# PROJECT REPORT

# DEMANDEST - AI POWERED FOOD DEMAND FORECASTER

# TEAM ID: PNT2022TMID00218

## 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 recognizing 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

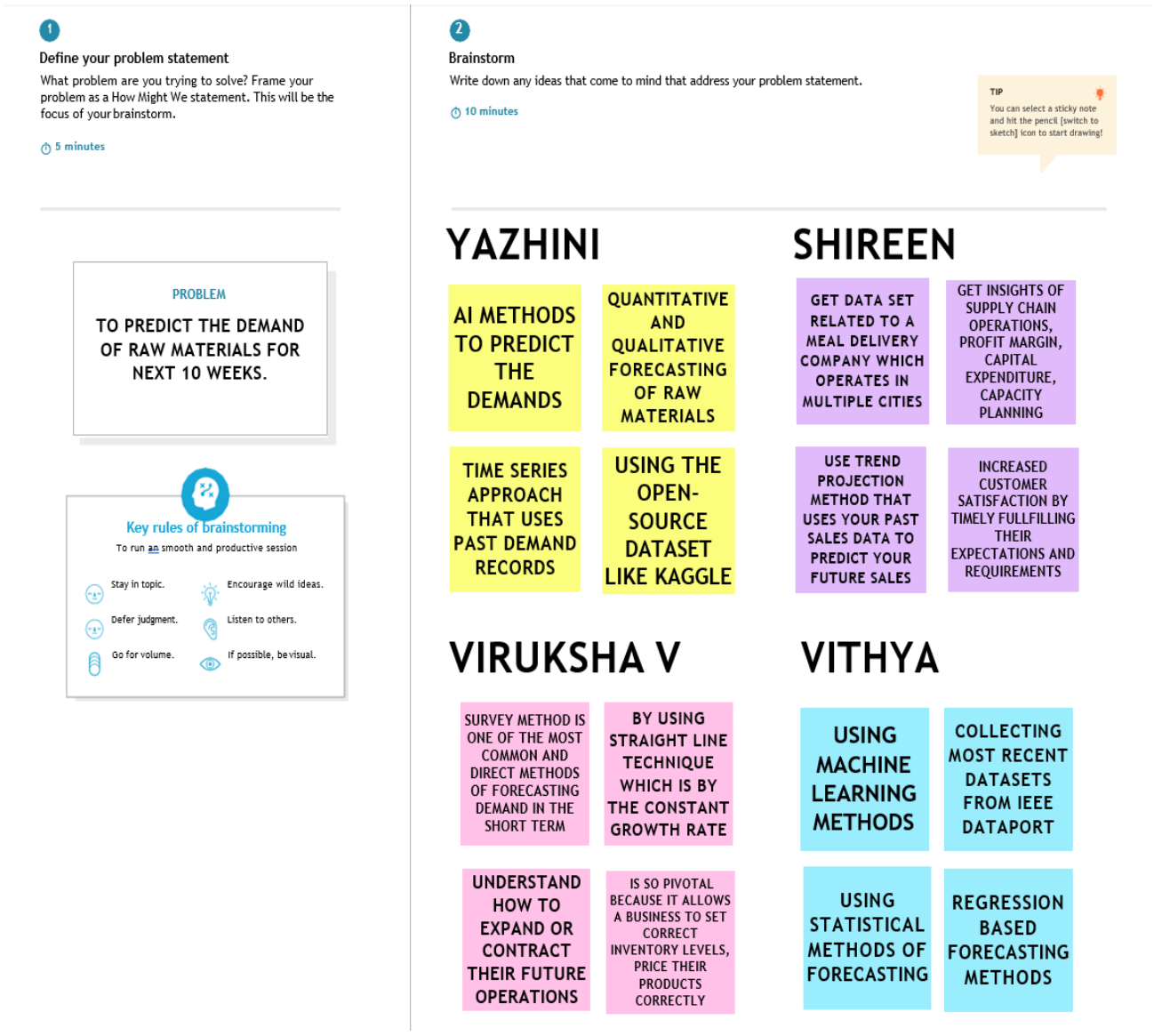
- The data set relates to a food delivery service that has operations throughout several cities. For delivering meal orders to clients, they have a number of fulfilment sites in these cities. The required raw materials are stocked appropriately at the fulfilment centers.

## 3. IDEATION & PROPOSED SOLUTION

### 3.1 EMPATHY MAP CANVAS

EMPATHY MAP FOR FOOD DEMAND FORCASTING

# 3.2 IDEATION & BRAINSTORMING



3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

GROUPING BASED ON METHODS

- AI METHODS TO PREDICT THE DEMANDS
- BY USING STRAIGHT LINE TECHNIQUE WHICH IS BY THE CONSTANT GROWTH RATE
- USE TREND PROJECTION METHOD THAT USES YOUR PAST SALES DATA TO PREDICT YOUR FUTURE SALES
- REGRESSION BASED FORECASTING METHODS

GROUPING BASED ON DATASET

- USING THE OPEN-SOURCE DATASET LIKE KAGGLE
- GET DATA SET RELATED TO A MEAL DELIVERY COMPANY WHICH OPERATES IN MULTIPLE CITIES
- COLLECTING MOST RECENT DATASETS FROM IEEE DATAPORT

GROUPING BASED ON SURVEY

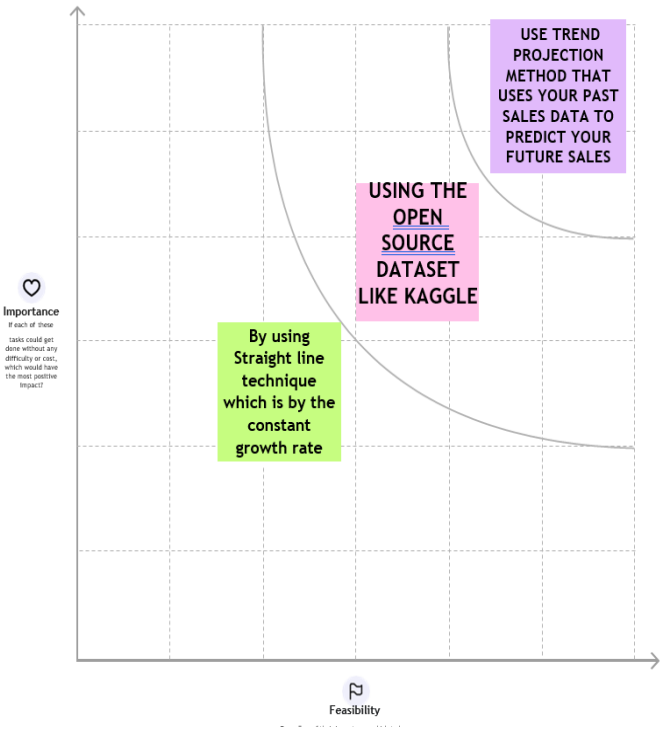
- SURVEY METHOD IS ONE OF THE MOST COMMON AND DIRECT METHODS OF FORECASTING DEMAND IN THE SHORT TERM
- INCREASED CUSTOMER SATISFACTION BY TIMELY FULLFILLING THEIR EXPECTATIONS AND REQUIREMENTS
- UNDERSTAND HOW TO EXPAND OR CONTRACT THEIR FUTURE OPERATIONS

