Project Report Format

TEAM ID : PNT2022TMID19852

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-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

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

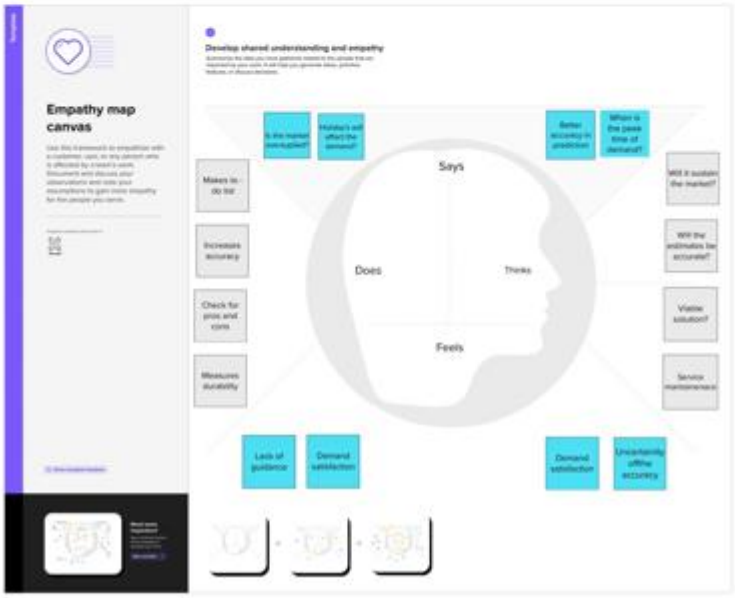
3.1 Empathy Map Canvas

Ideation Phase
Empathize & Discover

Date	27 September 2022
Team ID	PNT2022TMID19852
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

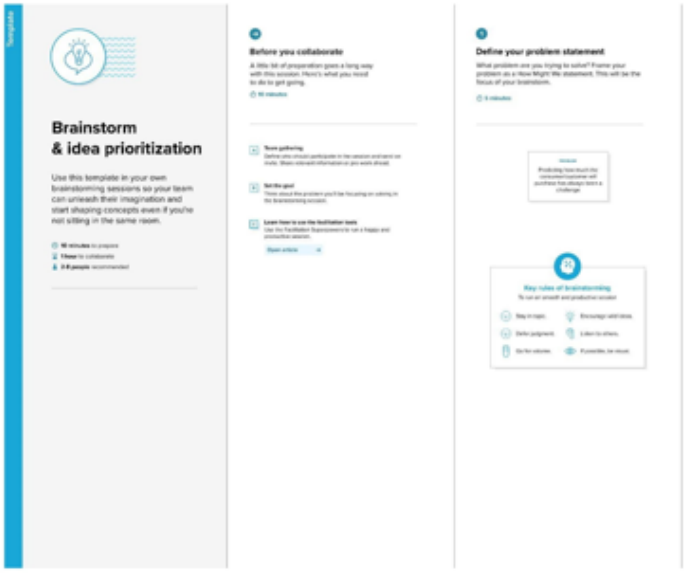
Ideation Phase
Brainstorm & Idea Prioritization Template

Date	19 September 2022
Team ID	PNT2022TMID19852
Project Name	AI powered – Food Demand Forecaster
Maximum Marks	

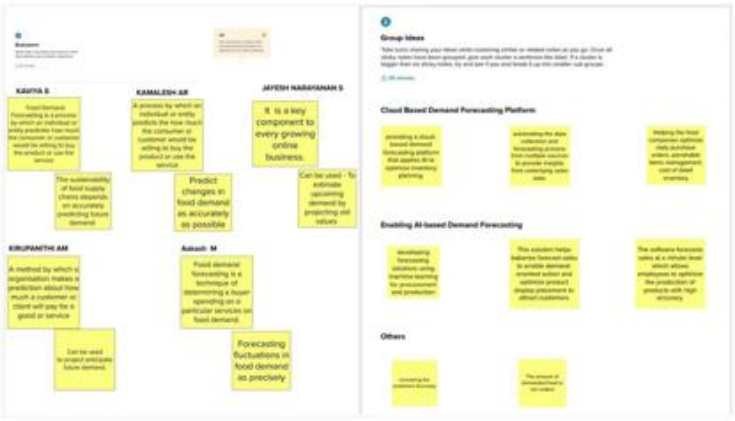
Brainstorm & Idea Prioritization Template:

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

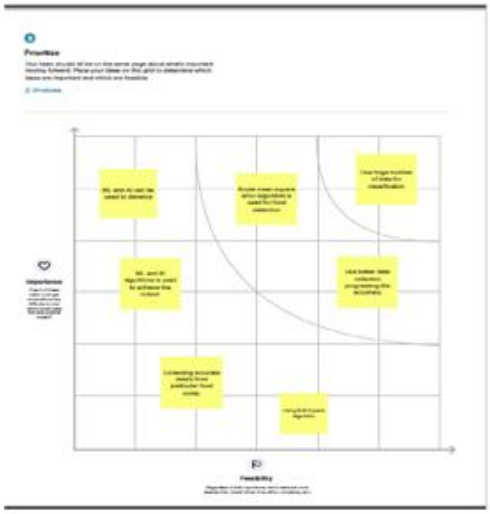
Step-1: Team Gathering, Collaboration and Select the Problem Statement



Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization



3.3 Proposed Solution

Project Design Phase -I

Proposed Solution

Date	10 November 2022
Team ID	PNT2022TMID19852
Project Name	DemandEst-AI Powered Food Demand forecaster
Maximum Marks	

Proposed Solution:

SI.No	Parameter	Description
1.	Problem Statement (problem to be solved)	To create an appropriate machine learning model to forecast the number of orders to gather raw materials for ten weeks
2.	Idea/Solution description	Perception, Representation& Reasoning, Learning, Human AI interaction and societal impact
3.	Novelty/Uniqueness	The AI based system is fed with the instructions to make the peoples happy based on the hard coded biases. In this way, this help to spot the favorites trend among people to improve the technology
4.	Social Impact/Customer Satisfaction	It useful to peoples. Product can be useful for long days.
5.	Business Model (Revenue Model)	• Google ads- ads can be displayed in the application • Subscription – Subscription can be provided to access specific features.
6.	Scalability Of the Solution	A scalable AI solution has to work with data in real-time as it is being generated and sometimes to the tune of millions of records on a daily basis. This requires the transformation of the operating model of a business, a series of top-down and bottom-up actions, adopting a new culture, and commitment of a big budget

3.4 Problem Solution fit

Project Design Phase-I - Problem Solution Fit **Team ID:** PNT2022TMID19852

DemandEst-AI Powered Food Demand forecaster

Define CS, fit into CC

1. CUSTOMER SEGMENTS CS

A company can employ a machine learning algorithm to forecast changes in consumer demand as precisely as feasible.

6. CUSTOMER CONSTRAINTS CC

Was the output accurately predicted?

Is this product reliable?

5. AVAILABLE SOLUTIONS AS

There are no well-known algorithms that can forecast food demand for longer than ten weeks.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Possibly incorrect data in the heavily processed data set.

9. PROBLEM ROOT CAUSE RC

Data that has been annotated may contain errors.

7. BEHAVIOUR BE

Choose a product that reliably and quickly predicts the output of preprocessed data.

Focus on J&P, tap into BE, understand RC

3. TRIGGERS TR

To as accurately and rapidly forecast food demand as feasible.

10. YOUR SOLUTION SL

These algorithms are able to detect signals for demand fluctuations and automatically identify patterns, discover complex linkages in big data sets, and identify patterns.

8. CHANNELS of BEHAVIOUR CH

Online : Using software that is made available on the internet.

Offline: In order to forecast the demand for food for more than ten weeks, we are seeking assistance from people with experience in the food industry.

Identify strong TR & EM

4. EMOTIONS: BEFORE / AFTER EM

Before: Manual labor and inaccurate forecast.

