Project Report Format

TEAM ID : PNT2022TMID52458

INTRODUCTION

1.1 Project Overview

Machine learning algorithms can be used by businesses to as accurately predict changes in consumer demand as feasible. These algorithms are capable of automatically recognising patterns, locating intricate links in big datasets, and picking up indications for changing demand. 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-ofstocks - 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

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 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.

2. LITERATURE SURVEY

2.1 Existing problem

There are lot more problems on ordering food over network and there is no proper demand for all the individual as well for the deployment, Consistent evaluation is also eradicated.

2.2 References

- AQUAREL
- 09Solution
- Kaggle

2.3 Problem Statement Definition

- The data set relates to a food delivery service that has operations throughout several cities. For delivering meal orders to clients, they have a number of fulfilment sites in these cities. The required raw materials are stocked appropriately at the fulfilment centers.

3. IDEATION & PROPOSED SOLUTION

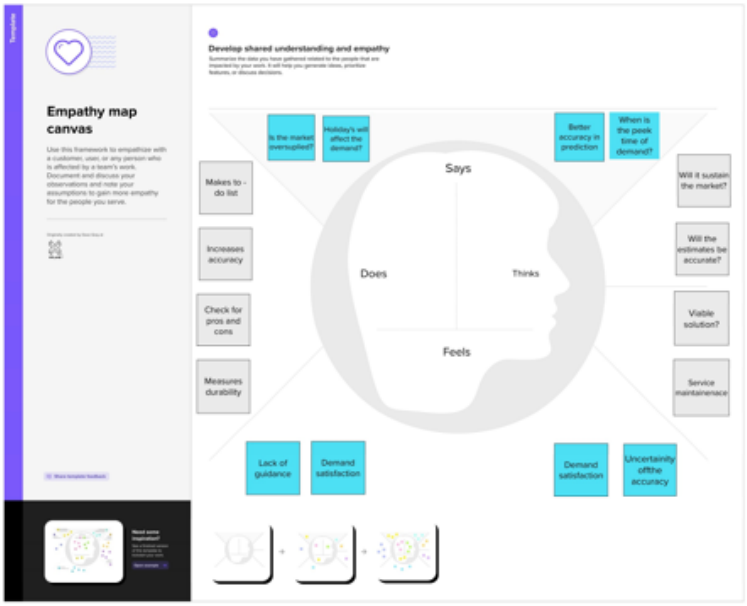
3.1 Empathy Map Canvas

Ideation Phase
Empathize & Discover

Date	27 September 2022
Team ID	PNT2022TMID52458
Project Name	Project – AI powered Food Demand Forecaster
Maximum Marks	

Empathy Map Canvas:

Teams can utilise an empathy map as a collaborative tool to learn more about their clients. An empathy map can depict a group of users, such as a consumer segment, in a manner similar to customer interactions.
It is a helpful tool that enables teams to comprehend their users more fully. It's important to comprehend both the actual issue and the individual who is experiencing it in order to develop a workable solution. Participants learn to think about issues from the user's perspective, as well as his or her objectives and obstacles, through the process of constructing the map.

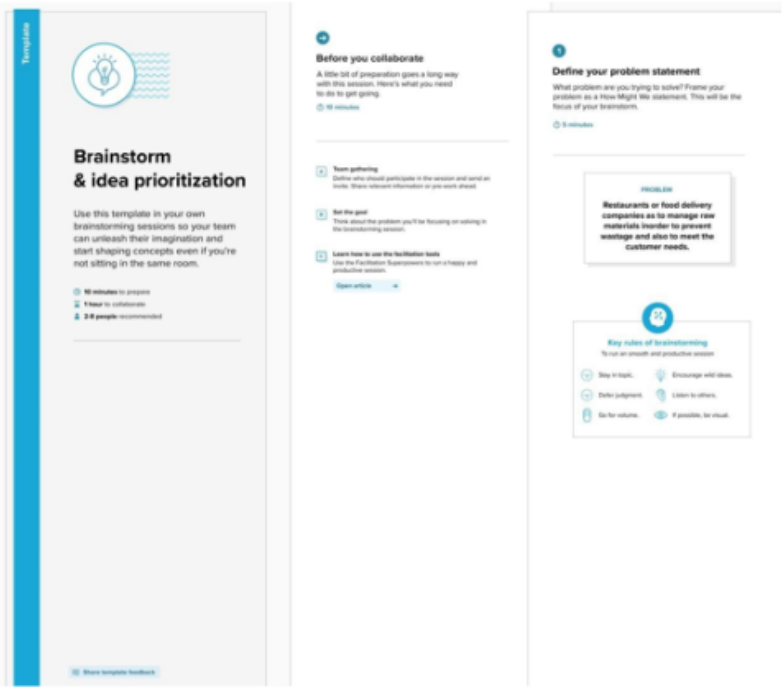


3.2 Ideation & Brainstorming

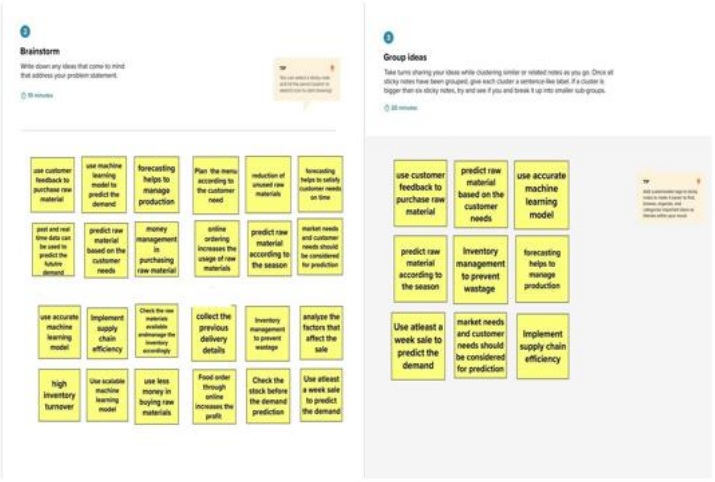
Ideation Phase
Brainstorm & Idea Prioritization Template

Date	20 October 2022
Team ID	PNT2022TMID52458
Project Name	DemandEst-AI Powered Food Demand Forecaster.
Maximum Marks	4 Marks

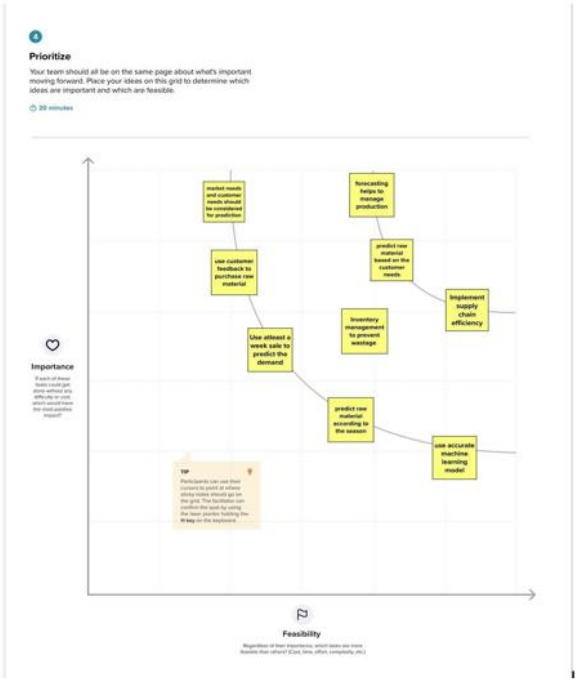
Step-1: Team Gathering, Collaboration and Select the Problem Statement



Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization



3.3Proposed Solution

Project Design Phase-I
Proposed Solution Template

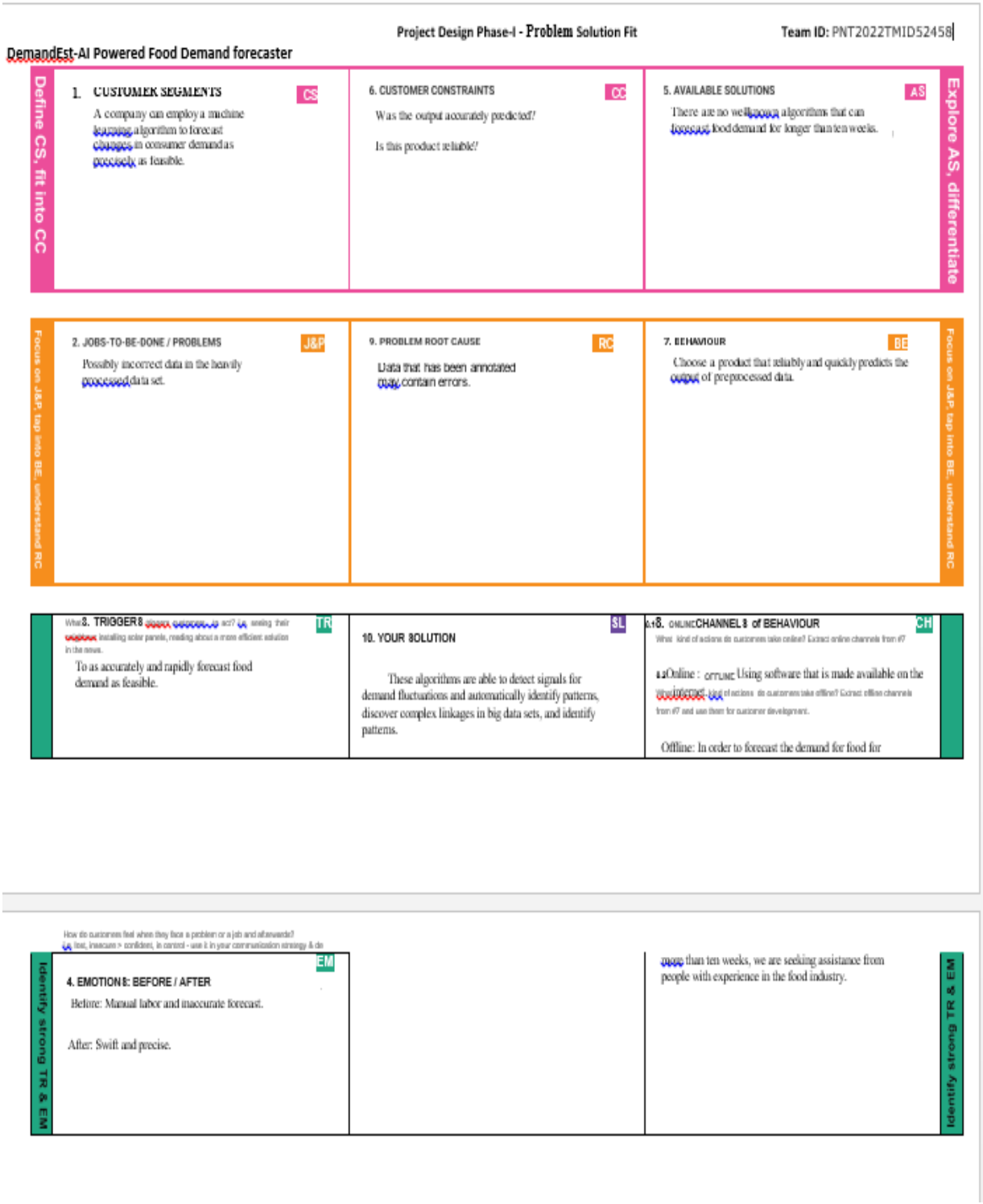
Date	26 September 2022
Team ID	PNT2022TMID52458
Project Name	AI powered Food Demand Forecaster
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Your client is a meal delivery company which operates in multiple cities. They have various fulfillment centres in these cities for dispatching meal orders to their customers. The client wants you to help these centres with demand forecasting for upcoming weeks so that these centres will plan the stock of raw materials accordingly. 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 centres is also one area wherein accurate demand forecasts are really helpful.
2.	Idea / Solution description	The data set is related to a meal delivery company which operates in multiple cities. They have various fulfilment centres in these cities for dispatching meal orders to their customers. The dataset consists of historical data of demand for a product-centre combination for weeks 1 to 145. With the given data and information, the task is to predict the demand for the next 10 weeks (Weeks: 146-155) for the centre-meal combinations, so that these fulfilment centres stock the necessary raw materials accordingly.
3.	Novelty / Uniqueness	As an alternative to the traditional demand forecast format, there are opportunities to use market and AI data to assist managers in the S&OP (Sales & Operations Planning) process, as
		well as in the S&OE (Sales and Operations Execution) process. During the S&OP process, demand forecasting supported by AI facilitates the work of the marketing and sales areas, as well as reducing uncertainty and increasing predictability for the supply chain areas.
4.	Social Impact / Customer Satisfaction	When products are 'out of stock', this will decrease customer satisfaction, whereas customer satisfaction will increase when products are always available. This improves customer loyalty and brand perception.
5.	Business Model (Revenue Model)	Predict the future demand of each product over the next n days.