4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes



3.3 PROPOSED SOLUTION

**Project Design Phase-I**
**Proposed Solution Template**

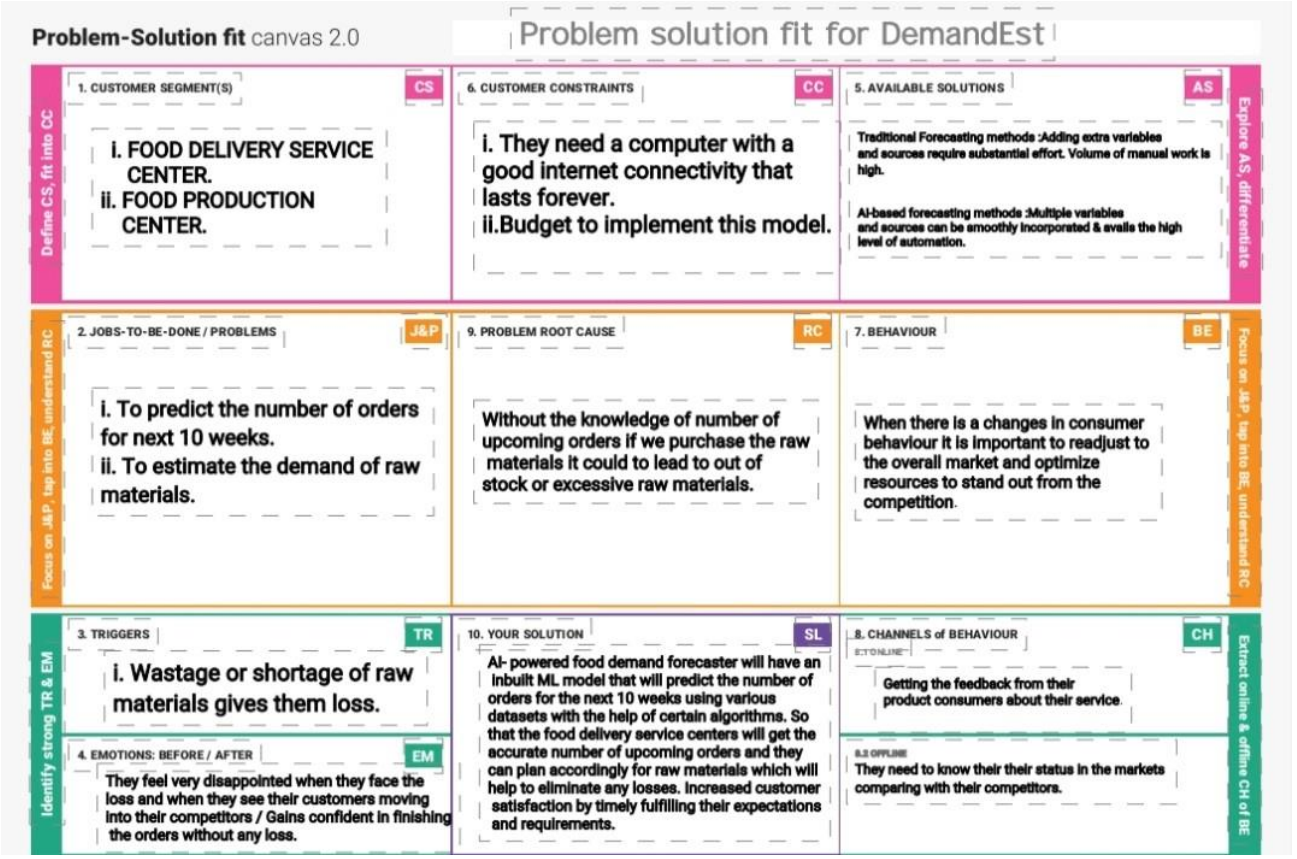
| | |
|---|---|
| Date | 24 September 2022 |
| Team ID | PNT2022TMID00218 |
| Project Name | Project – DemandEst –AI Powered Food Demand Forecaster |
| Maximum Marks | 2 Marks |

**Proposed Solution Template:**

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

| S. No. | Parameter | Description |
|---|---|---|
| 1. | Problem Statement (Problem to be solved) | 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. |
| 2. | Idea / Solution description | 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. |
| 3. | Novelty / Uniqueness | Accurately estimating the demand for the next 10 weeks will help the client to maintain perishable raw materials . Secondly staffing of the centers is also one area wherein accurate demand forecasts are really helpful. |
| 4. | Social Impact / Customer Satisfaction | 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.So these problems of the food delivery service centers will be solved by our model. |
| 5. | Business Model (Revenue Model) | This project will help the food delivery service centers to accurately predict the number of orders for the next 10 weeks which will help them to make necessary arrangements such as perishable raw materials , staffing in centers to avoid any type of losses. |
| 6. | Scalability of the Solution | The project focuses in applying methods to forecast the demand for products of a food industry, which directs its sales to the food service market, in order to base the short to medium term production planning. |

### 3.4 PROBLEM SOLUTION FIT




# 4. REQUIREMENT ANALYSIS

### 4.1 FUNCTIONAL REQUIREMENT

**Project Design Phase-II**
**Solution Requirements**
**(Functional & Non-functional)**

| | |
|---|---|
| Date | 17 October 2022 |
| Team ID | PNT2022TMID00218 |
| Project Name | Project - DemandEst - AI powered Food Demand Forecaster |
| Maximum Marks | 4 Marks |

**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<br>Registration through Gmail<br>Registration through LinkedIN |
| FR-2 | User Confirmation | Confirmation via<br>EmailConfirmation via<br>OTP |
| FR-3 | Home page | The User is directed to the home page |
| FR-4 | Sample use | To gain a feel of how to use it, the user would usethe web application to calculate example ideas. |
| FR-5 | Adding sub-users and creating network | The user could create a network by including his coworkers on his application page. |
| FR-6 | Feedback and support | After deployment, continuous customer support using the feedback |

