DemandEst - AI Powered Food Demand Forecaster

PROJECT REPORT

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Department of ELECTRONICS AND COMMUNICATION ENGINEERING

BONAFIDE CERTIFICATE

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ABSTRACT

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

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.

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1. INTRODUCTION

1.1 OVERVIEW

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

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

The replenishment of the majority of raw materials is done on weekly basis and since the raw material is perishable, the procurement planning is of utmost importance. Also the recruiting of staff members at the fulfillment center is an prospect wherein the prediction of orders would be beneficial. Although this is a process that can be done manually.

2.2 REFERENCE

- Adi, G. N. (2018, March 9). Thousands of GO-CAR Drivers on Strike in Surakarta. The Jakarta Post. https://www.thejakartapost.com/news/2018/03/08/thousands-of-go-car-drivers-on-strike-in-surak arta.html

- Alkhatib, A., & Bernstein, M. (2019, May). Street-level algorithms: A theory at the gaps between policy and decisions. In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (pp. 1-13).

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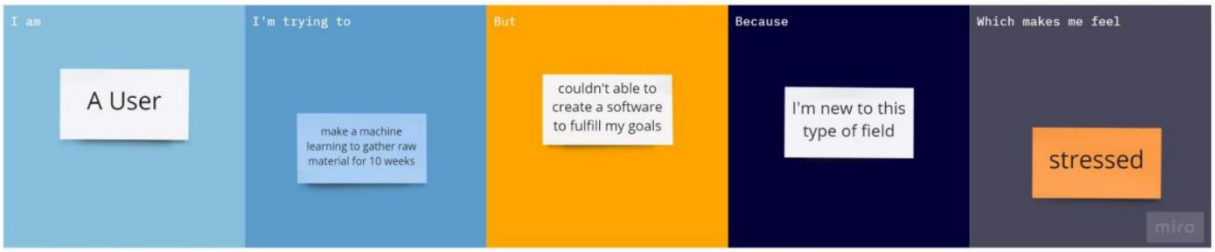
- Colley, A., & Häkkilä, J. (2018, November). Service Design Methods for Human Computer Interaction. In Proceedings of the 17th International Conference on Mobile and Ubiquitous Multimedia (pp. 563-566).

- Clarke, S. (2006). Transformation Lessons from Coca-Cola Enterprises Inc.: Managing the Introduction of a Structured Forecast Process. Foresight: The International Journal of Applied Forecasting, (4), 21-25.