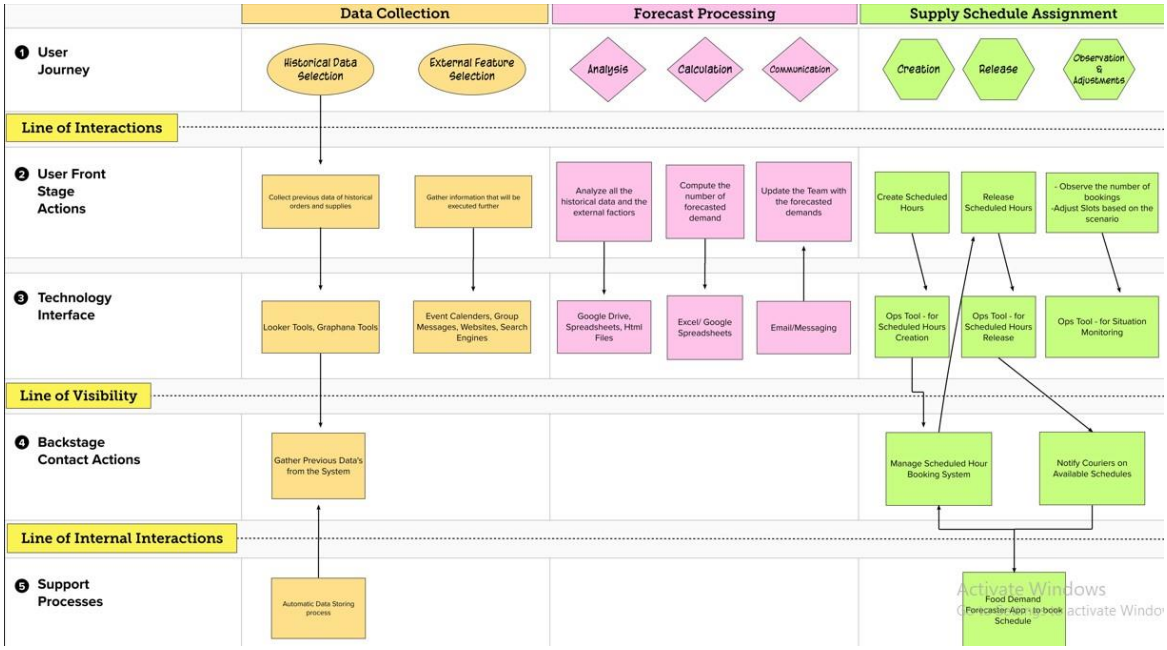
3.4 Problem Solution fit



4. **PROJECT DESIGN**

4.1 Data Flow Diagrams

4.2 Solution & Technical Architecture



Project Design Phase-II

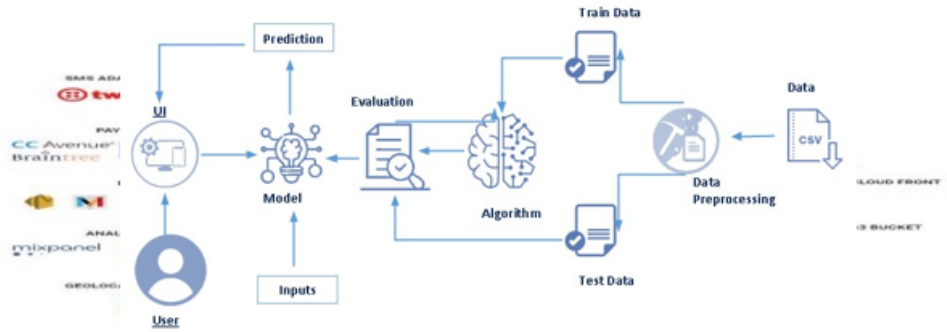
Technology Stack (Architecture & Stack)

Date	15 November 2022
Team ID	PNT2022TMID52458
Project Name	DemandEst_ AI Powered Food Demand Forecasting.
Maximum Marks	4 Marks

Technical Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table

2 **Example: Order processing during pandemics for offline mode**



S.No	Component	Description	Technology
1.	Customer	By using Mobile App and Through online registration.	HTML, CSS, JavaScript.
2.	Restaurant	It includes all the goods and services that the restaurant meals.	Online transactions

Table-1 : Components & Technologies:

5.	Database Analytics	Data Type, Configurations etc.	MySQL, NoSQL, etc.
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
7.	File Storage	User information.	IBM Block Storage or Other Storage Service or Local Filesystem
8.	Amazon s3 bucket	Storage with data availability.	HTTP interface .
9.	Cloudwatch alarm	Purpose of External API used in the application	Notification services.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Google chrome, online websites	Technology of Open Source framework
2.	Security Implementations	Authentications through OTP.	Through mobile phones.
3.	Scalable Architecture	Based on quality. Based on taste.	Quality assurance Quality control.
4.	Availability	Available through online	Online system
5.	Performance	Provide qualitative food Encourage customer loyalty. Boost sales.	Testing shows preference for mistakes. Detecting the defect within a software.

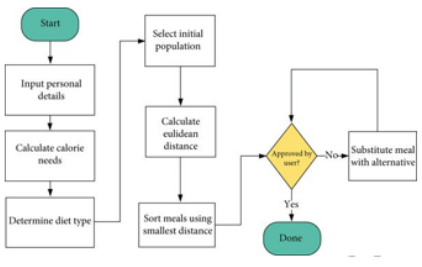
4.3 User Stories

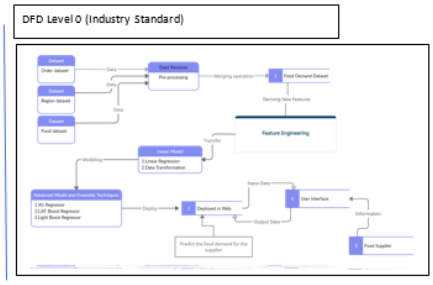
Project Design Phase-II
Data Flow Diagram & User Stories

Date	28 October 2022
Team ID	PNT2022TMID52458
Project Name	AI Powered Food Demand Forecaster.
Maximum Marks	

Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.





User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can register & access the dashboard through Gmail Login	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can login to the application by entering respective email & password.	High	Sprint-1
	Dashboard	USN-6	As a user, I can access all the services provided in the dashboard.	I can predict the orders for next 10 weeks and I estimate of raw materials for the same.	High	Sprint-1
Customer (Web user)	Login & Dashboard	USN-8	As a user, I can login through web application and access the resources in the dashboard.	I can login with the credentials required and I can access the services provided through web application.	High	Sprint-1
Customer Care Executive	Support	USN-9	As a user I can get support from the help desk and can get my queries cleared.	I can get guidance and support to use the application	High	Sprint-2

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Administrator	Management	USN-10	As an admin I can maintain the application.	I can perform maintenance of the app even after the release	Medium	Sprint-1
		USN-11	As an admin I can update the new datasets to the model and train them.	I can periodically update the datasets.	High	Sprint-1
		USN-12	As an admin I can update the features of the app and upgrade it to better versions.	I can perform upgrading of features and versions.	Medium	Sprint-1
		USN-13	As an admin I can maintain all the user details stored and the user's history.	I can maintain the application user's records.	High	Sprint-1

5. PROJECT PLANNING & SCHEDULING

5.1 Sprint Planning & Estimation

SPRINT 1:

```
<!DOCTYP
E html>
        <html lang="en">
        <head>
          <meta charset="UTF-8">
          <meta http-equiv="X-UA-Compatible" content="IE=edge">
          <meta name="viewport" content="width=device-width, initial-scale=1.0">
```

```
                    <title>Home</title>
                    <link type="text/css" rel="stylesheet" href="/Flask/static/style.css">
                    <link rel="preconnect" href="https://fonts.googleapis.com">
                <link rel="preconnect" href="https://fonts.gstatic.com" crossorigin>
                <link
                href="https://fonts.googleapis.com/css2?family=Poppins:wght@200;300;400;600;800&display=s
                wap" rel="stylesheet">
                <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
                awesome/6.0.0beta2/css/all.min.css">
                <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
                awesome/6.0.0beta2/css/v4-shims.min.css">
                <style>


                *{
        margin: 0;          padding:
0;
                    font-family: 'Poppins', sans-serif;
                }
                .bar
                {
        margin: 0px;        padding:
15px;
        background-color:rgb(64, 100, 246);     font-family:'Poppins',sans-serif;
                font-size:25px;
        }          a{
        color:#fff;          float:right;
        text-decoration:none;
        padding-right:20px;
                }
                a:hover{
    padding: 3.5px;     background: #FAAE42;
                }


                .text-box{
                    width: 90%;
            color:rgba(51, 210, 249, 0.905);
text-shadow: #0c0d0e;          position:absolute;
            top: 45%;          left: 50%;
            transform: translate(-50%,-50%);          text-align:
center;
```

```
                }
                .text-box h1{
            font-size: 70px;       text-shadow: 2px 2px
40px #ffffff;
                }
                .text-box p{
            margin: 10px 0 40px;            font-
size: 25px;              color: rgba(0, 0, 0,
0.946);
                }
                </style>
                </head>
                <body>
                  <section class="header">
                   <div class="bar">
                      <a href="/pred">Predict</a>
                      <a href="/home">Home</a>
                   <br>
                     </div>
                    <div class="text-box">
                     <h1>
                        DemandEst - AI powered Food Demand Forecaster</h1>
                     <p> The concept of a balance point between supply and demand is used to explain various
                situations in our
        daily lives, from bread in the neighborhood bakery, which can be sold at the equilibrium price, which
                        equals the quantities desired by buyers and sellers, to the negotiation of securities of
                companies in the stock market.
                        On the supply side, a definition of the correct price to be practiced and mainly the quantity
                are common issues in the planning and execution of the strategy of several companies.</p>

                    </div>
                  </section>
                </body>
                </html>
```