## 4.2 NON-FUNCTIONAL REQUIREMENTS

**Non-functional Requirements:**

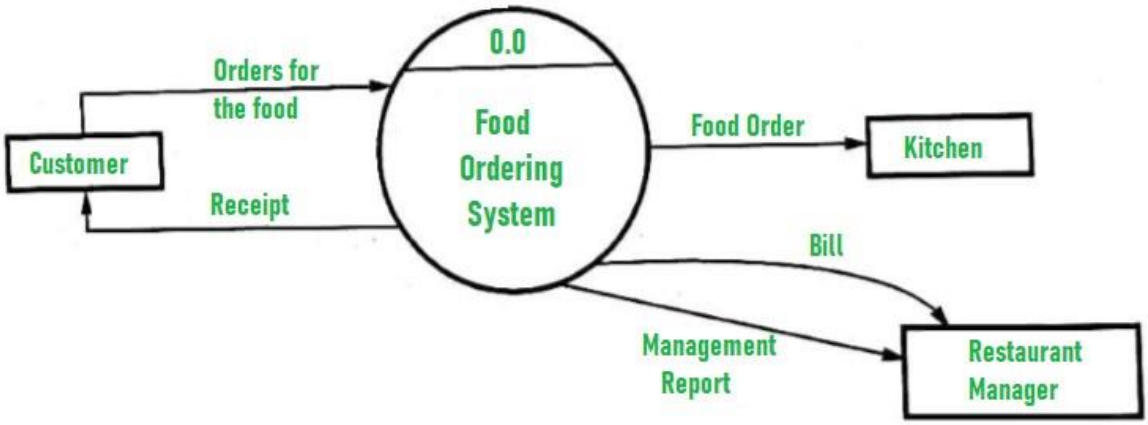
Following are the non-functional requirements of the proposed solution.

| FR No. | Non-Functional Requirement | Description |
|---|---|---|
| NFR-1 | **Usability** | For people who work in the food industry tocalculate how much food is needed for a particular time period, they must use a web application. |
| NFR-2 | **Security** | User's emails and passwords are kept in an encrypted form. The user can only access his database if the password matches the encrypted |

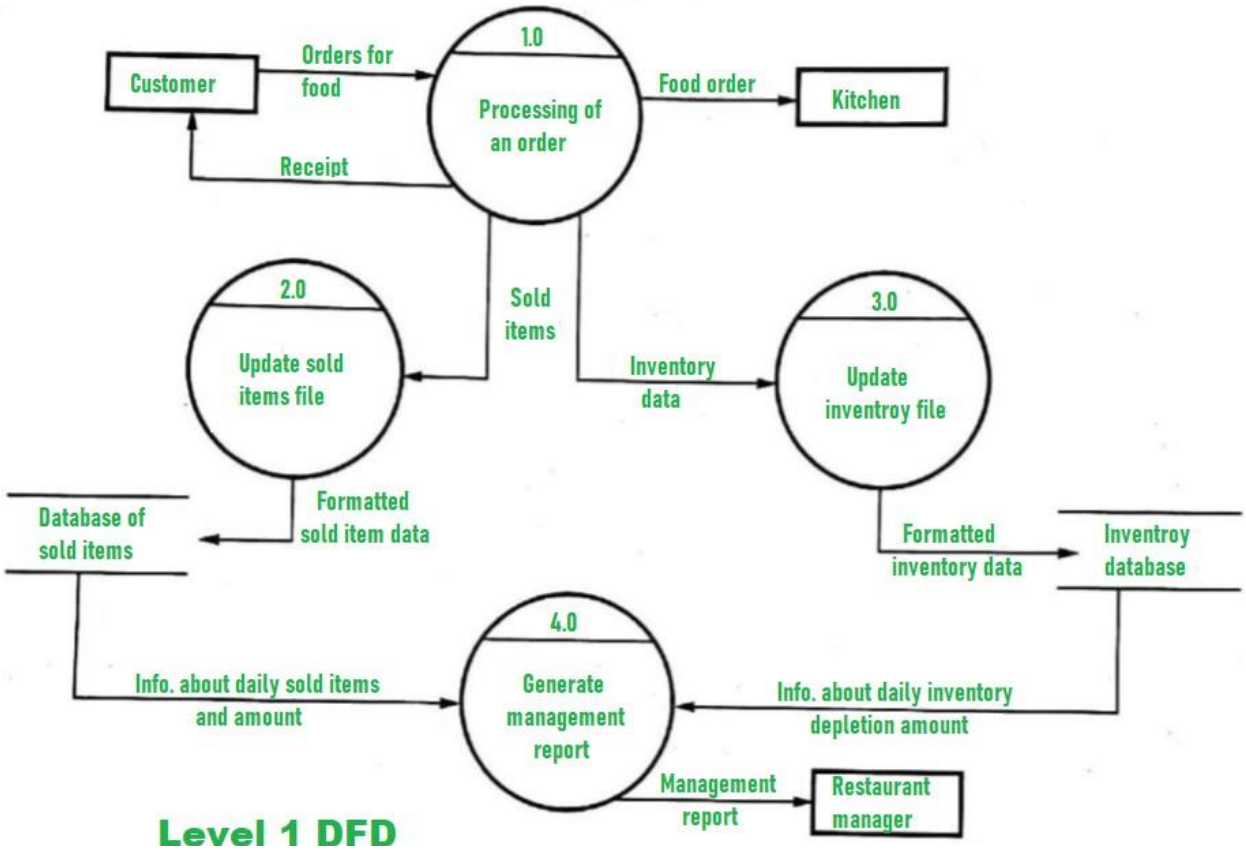
| | | |
|---|---|---|
| | | form. |
| NFR-3 | **Reliability** | Since access to the stored data requires a valid password and verification, the web application's data cannot be hacked. |
| NFR-4 | **Performance** | The web application is created in a way that ensures that performance is constant regardless of how many users are accessing it at once. |
| NFR-5 | **Availability** | The web application is available in all platforms |
| NFR-6 | **Scalability** | It works in a fixed scalability |