2.3 PROBLEM STATEMENT DEFINITION

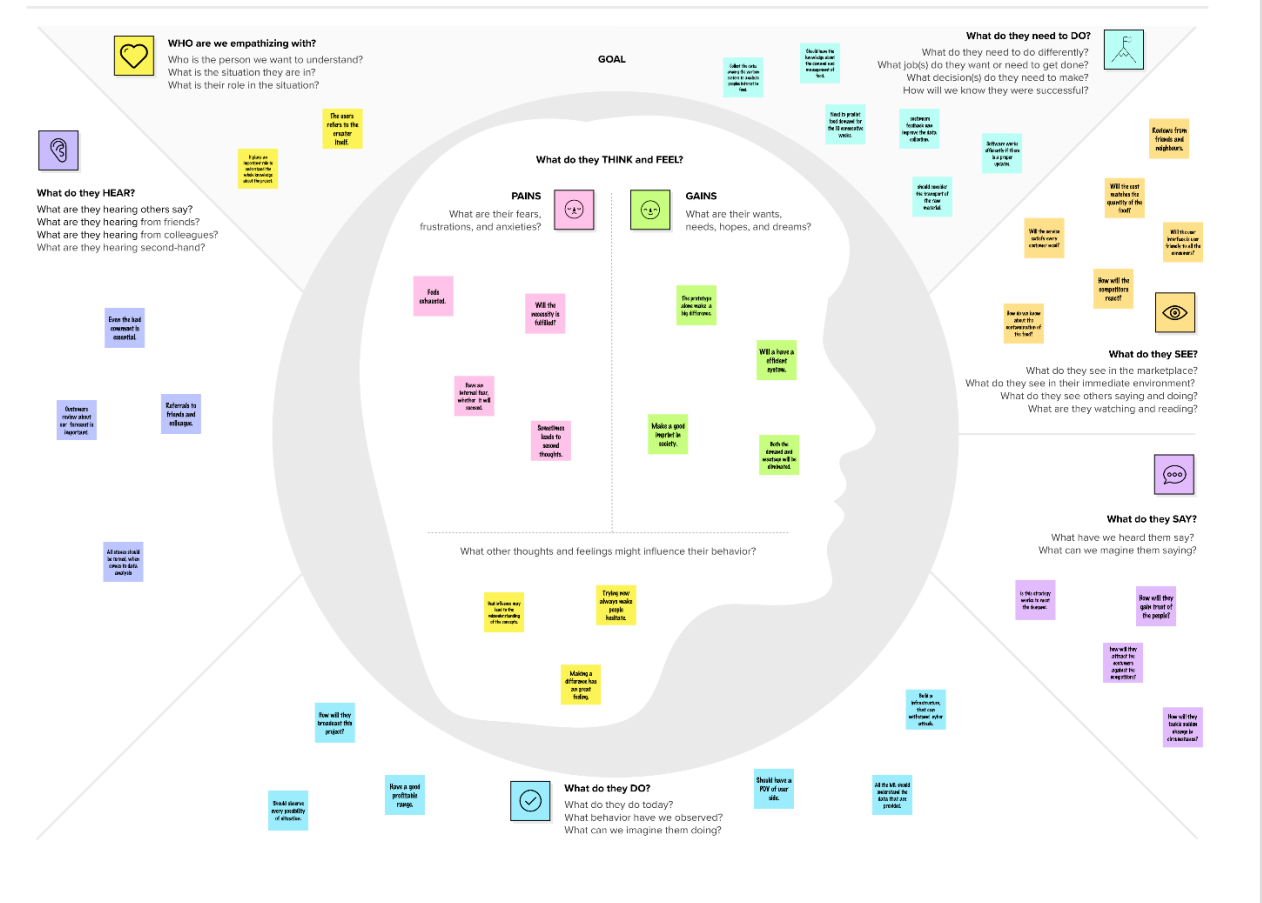


3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

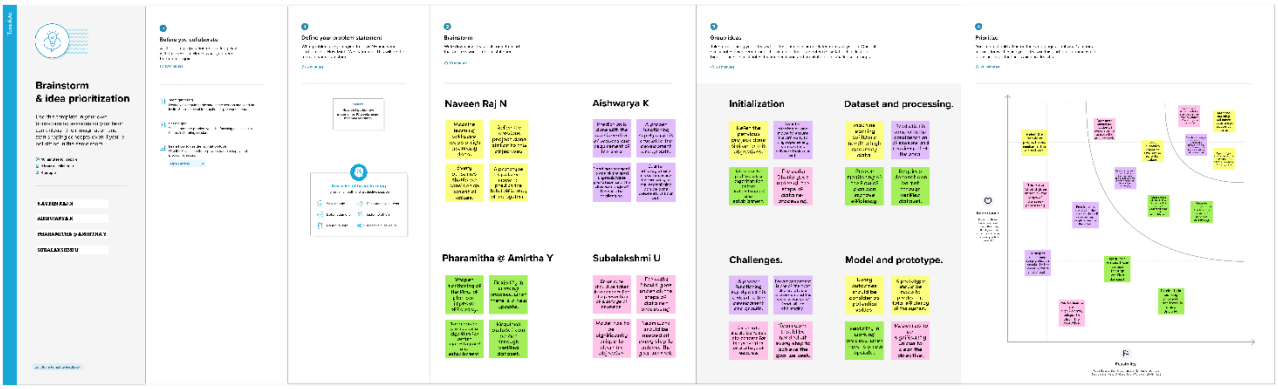
An empathy map is a collaborative visualization used to articulate what we know about a particular type of user. It externalizes knowledge about users in order to 1) create a shared understanding of user needs, and 2) aid in decision making.

Traditional empathy maps are split into 4 quadrants (Says, Thinks, Does, and Feels), with the user or persona in the middle. Empathy maps provide a glance into who a user is as a whole and are not chronological or sequential.



3.2 Ideation & Brainstorming

Brainstorming is a method design teams use to generate ideas to solve clearly defined design problems. In controlled conditions and a free-thinking environment, teams approach a problem by such means as “How Might We” questions. They produce a vast array of ideas and draw links between them to find potential solutions



Everyone in a design team should have a *clear* definition of the target problem. They typically gather for a brainstorming session in a room with a large board/wall for pictures/Post-Its. A good mix of participants will expand the experience pool and therefore broaden the idea space.

3.2 Proposed Solution

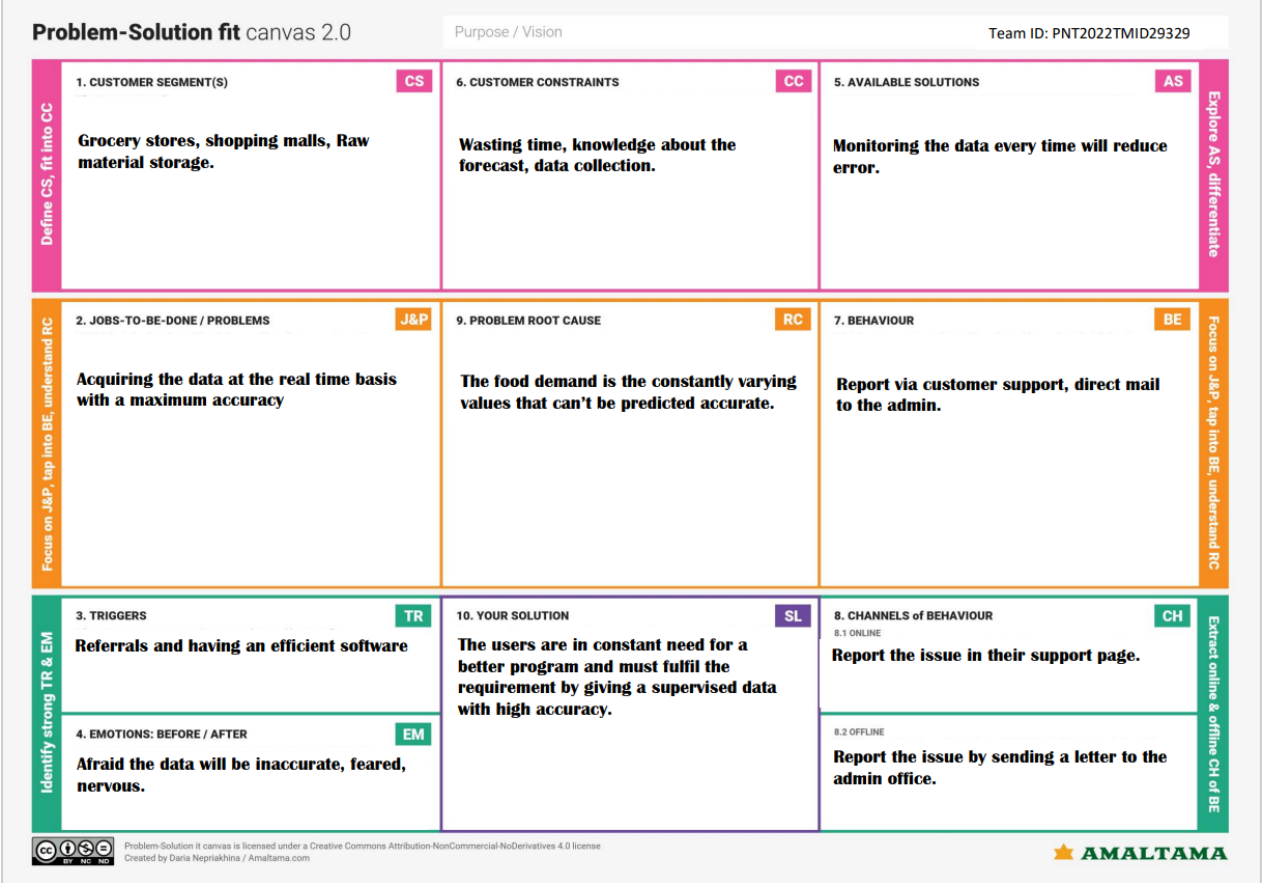
Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Forecast at real time, acquire accurate data.
2.	Idea / Solution description	All the data are feed to the server in real time with maximum accuracy.
3.	Novelty / Uniqueness	Compare to others the is more accurate and are predicted by advance Machine Learning.
4.	Social Impact / Customer Satisfaction	Costumers have a user-friendly interface and compute more no of data. Serve a green Environment.
5.	Business Model (Revenue Model)	On an average of annual turn over will increase due to the satisfaction of society from food demand.
6.	Scalability of the Solution	This solution will serve all the needs that required from the users.