ii)

```
<html lang="en"
>
                <head>
                  <meta charset="UTF-8">
                  <meta http-equiv="X-UA-Compatible" content="IE=edge">
```

```
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Predict</title>
    <link rel="preconnect" href="https://fonts.googleapis.com">
<link rel="preconnect" href="https://fonts.gstatic.com" crossorigin>
<link
href="https://fonts.googleapis.com/css2?family=Poppins:wght@200;300;400;600;800&display=swa
p" rel="stylesheet">
<link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
awesome/6.0.0beta2/css/all.min.css">


<style>
.bar
{
    margin: 0px;        padding:
15px;
 background-color:rgb(100, 5, 29);  /* opacity:0.6;
*/      font-family:'Poppins',sans-serif;      font-
size:25px;
    }
    a
    {
    color:#fff;
    float:right;          text-
decoration:none;
    padding-right:20px;
    }
    a:hover{
        padding: 3.5px;
        background: #FAAE42;


    }
    h1{
        color:rgb(100, 5, 29);          font-
family:Poppins;     font-size:30
    }
    h2{
        color:rgb(100, 5, 29);          font-
family: Poppins;     font-size:60;
margin-bottom: 10px;
```

```
                }
                .my-cta-button{


            font-size: 20px;       color: rgb(15,
15, 15);                  border: 1px solid
#0e0e0ccf;              padding: 3.5px;

                   cursor: pointer;
                }
        .my-cta-button:hover{
border: 2px solid #faae42;       padding:
3.5px;      background: #FAAE42;
        }
        p
        {
                color:white;
        font-family: Poppins;             font-
size:30px;
                }
                </style>
                </head>


                <body>
                   <div class="bar">
                     <a href="/pred">Predict</a>
                     <a href="/home">Home</a>
                    <br>
                      </div>
                   <div class="container">
                         <center> <div id="content" style="margin-top:2em">
                         <h2><center>Food Demand Forecasting</center></h2>
                             <form action="{{ url_for('predict') }}" method="POST">

                    <select id="homepage_featured" name="homepage_featured">
                     <option value="">homepage_featured</option>
                       <option value="0">No</option>
                       <option value="1">Yes</option>

                     </select><br><br>
                   <select id="emailer_for_promotion" name="emailer_for_promotion">
```

```
      <option value="">emailer_for_promotion</option>
        <option value="0">No</option>
        <option value="1">Yes</option>

      </select><br><br>


    <input class="form-input" type="text" name="op_area" placeholder="Enter the
op_area(27)"><br><br>
    <select id="cuisine" name="cuisine">
    <option value="">Cuisine</option>
        <option value="0">Continental</option>
        <option value="1">Indian</option>
        <option value="2">Italian</option>
        <option value="3">Thai</option>

      </select><br><br>
      <input class="form-input" type="text" name="city_code" placeholder="Enter
city_code"><br><br>
    <input class="form-input" type="text" name="region_code" placeholder="Enter
region_code"><br><br>
    <select id="category" name="category">
    <option value="">Category</option>
        <option value="0">Beverages</option>
        <option value="1">Biryani</option>
        <option value="2">Desert</option>
        <option value="3">Extras</option>
        <option value="4">Fish</option>
        <option value="5">Other Snacks</option>
        <option value="6">Pasta</option>
        <option value="7">Pizza</option>
        <option value="8">Rice Bowl</option>
        <option value="9">Salad</option>
        <option value="10">Sandwich</option>
        <option value="11">Seafood</option>
        <option value="12">Soup</option>
        <option value="13">Starters</option>
      </select><br><br>

            <input type="submit" class="my-cta-button" value="Predict">
          </form>
```

```
                    <br>
                     <h1 class="predict">Number of orders: {{ prediction_text }}</h1>
                      </div></center>
                    </div>
                  </body>
                </body>
```

5.2 Sprint Delivery Schedule

SPRINT 2:-

```
import
pandas as
pd
        import numpy as np
        import pickle
        import os
            from flask import Flask, request, render_template


            app = Flask(__name__, template_folder="templates")




            @app.route('/', methods=['GET'])
            def index():
                return render_template('home.html')




@app.route('/home', methods=['GET'])  def about():
                return render_template('home.html')




@app.route('/pred', methods=['GET'])  def page():
                return render_template('upload.html')
```

```
@app.route('/predict', methods=['GET', 'POST']) def predict():
        print("[INFO] loading model...") model =
pickle.load(open('foodDemand.pkl', 'rb')) input_features =
[float(x) for x in request.form.values()] features_value =
[np.array(input_features)] print(features_value)


            features_name = ['homepage_featured', 'emailer_for_promotion', 'op_area', 'cuisine',
                'city_code', 'region_code', 'category']
        prediction = model.predict(features_value)
output = prediction[0] print(output)
            return render_template('upload.html', prediction_text=output)




    if __name__ == '__main__':
app.run(debug=False)
```

ii) ibmapp:

```
# import the
necessary
packages


        import pandas as pd
        import numpy as np
        import pickle
        import os
        import requests


        # NOTE: you must manually set API_KEY below using information retrieved from your IBM Cloud
        account.
        API_KEY = "68w9XBNJLBQFtHM2rG_aouV4LmlF-EtecYrhIQBQbt_K"
        token_response = requests.post('https://iam.cloud.ibm.com/identity/token',
                data={"apikey": API_KEY, "grant_type":
        'urn:ibm:params:oauth:granttype:apikey'})
        mltoken = token_response.json()["access_token"]
```

```
header = {'Content-Type': 'application/json', 'Authorization': 'Bearer ' + mltoken}

from flask import Flask, request, render_template

app = Flask(__name__, template_folder="templates")



@app.route('/', methods=['GET'])
def index():
    return render_template('home.html')



@app.route('/home', methods=['GET'])
def about():
    return render_template('home.html')



@app.route('/pred', methods=['GET'])
def page():
    return render_template('upload.html')



@app.route('/predict', methods=['GET', 'POST'])
def predict():
    print("[INFO] loading model...")
    # model = pickle.load(open('fdemand.pkl', 'rb'))
input_features = [int(x) for x in request.form.values()]
print(input_features)
features_value = [[np.array(input_features)]]
print(features_value)

    payload_scoring = {"input_data": [{"field": [['homepage_featured', 'emailer_for_promotion',
```

```
                'op_area', 'cuisine',
                                                'city_code', 'region_code', 'category']],
                                        "values": [input_features]}]}


                    response_scoring = requests.post(
                        'https://us-south.ml.cloud.ibm.com/ml/v4/deployments/80afcaad-591d-4869-bf54-
                    17bbb8c70ea3/predictions?version=2022-11-14',
                   json=payload_scoring, headers={'Authorization': 'Bear
print("Scoring response")       print(response_scoring.json())              predictions =
response_scoring.json()         print(predictions)
    print('Final Prediction Result', predictions['predictions'][0]['values'][0][0])      pred =
predictions['predictions'][0]['values'][0][0]


                    # prediction = model.predict(features_value)
                    # output=prediction[0]
                    #    print(output)                  print(pred)                  return
                   render_template('upload.html', prediction_text=pred)




        if __name__ == '__main__':      app.run(debug=False)
```