# 5. PROJECT DESIGN

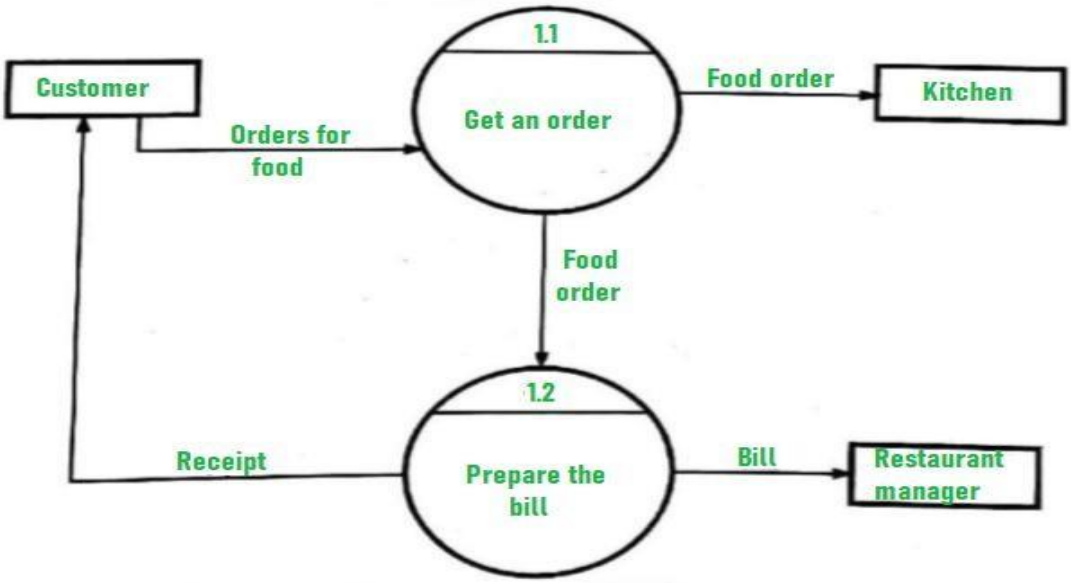
## 5.1 DATA FLOW DIAGRAMS



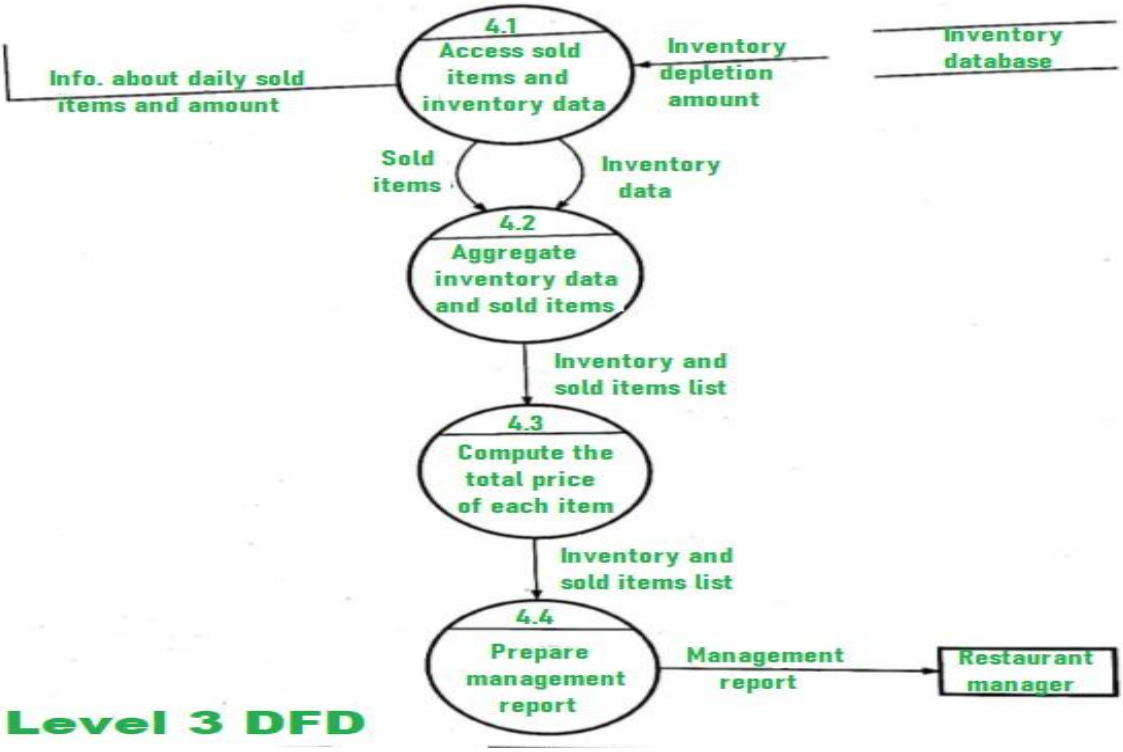

**Level 0 DFD (Context Level**




**Level 1 DFD**




**Level 2 DFD**




**Level 3 DFD**

# 5.2 SOLUTION & TECHNICAL ARCHITECTURE

**Project Design Phase-II**
**Technology Stack (Architecture & Stack)**

| | |
|---|---|
| Date | 17th October 2022 |
| Team ID | PNT2022TMID00218 |
| Project Name | Demand Est – AI POWERED FOOD DEMANDFORECASTER |
| Maximum Marks | 4 Marks |

**Technical Architecture:**

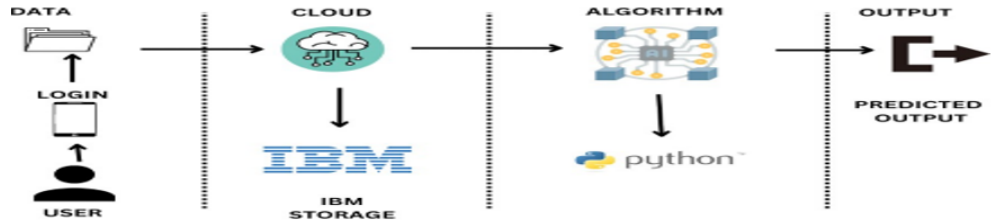



**Table-1: Components & Technologies:**

| S No | Component | Description | Technology |
|---|---|---|---|
| 1. | User Interface | User access to the application through the mobile application. | HTML |
| 2. | Application Logic-1 | Creating an application interface | Python |
| 3. | Application Logic-2 | Creating an AI assistant that gives food services to the user. | IBM Watson Assistance |
| 6. | File Storage | Files are stored in the local storage and stored in the cloud. | IBM Block Storage or Other Storage Service or Local File system |
| 7. | External API-1 | Use this REST API to manage locations. Get all locations. URI, /admin/resources/locations. | IBM Location REST API |
| 8. | Deep Learning Model | Creating an algorithm to calculate case information provides by the fulfillment center. | Object Recognition Model, etc. |
| 9. | Infrastructure (Cloud) | IBM Cloud App Configuration is a centralized feature-management and configuration service on IBM Cloud. | IBM Cloud Foundry |