Proposed Solution means the technical solution to be provided by the Implementation agency in response to the requirements and the objectives of the Project.Proposed Solution means the Proposed System with modifications that meet the Agency's requirements as set forth in this RFP.Proposed Solution means the combination of software, hardware, other products or equipment, and any and all services (including any installation, implementation, training, maintenance and support services) necessary to implement the solution described by Vendor in its Proposal

3.4 Problem Solution Fit

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem.



4. REQUIREMENT ANALYSIS

4.1 Functional requirement

Functional requirements may involve calculations, technical details, data manipulation and processing, and other specific functionality that define what a system is supposed to accomplish. Behavioral requirements describe all the cases where the system uses the functional requirements, these are captured in use cases.

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Interface	Default configuration set for the new users. Users can customise the interface to their need.
FR-4	Updates	Users should get daily updates.
FR-5	Needed permission	Software should get all the permission required.
FR-6	Customer support	Users have the access to call and report to help.

4.2 Non-Functional requirements

In systems engineering and requirements engineering, a non-functional requirement (NFR) is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviours.

Non-functional Requirements:

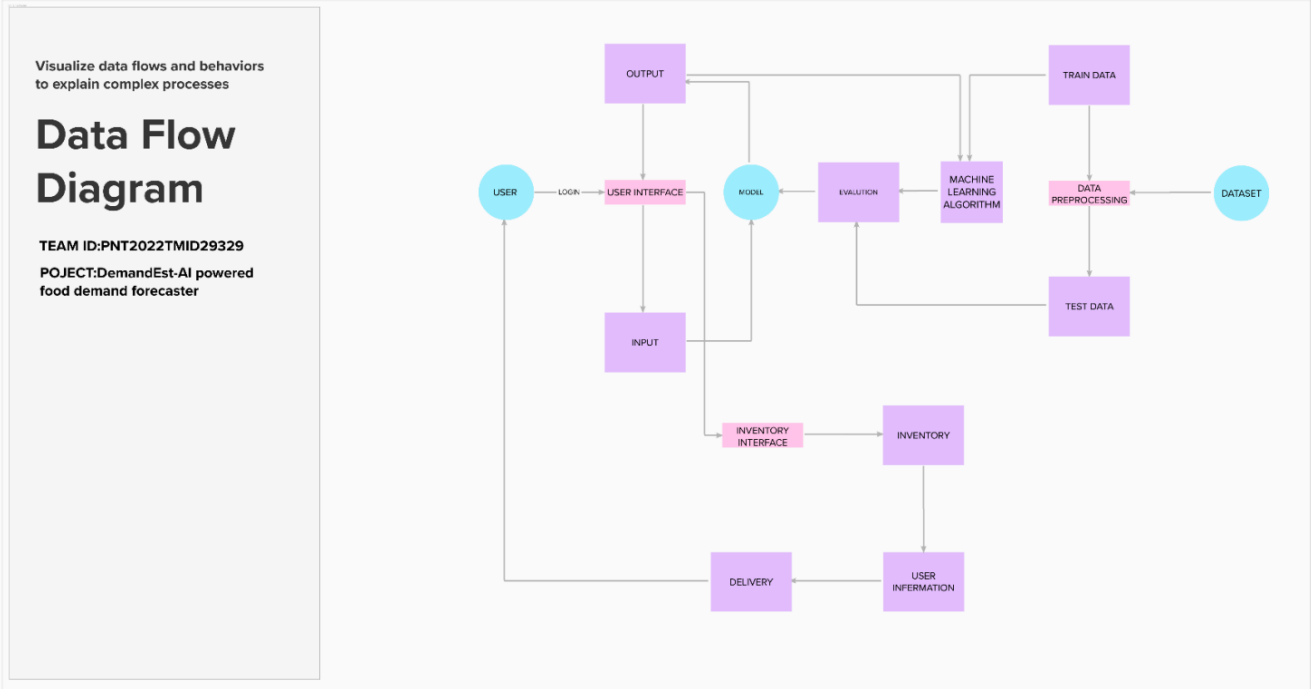
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Users with any device and a stable network can access the software
NFR-2	**Security**	Only the administrator will be allowed to view and edit the data.
NFR-3	**Reliability**	Software will be functional to its previous up-to-date update and can be updated any time.
NFR-4	**Performance**	The front-page loads in 2 secs with LTE networks. Loading of pages is less than 3 sec.
NFR-5	**Availability**	While a maintenance is in progress, the page which are not in progress will functional, maybe with a traffic.
NFR-6	**Scalability**	The website traffic is limit to 1 lakh users at a time.