iii) main.py:-

```
import numpy
as np
        import pandas as pd
        import plotly.express as px
        import matplotlib.pyplot as plt
        import seaborn as sns


        from sklearn.preprocessing import OneHotEncoder, StandardScaler
        from sklearn.model_selection import train_test_split           from
sklearn import metrics        from sklearn.pipeline import make_pipeline
        from sklearn.ensemble import RandomForestRegressor
```

```
import warnings
warnings.filterwarnings('ignore')


# Importing Raw Files train_raw =
pd.read_csv('train.csv') test_raw = pd.read_csv('test.csv')
meal = pd.read_csv('meal_info.csv') centerinfo =
pd.read_csv('fulfilment_center_info.csv')
# Analyzing Data
print("The Shape of Demand dataset :", train_raw.shape) print("The Shape of
Fulfillment Center Information dataset :", centerinfo.shape) print("The Shape
of Meal information dataset :", meal.shape) print("The Shape of Test dataset :",
test_raw.shape) train_raw.head() centerinfo.head() meal.head()
test_raw.head()
# Check for missing values train_raw.isnull().sum().sum()
test_raw.isnull().sum().sum()
# Analysis report
print("The company has", centerinfo["center_id"].nunique(), " warehouse ", "spreed into ",
centerinfo["city_code"].nunique(), "City and ", centerinfo["region_code"].nunique(), "Regions") print("The
products of the company are ", meal["meal_id"].nunique(), "unique meals , divided into ",
meal["category"].nunique(), "category and ", meal["cuisine"].nunique(), "cuisine")
# Merge meal,center-info data with train and test data train
= pd.merge(train_raw, meal, on="meal_id", how="left") train =
pd.merge(train, centerinfo, on="center_id", how="left") print("Shape of
train data : ", train.shape)
train.head()
# Merge test data with meal and center info test =
pd.merge(test_raw, meal, on="meal_id", how="outer") test =
pd.merge(test, centerinfo, on="center_id", how="outer") print("Shape of
test data : ", test.shape)
test.head()
# Typecasting to assign appropriate data type to variables col_names = ['center_id', 'meal_id',
'category', 'cuisine', 'city_code', 'region_code', 'center_type'] train[col_names] =
train[col_names].astype('category') test[col_names] = test[col_names].astype('category')
print("Train Datatype\n", train.dtypes) print("Test Datatype\n", test.dtypes) # Orders by
centers
center_orders = train.groupby("center_id", as_index=False).sum() center_orders =
center_orders[["center_id", "num_orders"]].sort_values(by="num_orders", ascending=False).head(10) fig =
px.bar(x=center_orders["center_id"].astype("str"), y=center_orders["num_orders"], title="Top 10
Centers by Order",
labels={"x": "center_id", "y": "num_orders"})
fig.show()
```

```
        # Pie chart on food category   fig = px.pie(values=train["category"].value_counts(),
names=train["category"].unique(),
                    title="Most popular food category")
            fig.show()
            # Orders by Cuisine types cuisine_orders = train.groupby(["cuisine"],
            as_index=False).sum() cuisine_orders = cuisine_orders[["cuisine",
            "num_orders"]].sort_values(by="num_orders", ascending=False)
        fig = px.bar(cuisine_orders, x="cuisine", y="num_orders", title="orders by cuisine")
        fig.show()
        # Impact of check-out price on order     train_sample = train.sample(frac=0.2)   fig =
px.scatter(train_sample, x="checkout_price", y="num_orders", title="number of order change with checkout price")
            fig.show()
        sns.boxplot(train["checkout_price"])     #
Orders weekly trend
        week_orders = train.groupby(["week"], as_index=False).sum()          week_orders =
week_orders[["week", "num_orders"]]             fig = px.line(week_orders, x="week", y="num_orders",
markers=True, title="Order weekly trend")       fig.show()
        # Deriving discount percent and discount y/n       train['discount percent'] = ((train['base_price'] -
train['checkout_price']) / train['base_price']) * 100
            # Discount Y/N
            train['discount y/n'] = [1 if x > 0 else 0 for x in (train['base_price'] - train['checkout_price'])]
        # Creating same feature in test dataset   test['discount percent'] = ((test['base_price'] -
test['checkout_price']) / test['base_price']) * 100             test['discount y/n'] = [1 if x > 0 else 0 for x in
(test['base_price'] - test['checkout_price'])]       train.head(2)
        # Check for correlation between numeric features
        plt.figure(figsize=(13, 13))     sns.heatmap(train.corr(), linewidths=.1,
cmap='Reds', annot=True)  plt.title('Correlation Matrix')
            plt.show()




        # Define One hot encoding function      def
one_hot_encode(features_to_encode, dataset):
            encoder = OneHotEncoder(sparse=False)
encoder.fit(dataset[features_to_encode])             encoded_cols =
pd.DataFrame(encoder.transform(dataset[features_to_encode]),
            columns=encoder.get_feature_names())     dataset =
            dataset.drop(columns=features_to_encode)     for cols
            in encoded_cols.columns:
                dataset[cols] = encoded_cols[cols]
            return dataset
```

```
        # get list of categorical variables in data set          ls =
train.select_dtypes(include='category').columns.values.tolist()
        # Run one-hot encoding on all categorical variables
        features_to_encode = ls         data =
one_hot_encode(features_to_encode, train)       data =
data.reset_index(drop=True)             # Train-Validation Data
Split     y = data[["num_orders"]]
            X = data.drop(["num_orders", "id", "base_price", "discount y/n"], axis=1)
            X = X.replace((np.inf, -np.inf, np.nan), 0)  # replace nan and infinity values with 0
            # 20% of train data is used for validation
            X_train, X_val, y_train, y_val = train_test_split(X, y, test_size=0.20, random_state=100)
        # Prepare test data post applying onehot encoding               OH_test =
one_hot_encode(features_to_encode, test)        test_final = OH_test.drop(["id",
"base_price", "discount y/n"], axis=1)
            # Create pipeline for scaling and modeling
            RF_pipe = make_pipeline(StandardScaler(), RandomForestRegressor(n_estimators=100, max_depth=7))
            # Build Model
            RF_pipe.fit(X_train, y_train)
            # Predict Value
            RF_train_y_pred = RF_pipe.predict(X_val)
            # Model Evaluation-
        print('R Square:', RF_pipe.score(X_val, y_val))    print('RMSLE:', 100 *
np.sqrt(metrics.mean_squared_log_error(y_val, RF_train_y_pred)))
        # Applying algorithm to predict orders  test_y_pred
= RF_pipe.predict(test_final)           Result =
pd.DataFrame(test_y_pred)               print(Result.values)
            Result = pd.DataFrame(test_y_pred)
            Submission = pd.DataFrame(columns=['id', 'num_orders'])
            Submission['id'] = test['id']
            Submission['num_orders'] = Result.values
        Submission.to_csv('My submission.csv', index=False)
        print(Submission.shape)
            print(Submission.head())
```

iv) ibm.py:-

```
import
array as
arr
        import numpy as np
        import json


        import requests       from json
import JSONEncoder




        class NumpyEncoder(JSONEncoder):
def default(self, obj):                 if
isinstance(obj, np.ndarray):
        return obj.tolist()         return
JSONEncoder.default(self, obj)




            # NOTE: you must manually set API_KEY below using information retrieved from your IBM Cloud
            account.
            API_KEY = "68w9XBNJLBQFtHM2rG_aouV4LmlF-EtecYrhIQBQbt_K"
        token_response = requests.post('https://iam.cloud.ibm.com/identity/token',
data={"apikey": API_KEY, "grant_type": 'urn:ibm:params:oauth:grant-type:apikey'})    mltoken =
token_response.json()["access_token"]


            header = {'Content-Type': 'application/json', 'Authorization': 'Bearer ' + mltoken}


        values = np.ndarray([0, 0, 3, 1, 647, 56, 11])
        print(values.shape)




        # NOTE: manually define and pass the array(s) of values to be scored in the next line       payload_scoring =
json.dumps({"input_data": [{"field": [['homepage_featured', 'emailer_for_promotion',
            'op_area', 'cuisine', 'city_code', 'region_code', 'category']], "values": [[0, 0, 3, 1, 647, 56, 11], [1, 1, 2, 3,
            600, 46, 19]]}]},cls=NumpyEncoder)
```

```
response_scoring = requests.post(
    'https://us-south.ml.cloud.ibm.com/ml/v4/deployments/80afcaad-591d-4869-bf54-
    17bbb8c70ea3/predictions?version=2022-11-14',
    json=payload_scoring,
headers={'Authorization': 'Bearer ' + mltoken})
print("Scoring response") predictions =
response_scoring.json() for i in predictions:
print(i, predictions[i])
```