**Table 2: Application Characteristics**:

| S No | Characteristics | Description | Technology |
|---|---|---|---|
| 1. | Open-Source Frameworks | There are no open-source frameworks in this application. | Python |
| 2. | Security Implementations | Block chain technology is used for Security implementation its private framework protects all data. | Block chain |
| 3. | Scalable Architecture | Users are provided with food services in online and they can also get info about the recent highly used products. In this model costumer gets benefits on analyzing their industry data and provides prediction on day-to-day analysis of food that sold and reduce the wastage of food by predicting its sales movements. | IBM Cloud |
| 4. | Availability | Here data are updated and the demands were predicted according to the data. | IBM Watson Assistant |
| 5. | Performance | The geo-fencing algorithm is updated daily and shows the day-to-day updates of the contaminated zones. | Geo fence |

## 5.3 USER STORIES

**Project Design Phase-II**
**Data Flow Diagram & User Stories**

| | |
|---|---|
| Date | 17 October 2022 |
| Team ID | PNT2022TMID00218 |
| Project Name | Demand Est – AI Powered Food DemandForecaster. |
| Maximum Marks | 4 Marks |

**User Stories for Demand Est**

| 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 | High | Sprint-1 |

| User Type | Functional Requirement (Epic) | User Story Number | User Story / Task | Acceptance criteria | Priority | Release |
|---|---|---|---|---|---|---|
| | | | | provided through web application. | | |
| 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 any support to use the application. | High | Sprint-2 |
| 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 |

# 6. PROJECT PLANNING & SCHEDULING

## 6.1 SPRINT PLANNING & ESTIMATION

**Project Planning Phase**

**Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)**

| | |
|---|---|
| Date | 22 October 2022 |
| Team ID | PNT2022TMID00218 |
| Project Name | Project – Demand Est - AI Powered FoodDemand Forecaster |
| Maximum Marks | 8 Marks |

**Product Backlog, Sprint Schedule, and Estimation (4 Marks)**

Use the below template to create product backlog and sprint schedule

| Sprint | Functional Requirement (Epic) | 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. | 2 | High | YAZHINI SHIREEN VIRUKSHA VITHYA |
| Sprint-1 | | USN-2 | As a user, I will receive confirmation email once I have registered for the application | 1 | High | YAZHINI SHIREEN VIRUKSHA VITHYA |
| Sprint-2 | | USN-3 | As a user, I can register for the application through Facebook | 2 | Low | YAZHINI SHIREEN VIRUKSHA VITHYA |
| Sprint-2 | | USN-4 | As a user, I can register for the application through Gmail | 2 | Medium | YAZHINI SHIREEN VIRUKSHA VITHYA |
| Sprint-1 | Login | USN-5 | As a user, I can log into the application by entering email & password | 1 | High | YAZHINI SHIREEN VIRUKSHA VITHYA |
| Sprint-1 | Dashboard | USN-6 | As a user, I can access the services and information provided in the dashboard | 2 | High | YAZHINI SHIREEN VIRUKSHA VITHYA |
| Sprint-1 | Login | USN-7 | As a user, I can log into the web application and access the dashboard | 1 | High | YAZHINI SHIREEN VIRUKSHA VITHYA |
| Sprint-4 | Helpdesk | USN-8 | As a user, I can get the guidance from the customer care | 1 | High | YAZHINI SHIREEN VIRUKSHA VITHYA |
| **Sprint** | **Functional Requirement (Epic)** | **User Story Number** | **User Story / Task** | **Story Points** | **Priority** | **Team Members** |
| Sprint-3 | Management | USN-9 | As an administrator, I can collect new datasets and keep the model trained | 2 | High | YAZHINI SHIREEN VIRUKSHA VITHYA |
| Sprint-3 | | USN-10 | As an administrator, I can update other features of the application | 2 | Medium | YAZHINI SHIREEN VIRUKSHA VITHYA |
| Sprint-3 | | USN-11 | As an administrator, I can maintain the information about the user | 2 | Medium | YAZHINI SHIREEN VIRUKSHA VITHYA |
| Sprint-4 | | USN-12 | As an administrator, I can maintain third-party services | 1 | Low | YAZHINI SHIREEN VIRUKSHA VITHYA |

# 6.2 SPRINT DELIVERY SCHEDULE

**Project Tracker, Velocity & Burndown Chart: (4 Marks)**

| 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 | 7 | 6 Days | 24 Oct 2022 | 29 Oct 2022 | 7 | 29 Oct 2022 |
| Sprint-2 | 4 | 6 Days | 31 Oct 2022 | 05 Nov 2022 | 4 | 05 Nov 2022 |
| Sprint-3 | 6 | 6 Days | 07 Nov 2022 | 12 Nov 2022 | 6 | 12 Nov 2022 |
| Sprint-4 | 2 | 6 Days | 14 Nov 2022 | 19 Nov 2022 | 2 | 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