5. PROJECT DESIGN

5.1 Data Flow Diagrams

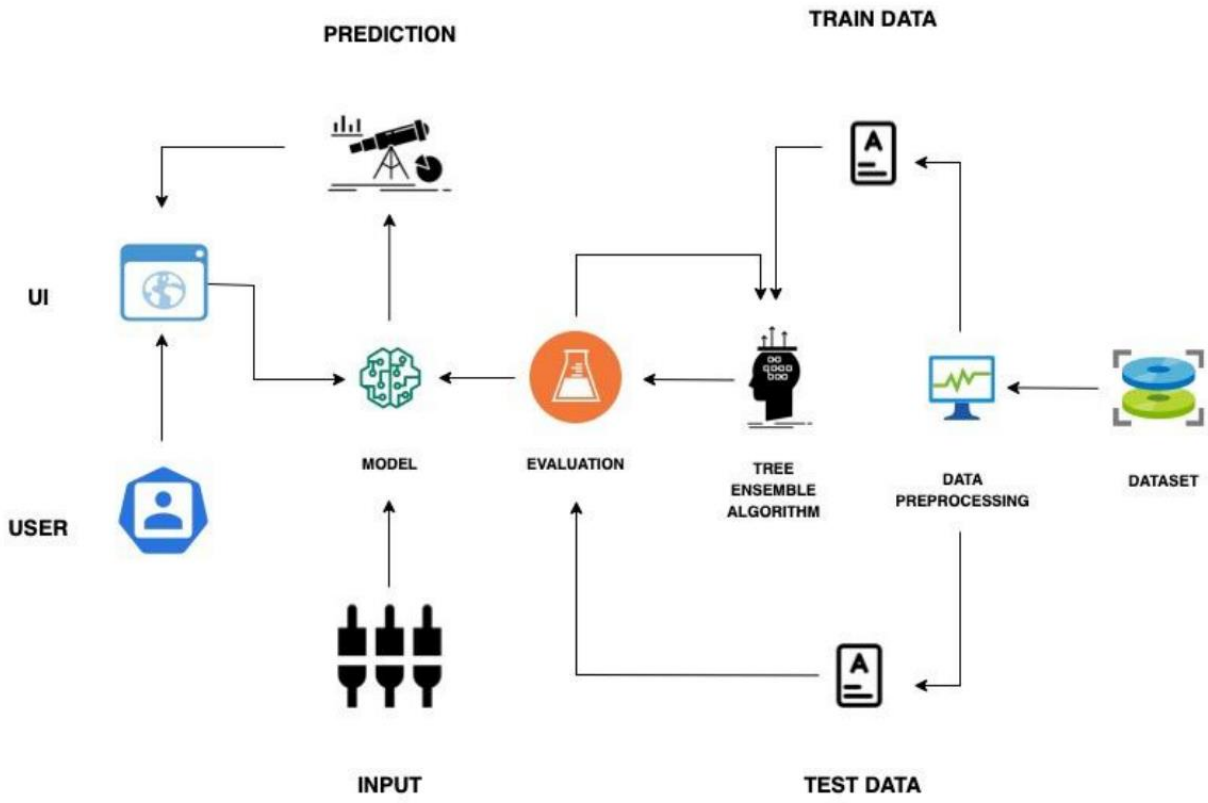
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



1.1 Solution & Technical Architecture

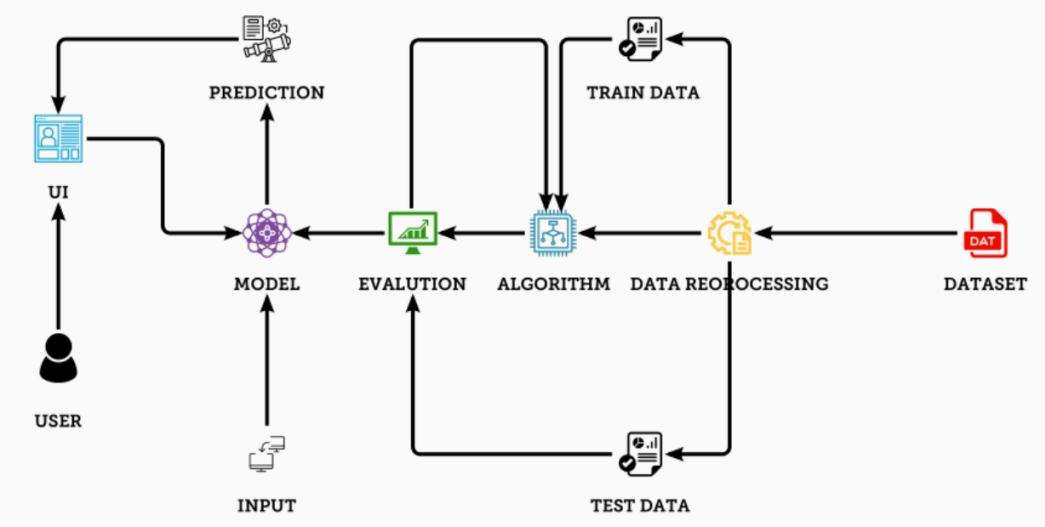
Solution Architecture:

A solution architecture (SA) is an architectural description of a specific solution. SAs combine guidance from different enterprise architecture viewpoints (business, information and technical), as well as from the enterprise solution architecture (ESA).



Technical Architecture:

Technical Architecture (TA) is a form of IT architecture that is used to design computer systems. It involves the development of a technical blueprint with regard to the arrangement, interaction, and interdependence of all elements so that system-relevant requirements are met.



1.2 User Stories

A user story is an informal, general explanation of a software feature written from the perspective of the end user or customer. The purpose of a user story is to articulate how a piece of work will deliver a particular value back to the customer

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	HTML, CSS, JavaScript / Angular Js / React Js etc.
2.	Application Logic-1	Logic for a process in the application	Java / Python
3.	Application Logic-2	Logic for a process in the application	IBM Watson STT service
4.	Application Logic-3	Logic for a process in the application	IBM Watson Assistant
5.	Database	Data Type, Configurations etc.	MySQL, NoSQL, etc.
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
7.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
8.	External API-1	Purpose of External API used in the application	IBM Weather API, etc.
9.	External API-2	Purpose of External API used in the application	Aadhar API, etc.
10.	Machine Learning Model	Purpose of Machine Learning Model	Object Recognition Model, etc.
11.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration :	Local, Cloud Foundry, Kubernetes, etc.

2. PROJECT PLANNING & SCHEDULING

2.1 Sprint Planning & Estimation

In Scrum Projects, Estimation is done by the entire team during Sprint Planning Meeting. The objective of the Estimation would be to consider the User Stories for the Sprint by Priority and by the Ability of the team to deliver during the Time Box of the Sprint.