5.3 Reports from JIRA

OutsourceShipping	4	0	0	4
ExceptionReporting	8	0	0	8
FinalReportOutput	5	0	0	5
VersionControl	3	0	0	3

Acceptance Testing
UAT Execution & Report Submission

Date	15 November 2022
Team ID	PNT2022TMID52458
Project Name	Project – DemandEst - AI Powered Food Demand Forecaster
Maximum Marks	4 Marks

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the DemandEst – AI Powered Food Demand Forecaster project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity1	Severity2	Severity3	Severity4	Subtotal
By Design	5	6	3	4	18
Duplicate	0	1	2	0	3
External	2	1	0	1	4
Fixed	5	2	3	11	21
Not Reproduced	0	1	0	1	2
Skipped	2	0	0	1	3
Won'tFix	0	0	0	0	0
Totals	14	11	8	18	51

3. Test Case Analysis

Section	TotalCases	Not Tested	Fail	Pass
PrintEngine	6	0	0	6
ClientApplication	47	0	0	47

This report shows the number of test cases that have passed, failed, and untested

Test Case Report

Date	15 November 2022
Team ID	PNT2022TMID52458
Project Name	Project–DemandEst-AI Powered Food Demand Forecaster

Testcase_ id	Feature_ type	component	scenario	Prerequisite	Steps to execute	Expectd result	Actul result	status	Executed by
TC_010	Functional (Maintenance)	Administrator	As a administrator, I should be able to edit the menu's of the app.	Network accessing system	i)Performing testing after the software is released is known as maintenance testing. ii)Maintenance testing is different from new application testing. iii)There are two important parts of maintenance testing such as confirmation maintenance testing and regression maintenance testing.	Is valid one	Is valid	Passed	

Project Development Phase
Sprint 4

Date	15 November 2022
Team ID	PNT2022TMID52458
Project Name	Project – DemandEst-AI Powered Food Demand Forecaster
Maximum Marks	10 Marks

Testcase_id	Feature_ type	component	Test_ scenario	Steps to execute	Status	Executed by
TC_11	Functional (feedback)	Admin	As a customer care team member, I should be to get feedback from the users.	**Step 1**: Test Case ID. **Step 2**: Test Description **Step 3**: Assumptions and PreConditions **Step 4**: Test Data. **Step 5**: Steps to be Executed. . . **Step 6**: Expected Result. . . **Step 7**: Actual Result and PostConditions . . **Step 8**: Pass/Fail.	Passed	

6. TESTING:

Project Development Phase
Model Performance Test

Date	15 November 2022
Team ID	PNT2022TMID52458
Project Name	Project – DemandEst-AI Powered Food Demand Forecaster
Maximum Marks	10 Marks

Model Performance Testing:

S.No.	Parameter	Values	Screenshot

1.	Metrics	**Regression Model:**
		MAE 89.10334778841495,
		MSE - 43129.82977026746,
		RMSLE -207.67722496765856,
		R2 score -0.6946496854280233,
			Evaluating the model
			In [33]: `from sklearn.metrics import mean_squared_error`
			In [34]: `RMLSE=np.sqrt(mean_squared_error(y_test,pred))`
			`RMLSE`
			Out[34]: 209.71961740201198
			In [39]: `from sklearn import metrics`
			`from sklearn.metrics import mean_absolute_error`
			In [40]: `MSE=print(metrics.mean_squared_error(y_test,pred))`
			`MSE`
			43982.31792324628
			In [41]: `R2S=print(metrics.r2_score(y_test,pred))`
			`R2S`
			0.6886142448276894
			In [42]: `MAE=print(mean_absolute_error(y_test,pred))`
			89.10334778841495

2.	Tune the Model	**Hyperparameter Tuning** - RMSLE- 52.85812511759974 avg R-squared- 0.123 MSE: -64230.918	

7. CODING & SOLUTIONING (Explain the features

added in the project along with code)

a. Feature 1

Home.html:

```
<!DOCTYP
E html>
                <html lang="en">
                <head>
                   <meta charset="UTF-8">
                   <meta http-equiv="X-UA-Compatible" content="IE=edge">
                   <meta name="viewport" content="width=device-width, initial-scale=1.0">
                   <title>Home</title>
                   <link type="text/css" rel="stylesheet" href="/Flask/static/style.css">
                   <link rel="preconnect" href="https://fonts.googleapis.com">
                <link rel="preconnect" href="https://fonts.gstatic.com" crossorigin>
                <link
                href="https://fonts.googleapis.com/css2?family=Poppins:wght@200;300;400;600;800&display=s
                wap" rel="stylesheet">
                <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
                awesome/6.0.0beta2/css/all.min.css">
                <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
                awesome/6.0.0beta2/css/v4-shims.min.css">
                <style>


                *{
          margin: 0;          padding:
0;
                   font-family: 'Poppins', sans-serif;
                }
                .bar
                {
                margin: 0px; padding: 15px;
                background-color:rgb(64, 100,
                246); font-family:'Poppins',sans-
                serif; font-size:25px;
                } a{ color:#fff;
                float:right; text-
```

```
                    decoration:none;
                    padding-right:20px;
                    }
                    a:hover{
    padding: 3.5px;     background: #FAAE42;
                    }


                    .text-box{
                       width: 90%;
            color:rgba(51, 210, 249, 0.905);
text-shadow: #0c0d0e;           position:absolute;
            top: 45%;               left: 50%;
            transform: translate(-50%,-50%);          text-align:
center;
                    }
                    .text-box h1{
            font-size: 70px;      text-shadow: 2px 2px
40px #ffffff;
                    }
                    .text-box p{
            margin: 10px 0 40px;            font-
size: 25px;              color: rgba(0, 0, 0,
0.946);
                    }
                    </style>
                    </head>
                    <body>
                      <section class="header">
                       <div class="bar">
                          <a href="/pred">Predict</a>
                          <a href="/home">Home</a>
                       <br>
                           </div>
                         <div class="text-box">
                          <h1>
                             DemandEst - AI powered Food Demand Forecaster</h1>
                          <p> The concept of a balance point between supply and demand is used to explain various
                        situations in our            daily lives, from bread in the neighborhood bakery, which can be sold
                        at the equilibrium price, which            equals the quantities desired by buyers and sellers, to
                        the negotiation of securities of companies in the stock market.
                                On the supply side, a definition of the correct price to be practiced and mainly the quantity
                        are common issues in the planning and execution of the strategy of several companies.</p>
```

```
        </div>
      </section>
    </body>
    </html>
```