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

AV (Sprint 1) = 7/6 = 1

AV (Sprint 2) = 4/6 = 1

AV (Sprint 3) = 6/6 = 1

AV (Sprint 4) = 2/6 = 1

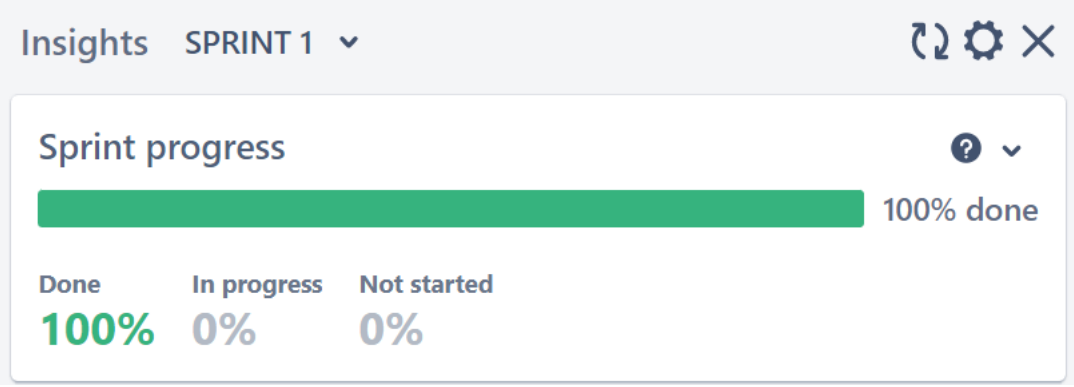
AV (Total) = 21/24 = 1

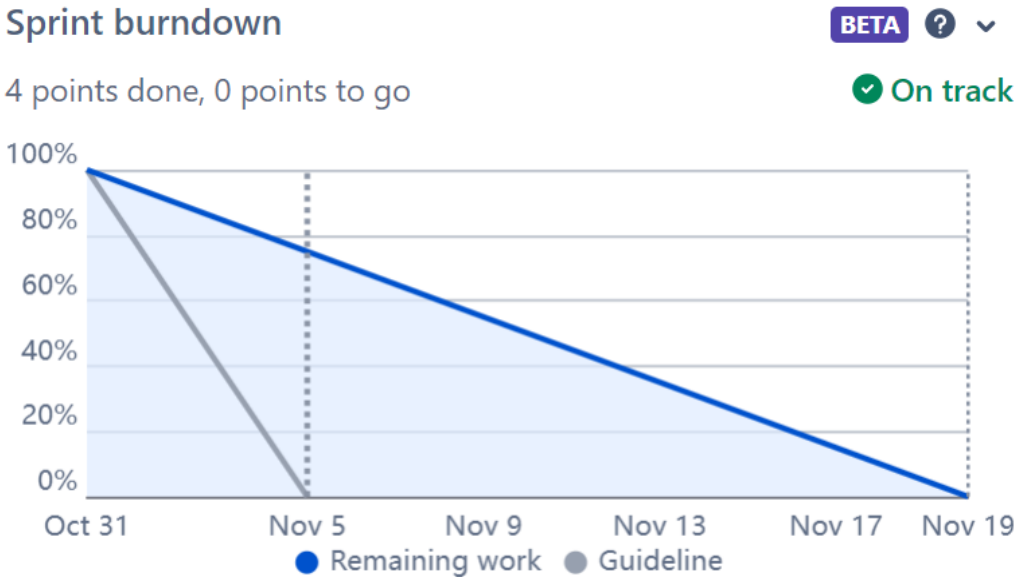
**Burndown Chart:**

A burndown chart is a graphical representation of work left to do versus time.
It is often used in agile software development methodologies such asScrum.
However, burn down charts can be applied to any project containing measurable progress over time.

