

Food Demand Forecasting for Food Delivery Company

Data Science Project

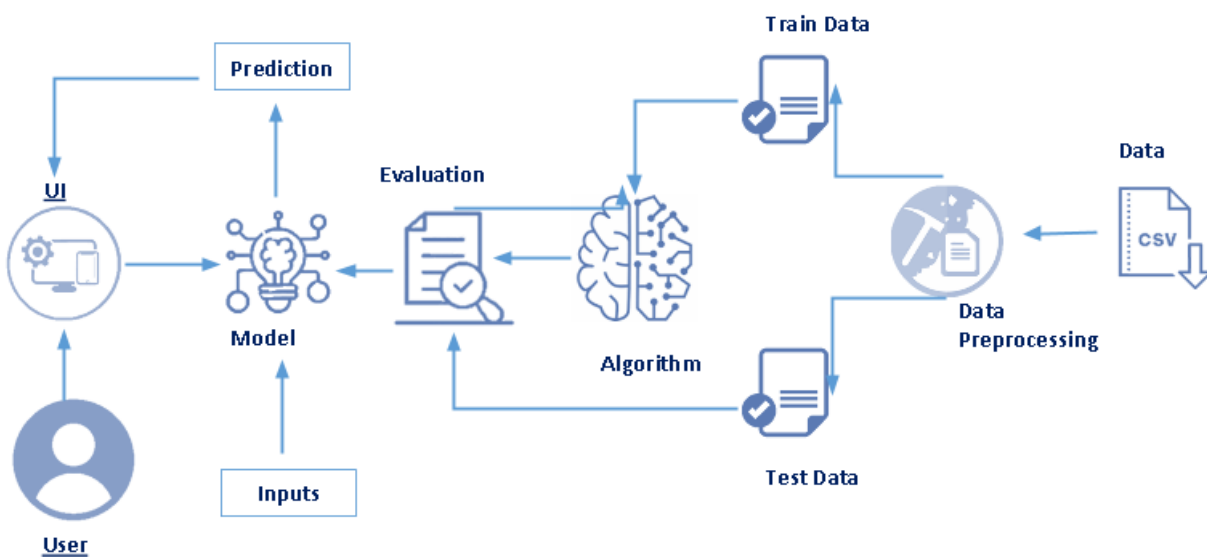
Project Description

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, the task is to predict the demand for the next 10 weeks.

Purpose

The main aim of this project is to create an appropriate machine learning model to forecast then number of orders to gather raw materials for next ten weeks. To achieve this, we should know the information about of fulfilment 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.

Project 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.
- Once the model analyses the uploaded inputs, the prediction is showcased on the UI.

Dataset

Base data consists of four csv files containing information about test data, train data and other required information.

- train.csv: Contains information like id, week, center id, meal id, checkout price, base price, emailer for promotion, homepage featured, number of orders. This file is used for training.

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

- test.csv: Contains information like id, week, center id, meal id, checkout price, base price, emailer for promotion, homepage featured. This file is used for testing.

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

- fulfilment_center_info.csv: Contains information of each fulfilment center.

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.csv: Contains information of each meal being served.

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

Data Pre-processing includes the following main tasks

1. Import the Libraries.
2. Reading the dataset.
3. Exploratory Data Analysis
4. Checking for Null Values.
5. Reading and merging .csv files
6. Dropping the columns
7. Label Encoding
8. Data Visualization.
9. Splitting the Dataset into Dependent and Independent variable.
10. Splitting Data into Train and Testing data

Train and Test Algorithms

There are several Machine learning algorithms to be used depending on the data you are going to process such as images, sound, text, and numerical values. The algorithms that you can choose according to the objective that you might have it may be Classification algorithms or Regression algorithms.

- Example:
1. Linear Regression.
 2. Lasso Regression.
 3. ELasticNet Regression / Classification.
 4. Decision Tree Regression / Classification.
 5. KNeighbors Regressor
 6. Gradient Boosting Regressor
 7. XGB Regressor

You will need to train the datasets to run smoothly and see an incremental improvement in the prediction rate. Import these libraries using:

Linear regression attempts to model the relationship between two variables by fitting a linear equation to observed data. One variable is considered to be an explanatory variable, and the other is considered

to be a dependent variable.