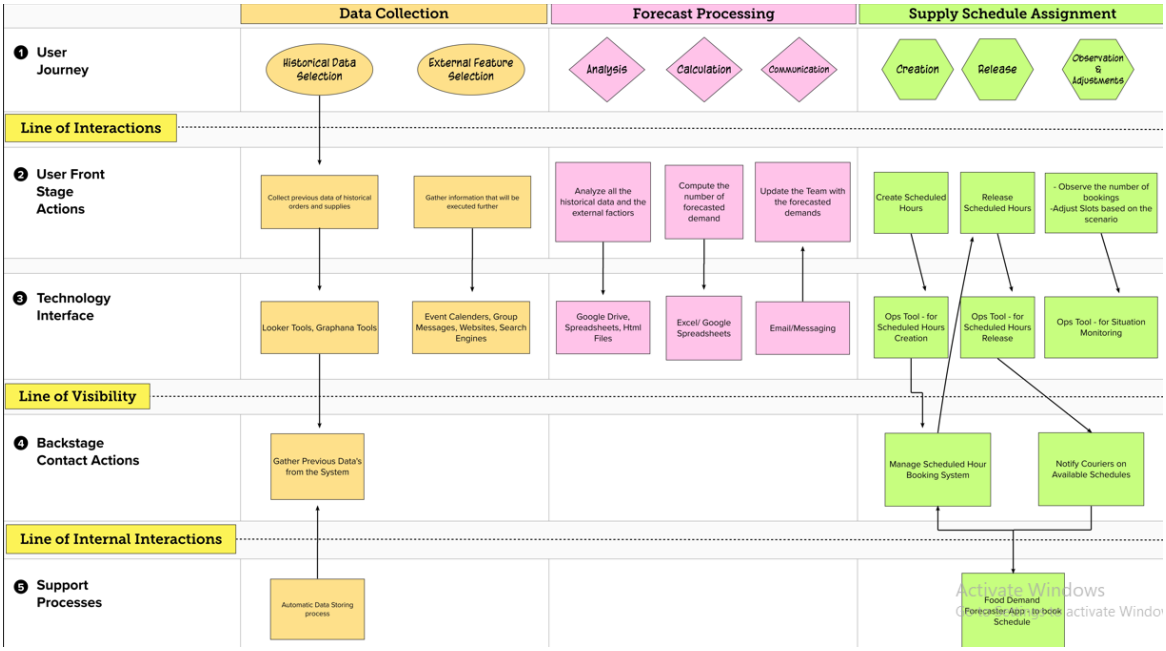
After: Swift and precise.

Identify strong TR & EM

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	PNT2022TMID19852
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**

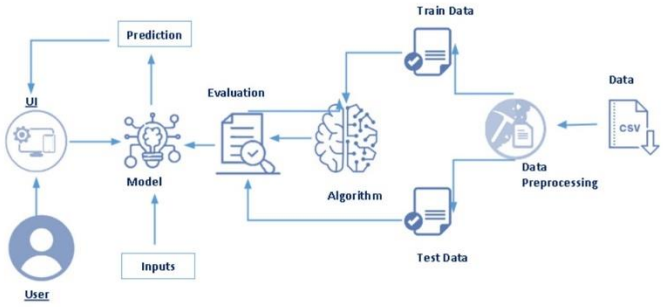


Table-1 : Components & Technologies:

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
3.	Geolocation	Used to reach the destination.	Google map,user address.
4.	Platform owner	Wait for the delivery of food.	Mobile phones and online websites.

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.

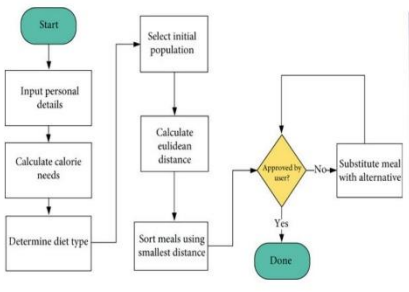
4.3 User Stories

Project Design Phase-II
Data Flow Diagram & User Stories

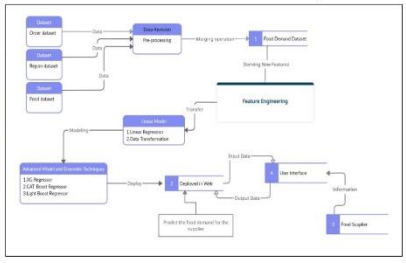
Date	28 October 2022
Team ID	PNT2022TMID19852
Project Name	AI Powered Food Demand Forecaster.
Maximum Marks	

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.