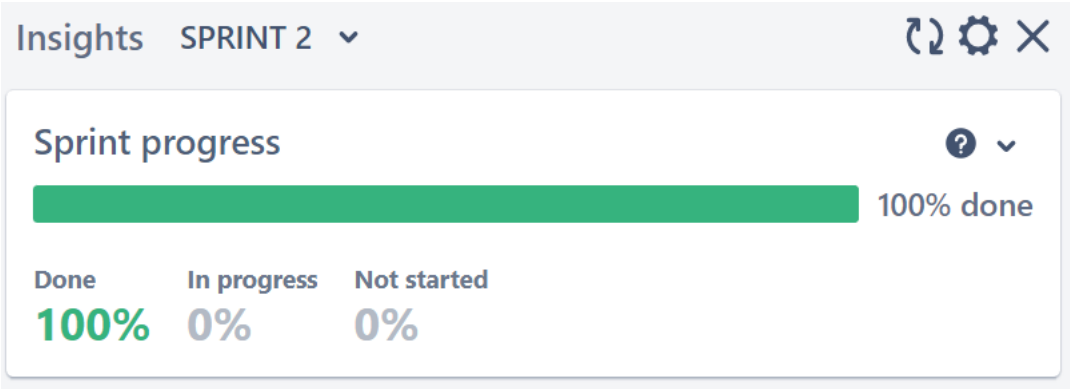
## 6.3 REPORTS FROM JIRA

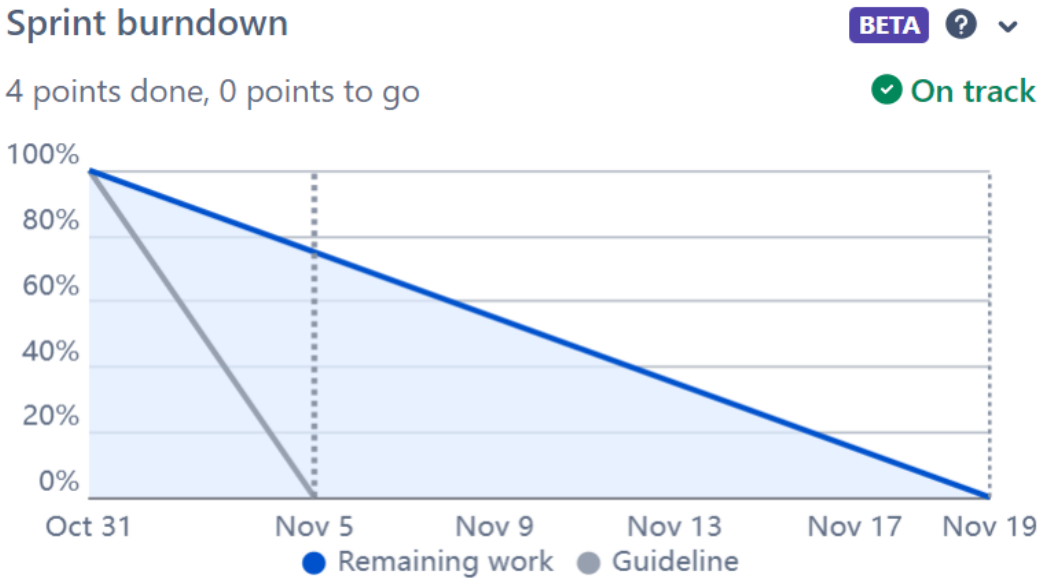
SPRINT - 1



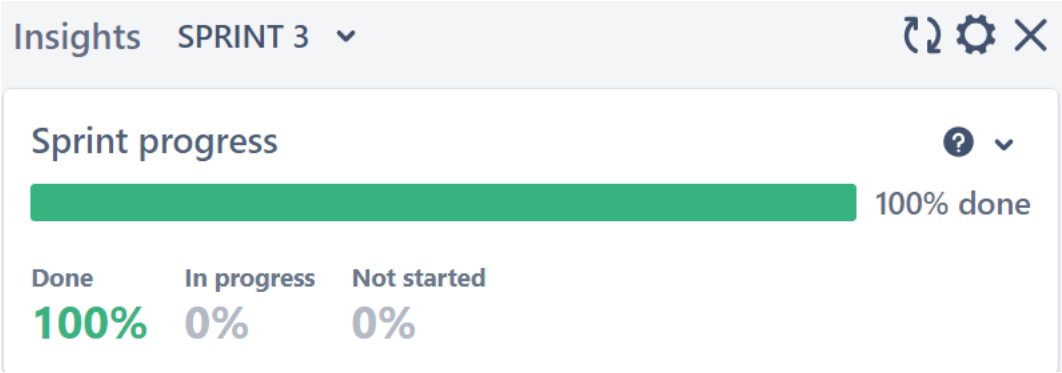



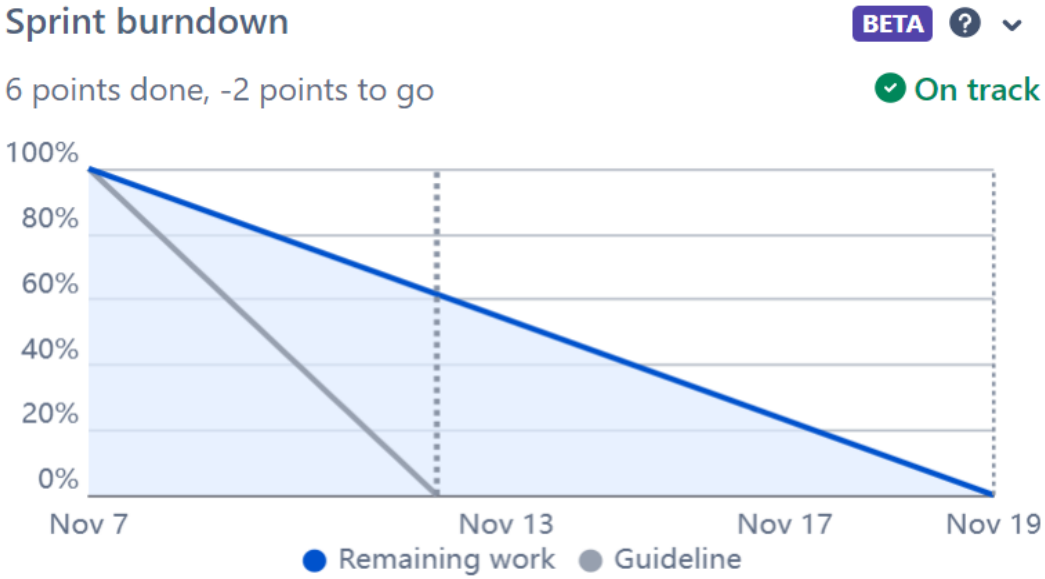
SPRINT – 2


Insights
SPRINT 2
Sprint progress
100% done
Done
100%
In progress
0%
Not started
0%

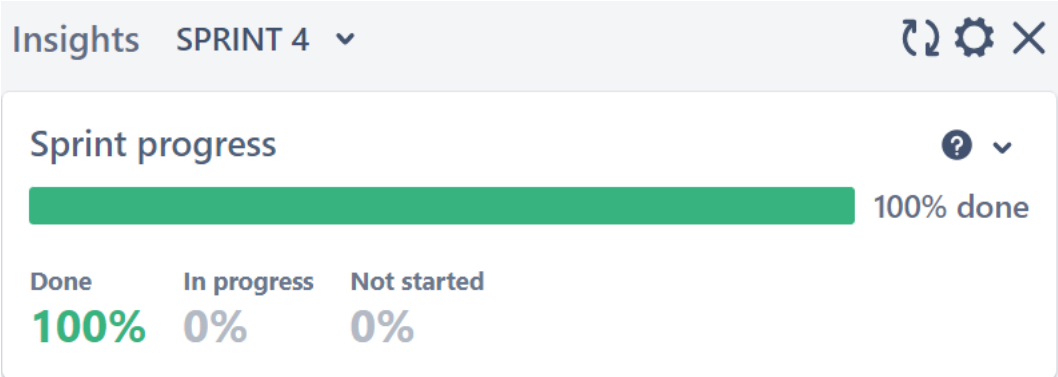

Sprint burndown
BETA
4 points done, 0 points to go
On track
100%
80%
60%
40%
20%
0%
Oct 31
Nov 5
Nov 9
Nov 13
Nov 17
Nov 19
Remaining work
Guideline

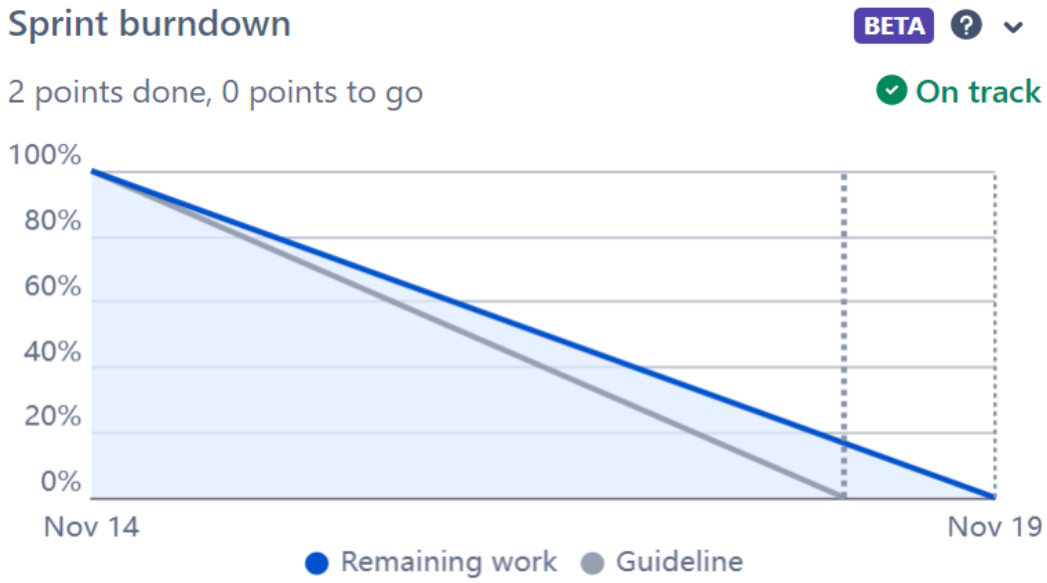
SPRINT – 3


Insights
SPRINT 3
Sprint progress
100% done
Done
100%
In progress
0%
Not started
0%


Sprint burndown
BETA
6 points done, -2 points to go
On track
100%
80%
60%
40%
20%
0%
Nov 7
Nov 13
Nov 17
Nov 19
Remaining work
Guideline

SPRINT – 4


Insights
SPRINT 4
Sprint progress
100% done
Done
100%
In progress
0%
Not started
0%


Sprint burndown
BETA
2 points done, 0 points to go
On track
100%
80%
60%
40%
20%
0%
Nov 14
Nov 19
Remaining work
Guideline

# 7. CODING & SOLUTIONING

## 7.1 FEATURE 1

```
<!DOCTYPE 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;4
00;600;800&display=swap" 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="  gthttps://cdnjs.cloudflare.com/ajax/libs/font-awesome/6.0.0-
beta2/css/v4-shims.min.css">
<style>
    body{
        background-image:url("bg.jpg");
    }

*{
    margin: 0;
    padding: 0;
    font-family: 'Poppins', sans-serif;
}
.bar
{
margin: 0;
padding: 15px;
background-color:rgb(5, 100, 84, 0.9);
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(5, 100, 84, 0.9);
    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>AI-DemandEst</h1>
           <h2>AI Powered Food Demand Forecasting Model </h2>
           <h3>An efficient solution for food delivery service
centers that helps in the procurement planning of perishable raw
materials.</h3>

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

## 7.2 FEATURE 2