Sprint	Functional Requirement	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	4	High	Naveen raj N Aishwarya K Pharamitha @ Amirtha Y Subalakshmi U
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application usage.	4	High	Naveen raj N Aishwarya K Pharamitha @ Amirtha Y Subalakshmi U
Sprint-1		USN-3	As a user, If I already have an account or have successfully. I can click the Login hypertext link to be taken to the login page.	4	Medium	Naveen raj N Aishwarya K Pharamitha @ Amirtha Y Subalakshmi U
Sprint-2	Login	USN-4	As a user, I can enter my email ID and password that I have used for creating account	4	High	Naveen raj N Aishwarya K Pharamitha @ Amirtha Y Subalakshmi U

Sprint	Functional Requirement	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2	Dashboard	USN-5	As a user, I can click the login button and login to the dashboard.	4	High	Naveen raj N Aishwarya K Pharamitha @ Amirtha Y Subalakshmi U
Sprint-3	Validation	USN-7	The email and password will be as a query variable to check the credential that has been registered already	5	High	Naveen raj N Aishwarya K Pharamitha @ Amirtha Y Subalakshmi U
Sprint-3	Prediction	USN-6	As a user, I should the time period and location to forecast demand	5	High	Naveen raj N Aishwarya K Pharamitha @ Amirtha Y Subalakshmi U
Sprint-3		USN-8	As a user, After I provide the input. I have to press the predict button.	5	High	Naveen raj N Aishwarya K Pharamitha @ Amirtha Y Subalakshmi U
Sprint-4	Uncertainty	USN-9	As a user, I want the prediction to be accurate. I shouldn't uncertain about the result	10	High	Naveen raj N Aishwarya K Pharamitha @ Amirtha Y Subalakshmi U
Sprint-4	Tangibility	USN-10	As a user, I require visualisation of understanding and the anticipated outcome as a user.	10	High	Naveen raj N Aishwarya K Pharamitha @ Amirtha Y Subalakshmi U
Sprint-4	Logout	USN-11	As a user, I can log out safely after finding the result	5	Medium	Naveen raj N Aishwarya K Pharamitha @ Amirtha Y Subalakshmi U

1.1 Sprint Delivery Schedule

A sprint schedule is a document that outlines sprint planning from end to end. It's one of the first steps in the agile sprint planning process—and something that requires adequate research, planning, and communication.

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:

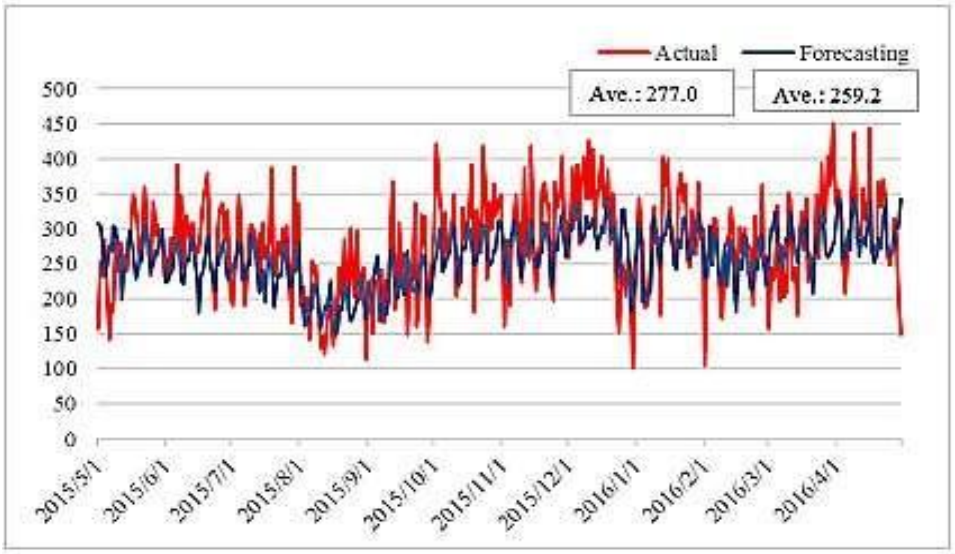
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Average velocity of sprint-1: AV = 20/6 = 3.33
Average velocity of sprint-2: AV = 20/6 = 3.33
Average velocity of sprint-3: AV = 20/6 = 3.33
Average velocity of sprint-4: AV = 20/6 = 3.33

1.2 Reports From JIRA

Jira helps teams plan, assign, track, report, and manage work and brings teams together for everything from agile software development and customer support to start-ups and enterprises. Software teams build better with Jira Software, the #1 tool for agile teams.



2. CODING & SOLUTIONING

2.1 Data Dictionary

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

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

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

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

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

- meal_info.csv: Contains information of each meal being served.

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

2.2 Libraries Used

pandas, numpy, scikit learn, matplotlib, seaborn, xgboost, lightgbm, catboost

2.3 Data Pre-Processing

- There are no Missing/Null Values in any of the three datasets.
- Before proceeding with the prediction process, all the three data sheets need to be merged into a single dataset. Before performing the merging operation, primary feature for combining the datasets needs to be validated.
- The number of Center IDs in train dataset is matching with the number of Center IDs in the Centers Dataset i.e 77 unique records. Hence, there won't be any missing values while merging the datasets together.
- The number of Meal IDs in train dataset is matching with the number of Meal IDs in the Meals Dataset i.e 51 unique records. Hence, there won't be any missing values while merging the datasets together.
- As checked earlier, there were no Null/Missing values even after merging the datasets.

2.4 Feature Engineering

Feature engineering is the process of using domain knowledge of the data to create features that improves the performance of the machine learning models.

With the given data, We have derived the below features to improve our model performance.

- Discount Amount : This defines the difference between the “base_Price” and “checkout_price”.
- Discount Percent : This defines the % discount offer to customer.
- Discount Y/N : This defines whether Discount is provided or not - 1 if there is Discount and 0 if there is no Discount.
- Compare Week Price : This defines the increase / decrease in price of a Meal for a particular center compared to the previous week.
- Compare Week Price Y/N : Price increased or decreased - 1 if the Price increased and 0 if the price decreased compared to the previous week.
- Quarter : Based on the given number of weeks, derived a new feature named as Quarter which defines the Quarter of the year.
- Year : Based on the given number of weeks, derived a new feature named as Year which defines the Year.

2.5 Data Transformation

- Logarithm transformation (or log transform) is one of the most commonly used mathematical transformations in feature engineering. It helps to handle skewed data and after transformation, the distribution becomes more approximate to normal.
- In our data, the target variable 'num_orders' is not normally distributed. Using this without applying any transformation techniques will downgrade the performance of our model.
- Therefore, we have applied Logarithm transformation on our Target feature 'num_orders' post which the data seems to be more approximate to normal distribution.
- After Log transformation, We have observed 0% of Outlier data being present within the Target Variable – num_orders using 3 IQR Method.