DFD Level 0 (Industry Standard)



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/6.0.0-
beta2/css/all.min.css">
<link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/6.0.0-
beta2/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/6.0.0-
        beta2/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>
```

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: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)
```

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	PNT2022TMID19852
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

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

Section	TotalCases	Not Tested	Fail	Pass
PrintEngine	6	0	0	6
ClientApplication	47	0	0	47
Security	2	0	0	2

Test Case Report

Date	15 November 2022
Team ID	PNT2022TMID19852
Project Name	Project–DemandEst-AI Powered Food Demand Forecaster

Testcase_ id	Feature_ type	component	scenario	Pre-requisite	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	Kamalesh AR

Project Development Phase
Sprint 4

Date	15 November 2022
Team ID	PNT2022TMID19852
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 Pre-Conditions. **Step 4:** Test Data. **Step 5:** Steps to be Executed. **Step 6:** Expected Result. **Step 7:** Actual Result and Post-Conditions. **Step 8:** Pass/Fail.	Passed	Kamalesh

6. TESTING:

Project Development Phase
Model Performance Test

Date	15 November 2022
Team ID	PNT2022TMID19852
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	

```
In [36]: print("R-Squared::{}".format(grid_cv_dtm.best_score_))
         print("Best Hyperparameters::\n{}".format(grid_cv_dtm.best_params_))

R-Squared::0.7491137865005842
Best Hyperparameters::
{'max_leaf_nodes': None, 'min_samples_leaf': 4, 'min_samples_split': 16}
```

```
In [39]: df = pd.DataFrame(data=grid_cv_dtm.cv_results_)
         df.head()
```

Out[39]:

	mean_fit_time	std_fit_time	mean_score_time	std_score_time	param_max_leaf_nodes	param_min_samples_leaf	param_min_samples_split	params
0	5.124407	1.065213	0.064598	0.028866	None	1	2	{'max_leaf_nodes': None, 'min_samples_leaf': 1, ...
1	4.910303	0.489172	0.059054	0.000248	None	1	4	{'max_leaf_nodes': None, 'min_samples_leaf': 1, ...
2	4.597915	0.328308	0.059024	0.000244	None	1	8	{'max_leaf_nodes': None, 'min_samples_leaf': 1, ...
3	4.148344	1.028443	0.043753	0.011934	None	1	16	{'max_leaf_nodes': None, 'min_samples_leaf': 1, ...
4	4.017286	0.786491	0.058191	0.009478	None	2	2	{'max_leaf_nodes': None, 'min_samples_leaf': 2, ...

```
In [42]: r2_scores = cross_val_score(grid_cv_dtm.best_estimator_, X, y, cv=10)
         mse_scores = cross_val_score(grid_cv_dtm.best_estimator_, X, y, cv=10,scoring='neg_mean_squared_error')

         print("avg R-squared::{:.3f}".format(np.mean(r2_scores)))
         print("MSE::{:.3f}".format(np.mean(mse_scores)))

avg R-squared::0.123
MSE::-64230.918
```

```
In [45]: grid_cv_dtm.best_estimator_.fit(X_train, y_train)
         y_pred = grid_cv_dtm.best_estimator_.predict(X_test)
         y_pred[y_pred<0] = 0
         from sklearn import metrics
         print('RMSLE:', 100*np.sqrt(metrics.mean_squared_log_error(y_test, y_pred)))

RMSLE: 52.85812511759974
```

```
In [ ]:
```

Tuning the model Using GridSearchCV

```
In [33]: from sklearn import preprocessing
         from sklearn.model_selection import GridSearchCV, cross_val_score, cross_val_predict
         import seaborn as sns
         import matplotlib.pyplot as plt
         sns.set_style('whitegrid')
         sns.set_context('talk')
         params = {'legend.fontsize': 'x-large',
                   'figure.figsize': (30, 10),
                   'axes.labelsize': 'x-large',
                   'axes.titlesize':'x-large',
                   'xtick.labelsize':'x-large',
                   'ytick.labelsize':'x-large'}

         plt.rcParams.update(params)
```

```
In [37]: param_grid = { "min_samples_split": [2, 4, 8, 16], "min_samples_leaf": [1, 2, 3, 4], "max_leaf_nodes": [None, 10, 16, 100] }

         grid_cv_dtm = GridSearchCV(model, param_grid, cv=5)

         grid_cv_dtm.fit(X_train, y_train)

Out[37]: GridSearchCV(cv=5, estimator=DecisionTreeRegressor(),
                      param_grid={'max_leaf_nodes': [None, 10, 16, 100],
                                  'min_samples_leaf': [1, 2, 3, 4],
                                  'min_samples_split': [2, 4, 8, 16]})
```

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/6.0.0-
                beta2/css/all.min.css">
                <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/6.0.0-
                beta2/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/6.0.0-
    beta2/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-19999-1659710722