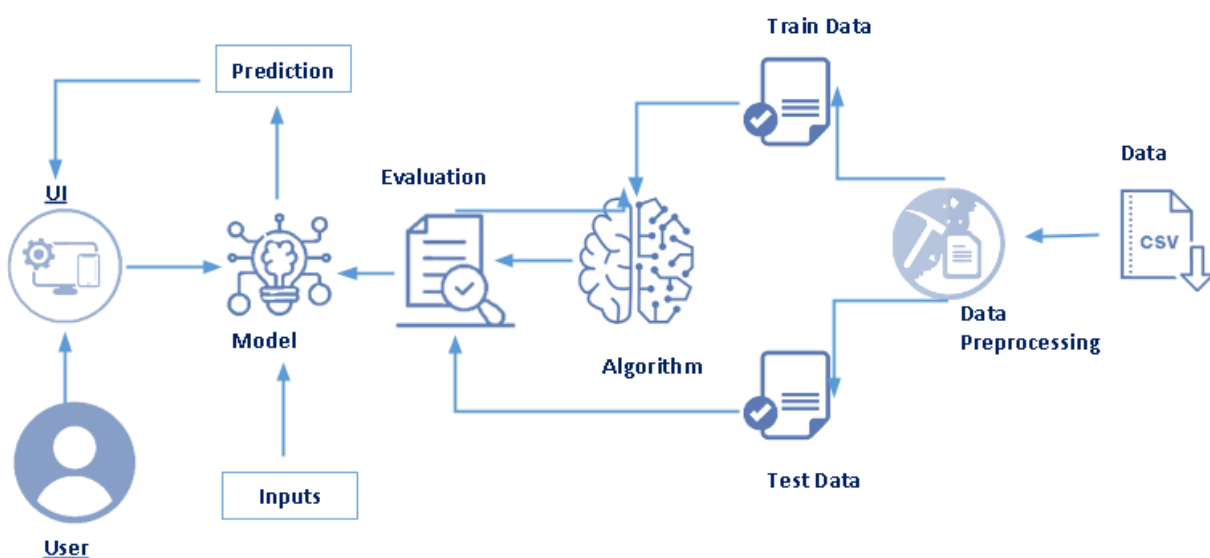
2.2 Proposed solution

The solution is to collect the data and do Data preprocessing. Use Python libraries for data analysis. Put a appropriate machine learning model which gives least root mean square error. This model will predict the demand forecasting.

3. THEORITICAL ANALYSIS

3.1 Block diagram

Diagrammatic overview of the project.



3.2 Hardware / Software designing

Hardware and software requirements of the project

- Anaconda Navigator
- Jupyter notebook

In Python, libraries required are

- pandas
- numpy
- scikit learn
- matplotlib
- seaborn
- xgboost
- lightgbm
- catboost
- Flask

4. EXPERIMENTAL INVESTIGATIONS

The dataset contains four csv datasets. They are test data, train data, fulfilment_center_info, meal_info.

train.csv is as follows:

Variable	Definition
id	Unique ID
week	Week No
center_id	Unique ID for fulfillment center
meal_id	Unique ID for Meal
checkout_price	Final price including discount, taxes & delivery charges
base_price	Base price of the meal
emailer_for_promotion	Emailer sent for promotion of meal
homepage_featured	Meal featured at homepage
num_orders	(Target) Orders Count

fulfillment_center_info which contains information regarding fulfillment center in different regions is as follows:

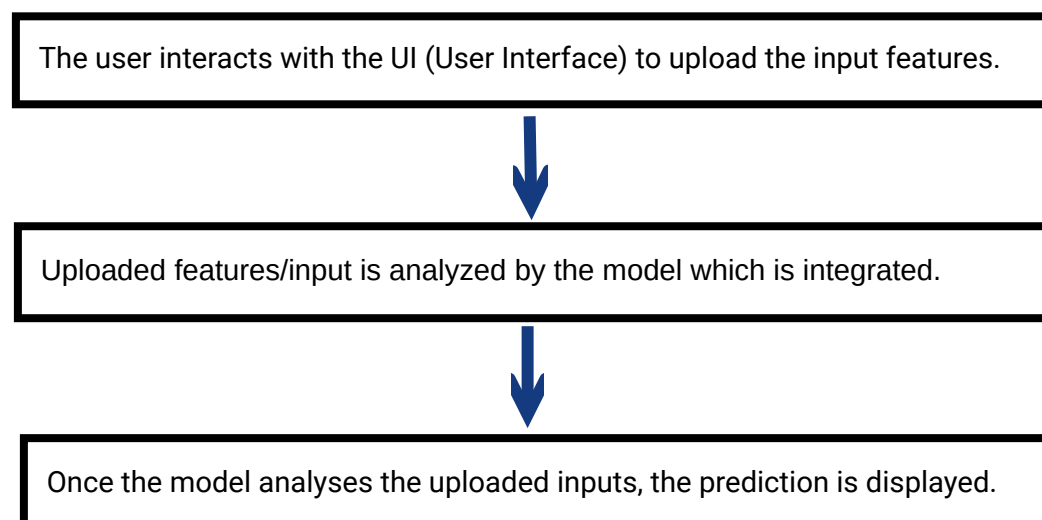
Variable	Definition
center_id	Unique ID for fulfillment center
city_code	Unique code for city
region_code	Unique code for region
center_type	Anonymized center type
op_area	Area of operation (in km ²)

meal_info which contains information regarding meals served is as follows:

Variable	Definition
meal_id	Unique ID for the meal
category	Type of meal (beverages/snacks/soups....)
cuisine	Meal cuisine (Indian/Italian/...)