2.6 Evaluation Metric

The evaluation metric for this competition is 100*RMSLE where RMSLE is Root of Mean Squared Logarithmic Error across all entries in the test set.

2.7 Initial Approach

- Simple Linear Regression model without any feature engineering and data transformation which gave a RMSE : 225.001
- Without feature engineering and data transformation, the model did not perform well and could'nt give a good score.
- Post applying feature engineering and data transformation (log and log1p transformation), Linear Regression model gave a RMSLE score of 0.634.

2.8 Advanced Models

- With improvised feature engineering, built advanced models using Ensemble techniques and other Regressor algorithms.
- Decision Tree Regressors performed well on the model which gave much reduced RMSLE.
- With proper hyper-parameter tuning, Decision Tree Regressor performed well on the model and gave the lease RMSLE of 0.5237

3. TESTING

3.1 Test Cases

A test case includes information such as test steps, expected results and data while a test scenario only includes the functionality to be tested.

Test case ID	Feature Type	Component	Test Scenario
LoginPage_TC_OO1	Functional	App	Run the Application to show the home page.
LoginPage_TC_OO2	UI	Home Page	Verify the UI elements
LoginPage_TC_OO3	Functional	Home page	Click on the predict to open the prediction page
LoginPage_TC_OO4	Functional	Predict page	Enter the values and execute to see result.

Pre-Requisite	Steps To Execute	Test Data	Expected Result
Run the application	1.Run the application.	IBM_app.py	Open the home page
Step into the UI interface	1.Click on page. 2.Click on the predict button 3.Redirect to the predict page	home.html	UI interface is visible to peform prediction.
Open the home page.	1.Click on the predict in home page 2.Redirect to predict page	home.html	User should navigate to predict page.
Open the predict page	1.Enter the values. 2.click on pedict.	upload.html	User gets the no of orders as a result.

Actual Result	Status	Commnets	TC for Automation(Y/N)	BUG ID	Executed By
Working as expected	Pass	All clear	y	no	Naveen raj N
Working as expected	Pass	All clear	y	no	Aishwarya K
Working as expected	Pass	All clear	y	no	Pharamitha @ Amirtha Y
Working as expected	Pass	All clear	y	no	Subalakshmi U

3.2 User Acceptance Testing

User Acceptance Testing (UAT), which is performed on most UIT projects, sometimes called beta testing or end-user testing, is a phase of software development in which the software is tested in the "real world" by the intended audience or business representative.

Defect Analysis:

Resolution	Severity1	Severity2	Severity3	Severity4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won'tFix	0	0	0	1	1
Totals	24	9	11	26	71

Test Case Analysis:

Section	TotalCases	Not Tested	Fail	Pass
PrintEngine	7	0	0	7
ClientApplication	51	0	0	51
Security	2	0	0	2
OutsourceShipping	3	0	0	3
ExceptionReporting	9	0	0	9
FinalReportOutput	4	0	0	4
VersionControl	2	0	0	2

4. RESULTS

4.1 Performance Metrics

Performance testing is the practice of evaluating how a system performs in terms of responsiveness and stability under a particular workload. Performance tests are typically executed to examine speed, robustness, reliability, and application size.

S.No.	Parameter	Values	Screenshot
1.	Metrics	**Regression Model:** MAE –105.93055528844432 MSE –50625.66862688001 RMSE –225.00148583260514 R2 score -0.6645666634919214	Attached below
2.	Tune the Model	Hyperparameter Tuning - GridSearchCV Validation Method – KFold cross Validation	Attached below

Metrics:

```
In [32]: DT=DecisionTreeRegressor()
         DT.fit(x_train,y_train)
         y_pred=DT.predict(x_val)
         y_pred[y_pred<0]=0
         from sklearn import metrics
         print('RMSLE:',100*np.sqrt(metrics.mean_squared_log_error(y_val,y_pred)))

         RMSLE: 62.76267907544625

In [33]: from sklearn.metrics import r2_score
         test_score=r2_score(y_val,y_pred)
         test_score

Out[33]: 0.6645666634919214

In [34]: train_score=DT.score(x_train,y_train)
         train_score

Out[34]: 0.6792448145375074

In [35]: from sklearn import metrics

         print('MAE:', metrics.mean_absolute_error(y_val,y_pred))
         print('MSE:', metrics.mean_squared_error(y_val,y_pred))
         print('RMSE:', np.sqrt(metrics.mean_squared_error(y_val,y_pred)))

         MAE: 105.93055528844432
         MSE: 50625.66862688001
         RMSE: 225.00148583260514
```

Tune modeling:

```
In [41]: from sklearn.model_selection import GridSearchCV

In [42]: param_grid = {
             "max_depth":[3,5,10,15,20,None],
             "min_samples_split":[2,5,7,10],
             "min_samples_leaf":[1,2,5]
                      }

In [45]: grid_cv= GridSearchCV(DT,param_grid,cv=5,n_jobs=-1)

In [48]: grid_cv.fit(x_train,y_train)
         print('Best Parametrs:',grid_cv.best_params_)

         Best Parametrs: {'max_depth': None, 'min_samples_leaf': 5, 'min_samples_split': 2}

In [49]: from sklearn.model_selection import KFold,cross_val_score
         cv=KFold(n_splits=10)

         print('Trian Data Validation')
         print('Decision Tree :'+str(cross_val_score(DT,x_train,y_train,cv=cv).mean()))

         print('\n\n')
         print('Test Data Validation')
         print('Decision Tree :'+str(cross_val_score(DT,x_val,y_val,cv=cv).mean()))

         Trian Data Validation
         Decision Tree :0.6542250948553616


         Test Data Validation
         Decision Tree :0.6067937915420428
```

5. ADVANTAGES & DISADVANTAGES

Advantages:

1. Food wastage will be minimized.
2. Simple and easy to use framework.

Disadvantages:

1. The output obtained may not be precised, due to the use of limited datasets.

11. APPLICATIONS

This project focuses on one food delivery client, which delivers food in many different cities through distribution networks and fulfillment centers.

12. CONCLUSION

The main moto behind this project is to reduce food wastage.The availability of the food items makes the society better. Our purposed model would definitely come handy to a company for predicting then number of food orders and help them to serve their customers better.

13. FUTURE SCOPE

1. Working on the frontend to make the framework more dynamic.
2. In the future, we also plan to improve forecasting accuracy and research on the efficiency of store management.