Lasso regression is a type of linear regression that uses shrinkage. Shrinkage is where data values are shrunk towards a central point, like the mean. The lasso procedure encourages simple, sparse models (i.e. models with fewer parameters).

Elastic Net is an extension of linear regression that adds regularization penalties to the loss function during training.

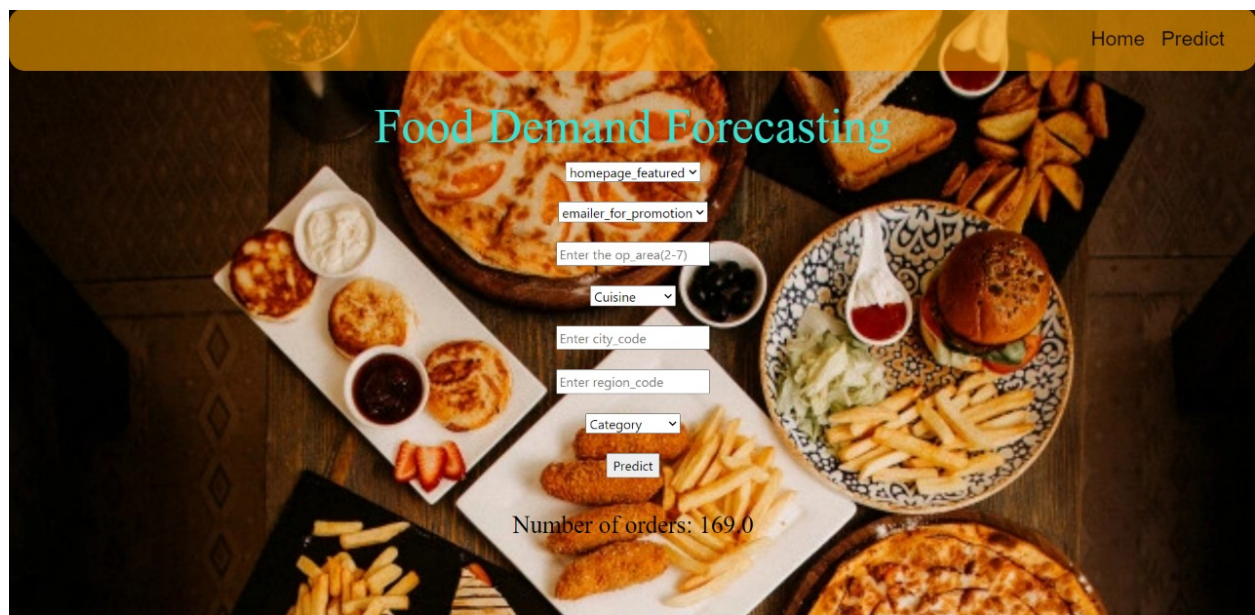
A decision tree is a supervised machine learning model used to predict a target by learning decision rules from features.

KNN regression is a non-parametric method that, in an intuitive manner, approximates the association between independent variables and the continuous outcome by averaging the observations in the same neighborhood.

Gradient boosting is a machine learning technique for regression and classification problems, which produces a prediction model in the form of an ensemble of weak prediction models, typically decision trees.

XGBoost is a powerful approach for building supervised regression models. Ensemble learning involves training and combining individual models (known as base learners) to get a single prediction, and XGBoost is one of the ensemble learning methods.

Predicting the output



The screenshot shows a web application titled "Food Demand Forecasting" with a background image of various food items like pizza, fries, and burgers. The interface includes a navigation bar with "Home" and "Predict" links. The main form contains several input fields and a "Predict" button:

- homepage_featured (dropdown menu)
- email_for_promotion (dropdown menu)
- Enter the op_area(2-7) (text input)
- Cuisine (dropdown menu)
- Enter city_code (text input)
- Enter region_code (text input)
- Category (dropdown menu)
- Predict (button)

Below the form, the text "Number of orders: 169.0" is displayed.

Food Demand Forecasting

Number of orders: 169.0