Upload.html:-

```
<html
lang="en"
>
        <head>
          <meta charset="UTF-8">
          <meta http-equiv="X-UA-Compatible" content="IE=edge">
          <meta name="viewport" content="width=device-width, initial-scale=1.0">
          <title>Predict</title>
          <link rel="preconnect" href="https://fonts.googleapis.com">
        <link rel="preconnect" href="https://fonts.gstatic.com" crossorigin>
        <link
        href="https://fonts.googleapis.com/css2?family=Poppins:wght@200;300;400;600;800&display=swa
        p" rel="stylesheet">
        <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
        awesome/6.0.0beta2/css/all.min.css">


        <style>
        .bar { margin: 0px; padding:
        15px; background-color:rgb(100,
        5, 29); /* opacity:0.6; */ font-
        family:'Poppins',sans-serif; font-
        size:25px;
        } a { color:#fff;
    float:right;        text-
decoration:none;  padding-
right:20px;
        }
        a:hover{
  padding: 3.5px;    background: #FAAE42;
```

```
                }
                h1{
            color:rgb(100, 5, 29);          font-
family:Poppins;      font-size:30
                }
                h2{
            color:rgb(100, 5, 29);          font-
family: Poppins;      font-size:60;
margin-bottom: 10px;

                }
                .my-cta-button{


            font-size: 20px;      color: rgb(15,
15, 15);              border: 1px solid
#0e0e0ccf;            padding: 3.5px;

                  cursor: pointer;
                }
                .my-cta-button:hover{
                border: 2px solid #faae42;
                padding: 3.5px;
                background: #FAAE42;
                } p { color:white;
                font-family:
                Poppins; font-
                size:30px;
                }
                </style>
                </head>


                <body>
                  <div class="bar">
                    <a href="/pred">Predict</a>
                    <a href="/home">Home</a>
                   <br>
                     </div>
                  <div class="container">
                        <center> <div id="content" style="margin-top:2em">
                        <h2><center>Food Demand Forecasting</center></h2>
```

```
            <form action="{{ url_for('predict') }}" method="POST">

    <select id="homepage_featured" name="homepage_featured">
     <option value="">homepage_featured</option>
       <option value="0">No</option>
       <option value="1">Yes</option>

      </select><br><br>
    <select id="emailer_for_promotion" name="emailer_for_promotion">
     <option value="">emailer_for_promotion</option>
       <option value="0">No</option>
       <option value="1">Yes</option>

      </select><br><br>


    <input class="form-input" type="text" name="op_area" placeholder="Enter the op_area(2-
7)"><br><br>
    <select id="cuisine" name="cuisine">
    <option value="">Cuisine</option>
       <option value="0">Continental</option>
       <option value="1">Indian</option>
       <option value="2">Italian</option>
       <option value="3">Thai</option>

      </select><br><br>
      <input class="form-input" type="text" name="city_code" placeholder="Enter
city_code"><br><br>
    <input class="form-input" type="text" name="region_code" placeholder="Enter
region_code"><br><br>
    <select id="category" name="category">
    <option value="">Category</option>
       <option value="0">Beverages</option>
       <option value="1">Biryani</option>
       <option value="2">Desert</option>
       <option value="3">Extras</option>
       <option value="4">Fish</option>
       <option value="5">Other Snacks</option>
       <option value="6">Pasta</option>
       <option value="7">Pizza</option>
       <option value="8">Rice Bowl</option>
       <option value="9">Salad</option>
```

```
                    <option value="10">Sandwich</option>
                    <option value="11">Seafood</option>
                    <option value="12">Soup</option>
                    <option value="13">Starters</option>
                  </select><br><br>

                        <input type="submit" class="my-cta-button" value="Predict">
                      </form>

                    <br>
                     <h1 class="predict">Number of orders: {{ prediction_text }}</h1>
                       </div></center>
                    </div>
                  </body>
                </body>
```

App.py:-

```
import pandas as pd import
numpy as np
        import pickle import os from flask import Flask,
        request, render_template


        app = Flask(__name__, template_folder="templates")



@app.route('/', methods=['GET'])  def index():
            return render_template('home.html')



@app.route('/home', methods=['GET'])  def about():
            return render_template('home.html')



@app.route('/pred', methods=['GET'])  def page():
            return render_template('upload.html')
```

```
@app.route('/predict', methods=['GET', 'POST']) def predict():
        print("[INFO] loading model...") model =
pickle.load(open('foodDemand.pkl', 'rb')) input_features =
[float(x) for x in request.form.values()] features_value =
[np.array(input_features)] print(features_value)


            features_name = ['homepage_featured', 'emailer_for_promotion', 'op_area', 'cuisine',
                    'city_code', 'region_code', 'category']
            prediction = model.predict(features_value) output =
          prediction[0] print(output) return
          render_template('upload.html', prediction_text=output)




    if __name__ == '__main__':
app.run(debug=False)
```

Ibmapp.py:

```
import
pandas as
pd
    import numpy as np
    import pickle
    import os
    import requests


        # NOTE: you must manually set API_KEY below using information retrieved from your IBM Cloud
        account.
        API_KEY = "68w9XBNJLBQFtHM2rG_aouV4LmlF-EtecYrhIQBQbt_K"
    token_response = requests.post('https://iam.cloud.ibm.com/identity/token',
data={"apikey": API_KEY, "grant_type": 'urn:ibm:params:oauth:grant-type:apikey'}) mltoken =
token_response.json()["access_token"]
```

```
header = {'Content-Type': 'application/json', 'Authorization': 'Bearer ' + mltoken}

from flask import Flask, request, render_template

app = Flask(__name__, template_folder="templates")


@app.route('/', methods=['GET'])  def index():
    return render_template('home.html')


@app.route('/home', methods=['GET'])  def about():
    return render_template('home.html')


@app.route('/pred', methods=['GET'])  def page():
    return render_template('upload.html')


@app.route('/predict', methods=['GET', 'POST'])  def predict():
    print("[INFO] loading model...")
  # model = pickle.load(open('fdemand.pkl', 'rb'))
  input_features = [int(x) for x in request.form.values()]
  print(input_features)  features_value =
[[np.array(input_features)]]  print(features_value)

    payload_scoring = {"input_data": [{"field": [['homepage_featured', 'emailer_for_promotion', 'op_area',
 'cuisine',
                                                  'city_code', 'region_code', 'category']],
                                       "values": [input_features]}]}
```

```
        response_scoring = requests.post(
            'https://us-south.ml.cloud.ibm.com/ml/v4/deployments/80afcaad-591d-4869-bf54-
        17bbb8c70ea3/predictions?version=2022-11-14',
        json=payload_scoring, headers={'Authorization': 'Bearer ' + mltoken})
        print("Scoring response")     print(response_scoring.json())
        predictions = response_scoring.json()
            print(predictions)     print('Final Prediction Result',
        predictions['predictions'][0]['values'][0][0])
            pred = predictions['predictions'][0]['values'][0][0]


            # prediction = model.predict(features_value)
        # output=prediction[0]
# print(output)         print(pred)
            return render_template('upload.html', prediction_text=pred)




    if __name__ == '__main__':
app.run(debug=False)
```