14. APPENDIX

SOURCE CODE:

home.html

```
<!DOCTYPE html>
<html>
<head>
<title>Home</title>
<style>
.navbar
{
margin: 0px;
padding:20px;
background-color:white;
opacity:0.6;
color:black;
font-family:'Roboto',sans-serif;
font-style: italic;
border-radius:20px;
font-size:25px;
}
a
{
color:grey;
float:right;
text-decoration:none;
font-style:normal;
padding-right:20px;
}
a:hover{
background-color:black;
color:white;
border-radius:15px;0
font-size:30px;
padding-left:10px;
}
p
{
color:white;
```

```
font-style:italic;
font-size:30px;
}
body
{
background-image:
url("https://as1.ftcdn.net/v2/jpg/01/54/14/86/1000_F_154148685_yvijeC6L2SFpvqFJ5H1lunPg40FzCAf1.jpg");
background-size: cover;
}
</style>
</head>
<body>
<div class="navbar">
<a href="/pred">Predict</a>
<a href="/home">Home</a>
<br>
</div>
<br>
<center><b><font color="yellow" size="15" font-family="Comic Sans MS" >Food Demand Forecasting</font></b></center>
<div>
<br>
<center>
<p>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.</p>
</center>
</div>
</body>
</html>
```

upload.html

```
<html lang="en">

    <head>
        <title>Predict</title>
        <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css" rel="stylesheet">
    <style>
    .bar
```

```
    {
    margin: 0px;
    padding:20px;
    background-color:white;
    opacity:0.6;
    color:black;
    font-family:'Roboto',sans-serif;
    font-style: italic;
    border-radius:20px;
    font-size:25px;
    }
    a
    {
    color:red;
    float:right;
    text-decoration:none;
    font-style:normal;
    padding-right:20px;
    }
    a:hover{
    background-color:black;
    color:white;
    border-radius:15px;0
    font-size:30px;
    padding-left:10px;
    }
    body
    {
    background-image: url("https://img.freepik.com/free-photo/top-view-circular-
food-frame_23-
2148723455.jpg?w=1060&t=st=1669017590~exp=1669018190~hmac=6c79e8265999315c36c8f80c
a61489c9c1528b3cb4317830de3f40d7abe3e19f");
    background-size: cover;
    }
    p
    {
    color:white;
    font-style:italic;
    font-size:30px;
    }
    h1,h2
    {
     color:0101DF;
    }
    </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>
       <select id="city_code" name="city_code">
<option value="">City Code</option>
    <option value="590">590</option>
    <option value="526">526</option>
    <option value="638">638</option>
    <option value="others">Others</option>

  </select><br><br>
     <select id="region_code" name="region_code">
<option value="">Region Code</option>
    <option value="23">23</option>
    <option value="34">34</option>
    <option value="35">35</option>
    <option value="56">56</option>
    <option value="71">71</option>
```