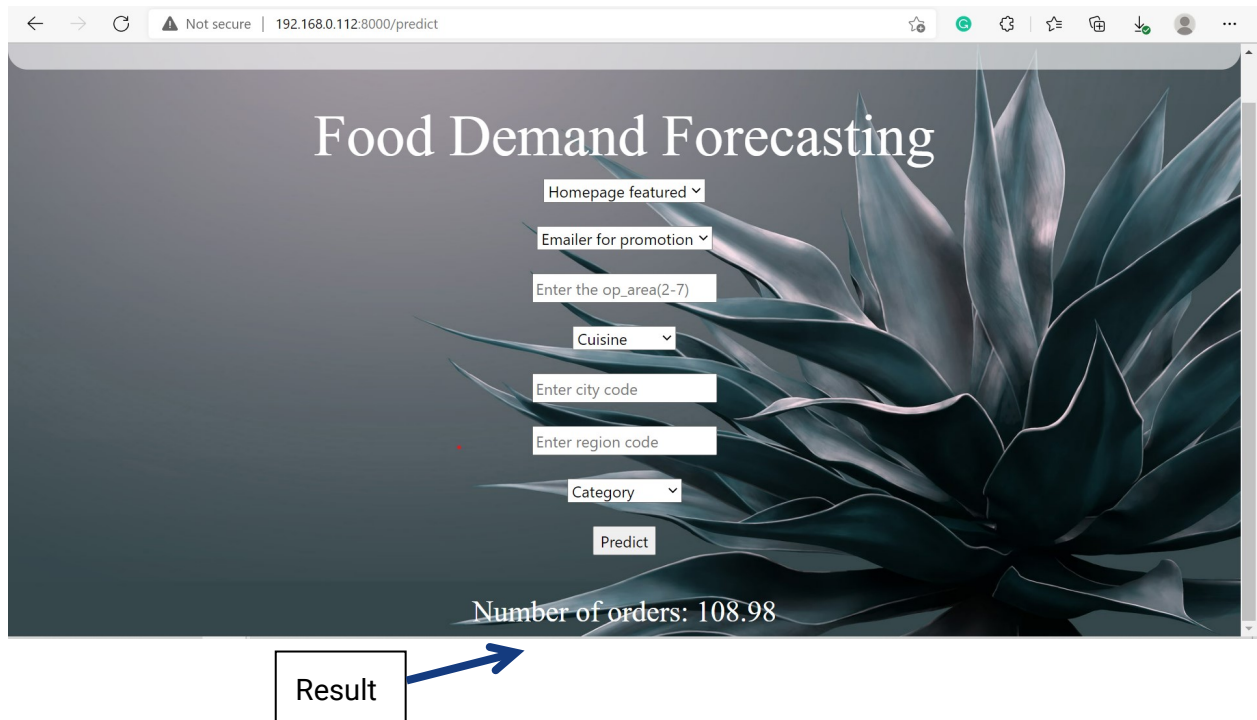
5. FLOWCHART

Diagram showing the control flow of the solution



6 RESULT

A sample result is shown after giving inputs in the predict page.



The screenshot shows a web browser window with the URL `192.168.0.112:8000/predict`. The page title is "Food Demand Forecasting". The form contains the following fields and controls:

- Homepage featured ☐
- Emailer for promotion ☐
- Enter the op_area(2-7)
- Cuisine
- Enter city code
- Enter region code
- Category
- Predict

The result displayed at the bottom of the form is "Number of orders: 108.98". A blue arrow points from a box labeled "Result" to this text.

7. ADVANTAGES & DISADVANTAGES

Advantages

It helps accurately predict the number of orders so that company can reduce wastage due to overstocking and avoid losing customers to competitors due to low stocking. It improves supply chain efficiency, labor-management and budget management. The solution is easy to use and deploy.

Disadvantages

The model has many assumptions, as described in the following. The solution may fail to predict if there is a severe weather impact. If consumer behavior changes drastically, the prediction can be wrong.

8. APPLICATIONS

It can be used to know the demand trends of food ordered based on seasons like festive, weekends, etc. This solution can be used by Suppliers, restaurants, food delivery companies, food shops, etc.

9. CONCLUSION

The project predicts the number of orders required by a food delivery company in order to minimize their cost and efforts.

The dataset showed a trend of food cuisines demand depending on regions and time. The past data was used, and a machine learning model which gave the least root mean square error was used to predict the demand. Flask framework was used to create a web application where a user can provide inputs related to food demand and know the demand forecast.

10. FUTURE SCOPE

There can be an option that enables users to choose the model where they can apply and get the prediction.

The project can be used for different companies depending on the region they are located and the different types of items they offer on their menu.

11. BIBLIOGRAPHY

References of previous works or websites visited/books referred for analysis about the project, previous solution findings, etc.

[Project Build-A-Thon \(smartinternz.com\)](https://smartinternz.com/)

[Food Demand Forecasting | Kaggle](https://www.kaggle.com/datasets/ucmls/food-demand-forecasting)

APPENDIX

A. Source Code

[SBSPS-Challenge-5918-Food-Demand-Forecasting-for-Food-Delivery-Company-using-IBM-Cloud/Food_demand_IBM.ipynb at main · smartinternz02/SBSPS-Challenge-5918-Food-Demand-Forecasting-for-Food-Delivery-Company-using-IBM-Cloud \(github.com\)](https://github.com/smartinternz02/SBSPS-Challenge-5918-Food-Demand-Forecasting-for-Food-Delivery-Company-using-IBM-Cloud/blob/main/Food_demand_IBM.ipynb)

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