b. Feature 2

main.py:-

```
import numpy
as np
    import pandas as pd
    import plotly.express as px
    import matplotlib.pyplot as plt
    import seaborn as sns


    from sklearn.preprocessing import OneHotEncoder, StandardScaler
    from sklearn.model_selection import train_test_split          from
sklearn import metrics        from sklearn.pipeline import make_pipeline
    from sklearn.ensemble import RandomForestRegressor


        import warnings
        warnings.filterwarnings('ignore')
```

```
        # Importing Raw Files           train_raw =
pd.read_csv('train.csv')       test_raw = pd.read_csv('test.csv')
        meal = pd.read_csv('meal_info.csv')      centerinfo =
pd.read_csv('fulfilment_center_info.csv')
            # Analyzing Data
        print("The Shape of Demand dataset :", train_raw.shape)     print("The Shape of
Fulfillment Center Information dataset :", centerinfo.shape)            print("The Shape of
Meal information dataset :", meal.shape)          print("The Shape of Test dataset :",
test_raw.shape)    train_raw.head()     centerinfo.head()     meal.head()
        test_raw.head()
        # Check for missing values     train_raw.isnull().sum().sum()
        test_raw.isnull().sum().sum()
            # Analysis report
        print("The company  has", centerinfo["center_id"].nunique(), " warehouse ", "spreed into  ",
centerinfo["city_code"].nunique(), "City and ", centerinfo["region_code"].nunique(), "Regions")   print("The
products of the company are ", meal["meal_id"].nunique(), "unique meals , divided into  ",
meal["category"].nunique(), "category and ", meal["cuisine"].nunique(), "cuisine")
        # Merge meal,center-info data with train and test data          train
= pd.merge(train_raw, meal, on="meal_id", how="left")   train =
pd.merge(train, centerinfo, on="center_id", how="left")    print("Shape of
train data : ", train.shape)
            train.head()
        # Merge test data with meal and center info          test =
pd.merge(test_raw, meal, on="meal_id", how="outer")     test =
pd.merge(test, centerinfo, on="center_id", how="outer")   print("Shape of
test data : ", test.shape)
            test.head()
            # Typecasting to assign appropriate data type to variables col_names = ['center_id', 'meal_id',
            'category', 'cuisine', 'city_code', 'region_code', 'center_type'] train[col_names] =
            train[col_names].astype('category') test[col_names] = test[col_names].astype('category')
            print("Train Datatype\n", train.dtypes) print("Test Datatype\n", test.dtypes)
            # Orders by centers
            center_orders = train.groupby("center_id", as_index=False).sum() center_orders =
            center_orders[["center_id", "num_orders"]].sort_values(by="num_orders",
            ascending=False).head(10)
            fig = px.bar(x=center_orders["center_id"].astype("str"), y=center_orders["num_orders"], title="Top 10
            Centers by Order",
                    labels={"x": "center_id", "y": "num_orders"})
            fig.show()
```

```
        # Pie chart on food category   fig = px.pie(values=train["category"].value_counts(),
names=train["category"].unique(),                  title="Most popular food category")
            fig.show()
        # Orders by Cuisine types      cuisine_orders = train.groupby(["cuisine"],
as_index=False).sum()       cuisine_orders = cuisine_orders[["cuisine",
"num_orders"]].sort_values(by="num_orders", ascending=False)
        fig = px.bar(cuisine_orders, x="cuisine", y="num_orders", title="orders by cuisine")
        fig.show()
        # Impact of check-out price on order     train_sample = train.sample(frac=0.2)   fig =
px.scatter(train_sample, x="checkout_price", y="num_orders", title="number of order change with checkout price")
            fig.show()
        sns.boxplot(train["checkout_price"])     #
Orders weekly trend
        week_orders = train.groupby(["week"], as_index=False).sum()          week_orders =
week_orders[["week", "num_orders"]]             fig = px.line(week_orders, x="week", y="num_orders",
markers=True, title="Order weekly trend")       fig.show()
        # Deriving discount percent and discount y/n       train['discount percent'] = ((train['base_price'] -
train['checkout_price']) / train['base_price']) * 100
            # Discount Y/N
            train['discount y/n'] = [1 if x > 0 else 0 for x in (train['base_price'] - train['checkout_price'])]
        # Creating same feature in test dataset   test['discount percent'] = ((test['base_price'] -
test['checkout_price']) / test['base_price']) * 100             test['discount y/n'] = [1 if x > 0 else 0 for x in
(test['base_price'] - test['checkout_price'])]
            train.head(2)
            # Check for correlation between numeric features
            plt.figure(figsize=(13, 13)) sns.heatmap(train.corr(),
            linewidths=.1, cmap='Reds', annot=True) plt.title('Correlation
            Matrix') plt.show()




        # Define One hot encoding function      def
one_hot_encode(features_to_encode, dataset):
            encoder = OneHotEncoder(sparse=False)
encoder.fit(dataset[features_to_encode])             encoded_cols =
pd.DataFrame(encoder.transform(dataset[features_to_encode]),
columns=encoder.get_feature_names())
            dataset = dataset.drop(columns=features_to_encode)
            for cols in encoded_cols.columns:           dataset[cols]
= encoded_cols[cols]           return dataset
```

```
        # get list of categorical variables in data set          ls =
train.select_dtypes(include='category').columns.values.tolist()
        # Run one-hot encoding on all categorical variables
        features_to_encode = ls         data =
one_hot_encode(features_to_encode, train)       data =
data.reset_index(drop=True)             # Train-Validation Data
Split     y = data[["num_orders"]]
            X = data.drop(["num_orders", "id", "base_price", "discount y/n"], axis=1)
            X = X.replace((np.inf, -np.inf, np.nan), 0)  # replace nan and infinity values with 0
            # 20% of train data is used for validation
            X_train, X_val, y_train, y_val = train_test_split(X, y, test_size=0.20, random_state=100)
        # Prepare test data post applying onehot encoding               OH_test =
one_hot_encode(features_to_encode, test)        test_final = OH_test.drop(["id",
"base_price", "discount y/n"], axis=1)
            # Create pipeline for scaling and modeling
            RF_pipe = make_pipeline(StandardScaler(), RandomForestRegressor(n_estimators=100, max_depth=7))
            # Build Model
            RF_pipe.fit(X_train, y_train)
            # Predict Value
            RF_train_y_pred = RF_pipe.predict(X_val)
            # Model Evaluation- print('R Square:',
            RF_pipe.score(X_val, y_val))
            print('RMSLE:', 100 * np.sqrt(metrics.mean_squared_log_error(y_val, RF_train_y_pred)))
            # Applying algorithm to predict orders
            test_y_pred = RF_pipe.predict(test_final)
            Result = pd.DataFrame(test_y_pred)
            print(Result.values)
            Result = pd.DataFrame(test_y_pred)
            Submission = pd.DataFrame(columns=['id', 'num_orders'])
            Submission['id'] = test['id']
            Submission['num_orders'] = Result.values
        Submission.to_csv('My submission.csv', index=False)
        print(Submission.shape)
            print(Submission.head())
```

RESULTS

c. Performance Metrics – he evaluation metric for this competition is 100*RMSLE where RMSLE is Root of Mean Squared Logarithmic Error across all entries in the test set where our accuracy 92% , rsme – 0.8934\

8. **ADVANTAGES & DISADVANTAGES**

ADVANTAGE:

- In supply chain networks, demand forecasting with the aid of AI-based techniques can cut errors by 30 to 50 percent. By implementing these approaches, organisations may be able to forecast accurately at all levels.

DIS-ADVANTAGE:

- Not every situation can be predicted

9. **CONCLUSION**

Therefore, this complete representation shows the progress on the topic in an systematically view .This implementation along with several code has separate topics to evolve around for the best outome as a report.

10. **FUTURE SCOPE**

Predictions , availability, Scalability , Demand , everything will be followed on a correct procedure .

11. **APPENDIX** :

https://github.com/IBM-EPBL/IBM-Project-47554-1660800169