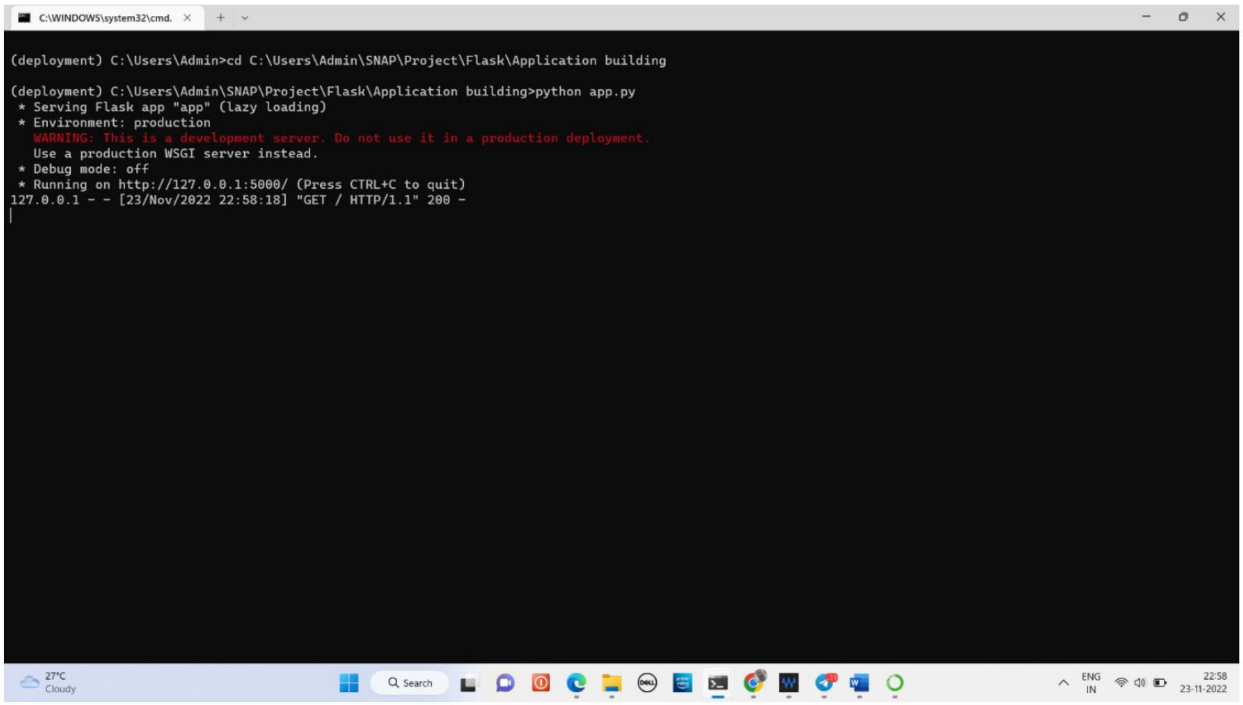
```
    <option value="77">77</option>
    <option value="85">85</option>
    <option value="93">93</option>
    </select><br><br>

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

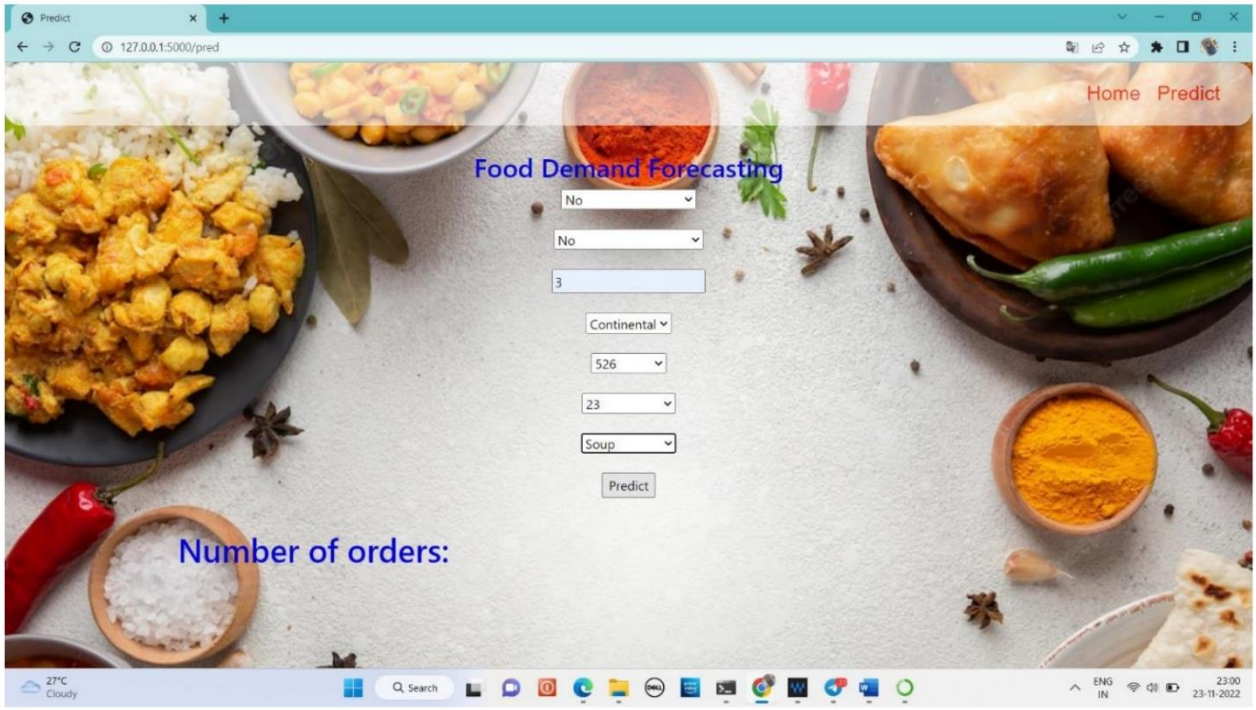
app.py

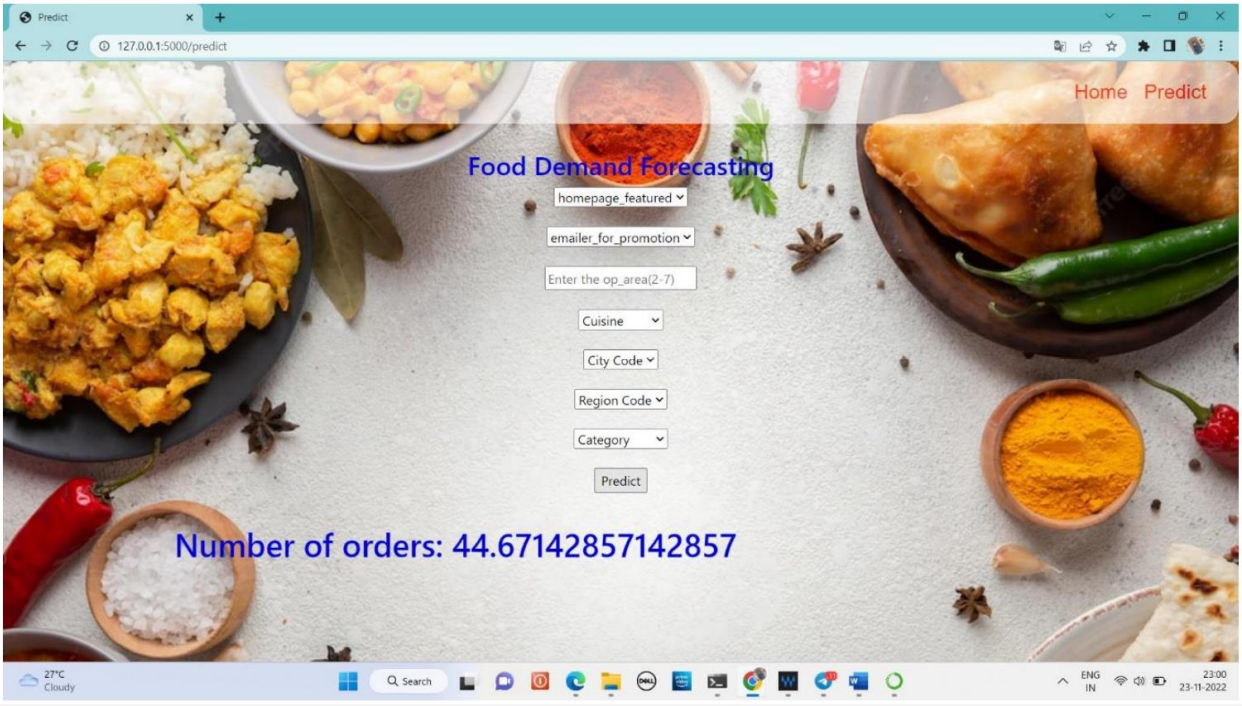
```
# import the necessary packages
import pandas as pd
import numpy as np
import pickle
import os
import requests

# NOTE: you must manually set API_KEY below using information retrieved from your
IBM Cloud account.
API_KEY = "qczbD3OcAicvxYwUvp-Hz1eYV1uuSbkH2Ei0pn6AZcPW"
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/04d71448-4e34-4ec0-bd34-
3c9bf801ff51/predictions?version=2022-11-20', 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)
```

OUTPUT SCREENSHOTS: n







GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-34216-1660232990

PROJECT DEMO LINK:

https://drive.google.com/file/d/1k-pK3i3yAn2o-zm5UaqVUs0A15ucb95P/view?usp=share_linK