```
<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&dis
play=swap" 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: 0;
padding: 15px;
background-color:rgb(5, 100, 84, 0.9);
/* 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(5, 100, 84, 0.9);
    font-family:Poppins,serif;
    font-size:30px
}
h2{
    color:rgb(5, 100, 84, 0.9);
    font-family: Poppins,serif;
    font-size:60px;
    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,serif;
font-size:30px;
}
</style>
</head>

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

                    <label for="homepage_featured"></label><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>
                    <label for="emailer_for_promotion"></label><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>


                    <label>
                        <input class="form-input" type="text" name="op_area"
placeholder="Enter the op_area(2-7)">
                    </label><br><br>
                    <label for="cuisine"></label><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>
                    <label>
                        <input class="form-input" type="text" name="city_code"
placeholder="Enter city_code">
                    </label><br><br>
                    <label>
                        <input class="form-input" type="text" name="region_code"
placeholder="Enter region_code">
                    </label><br><br>
                    <label for="category"></label><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></div>
```

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

# 8. TESTING

## 8.1 TEST CASES

### Test Case Report

| | |
|---|---|
| Date | 15 November 2022 |
| Team ID | PNT2022TMID00218 |
| Project Name | Project–Demand Est-AI Powered Food Demand Forecaster |

| Testcase_ id | Feature_ type | component | scenario | Pre-requisite | Steps to execute | Expected result | Actual result | status | Executed by |
|---|---|---|---|---|---|---|---|---|---|
| TC_010 | Functional (Maintenance) | Administrator | As a administrator, I should be able to edit the menus of the app. | Network accessing system | i) Performing testing after the software is released is known as maintenance testing.<br>ii)Maintenance testing is different from new application testing.<br>iii)There are two important parts of maintenance testing such as confirmation maintenance testing and regression maintenance testing. | Is valid one | Is valid | Passed | SHIREEN H<br>YAZHINI CK |

# Sprint 4 Test case

| | |
|---|---|
| Date | 15 November 2022 |
| Team ID | PNT2022TMID00218 |
| Project Name | Project — Demand Est-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. 1 should be to get feedback from the users. | Step 1: Test Case I D.<br>Step 2: Test DO Cf TQT HH<br>Step 5: Assumptions and Pre-Conditions.<br>Step 4: Test Data.<br>Step 5: Steps to be Executed.<br>Step I›: Expected Result.<br>Step 7: Actual Result and Post-Conditions.<br>Step 6: Pass/Fail. | Passed | SHIREEN H YAZHINI CK |

# 8.2 USER ACCEPTANCE TESTING:

**Acceptance Testing**
**UAT Execution & Report Submission**

| | |
|---|---|
| Date | 15 November 2022 |
| Team ID | PNT2022TMID00218 |
| Project Name | Project – Demand Est - 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 Demand Est – 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 howthey 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't Fix | 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 | Total Cases | Not Tested | Fail | Pass |
|---|---|---|---|---|
| Print Engine | 6 | 0 | 0 | 6 |
| Client Application | 47 | 0 | 0 | 47 |
| Security | 2 | 0 | 0 | 2 |

| | | | | |
|---|---|---|---|---|
| Outsource Shipping | 4 | 0 | 0 | 4 |
| Exception Reporting | 8 | 0 | 0 | 8 |
| Final Report Output | 5 | 0 | 0 | 5 |
| Version Control | 3 | 0 | 0 | 3 |

# 9. RESULTS

## 9.1 PERFORMANCE METRICS

Project Development Phase
Model Performance Test

| | |
|---|---|
| Date | 15 November 2022 |
| Team ID | PNT2022TMID00218 |
| Project Name | Project – Demand Est-AI Powered Food Demand Forecaster |
| Maximum Marks | 10 Marks |

**Model Performance Testing:**

| S. No. | Parameter | Values | Screenshot |
|---|---|---|---|
| 1. | Metrics | **Regression Model:**<br>MAE 89.10334778841495,<br>MSE - 43129.82977026746,<br>RMSLE -207.67722496765856,<br>R2 score -0.6946496854280233, | **Evaluating the model**<br>In [33]: `from sklearn.metrics import mean_squared_error`<br>In [34]: `RMLSE=np.sqrt(mean_squared_error(y_test,pred))`<br>`RMLSE`<br>Out[34]: 209.71961740201198<br>In [39]: `from sklearn import metrics`<br>`from sklearn.metrics import mean_absolute_error`<br>In [40]: `MSE=print(metrics.mean_squared_error(y_test,pred))`<br>`MSE`<br>43982.31792324628<br>In [41]: `R2S=print(metrics.r2_score(y_test,pred))`<br>`R2S`<br>0.6886142448276894<br>In [42]: `MAE=print(mean_absolute_error(y_test,pred))`<br>89.10334778841495 |

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

```
In [38]: print("R-Squared::{}".format(grid_cv_dtm.best_score_))
         print("Best Hyperparameters::\n{}".format(grid_cv_dtm.best_params_))

R-Squared::0.7601137863085042
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 | 5.324927 | 1.065213 | 0.090586 | 0.028695 | None | 1 | 2 | {'max_leaf_nodes': None, 'min_samples_leaf': 1... |
| 1 | 4.932083 | 0.489172 | 0.065634 | 0.009248 | None | 1 | 4 | {'max_leaf_nodes': None, 'min_samples_leaf': 1... |
| 2 | 4.597615 | 0.329380 | 0.050024 | 0.009244 | None | 1 | 8 | {'max_leaf_nodes': None, 'min_samples_leaf': 1... |
| 3 | 4.146344 | 1.038443 | 0.043753 | 0.011694 | None | 1 | 16 | {'max_leaf_nodes': None, 'min_samples_leaf': 1... |
| 4 | 4.017265 | 0.785451 | 0.056361 | 0.006479 | 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, 20, 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, 20, 100],
                                  'min_samples_leaf': [1, 2, 3, 4],
                                  'min_samples_split': [2, 4, 8, 16]})
```

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

## 10. 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, organizations may be able to forecast accurately at all levels.

**DIS-ADVANTAGE:**

- Not every situation can be predicted

## 11. CONCLUSION

Demand forecasts is, with no doubt, the basis for developing an efficient supply chain. The supply chain planning and control depends of accurate estimates of the volumes of products and services to be processed to satisfy customer's needs. The food products have a factor that limits the maintenance of stocks, the short perishability. These products have a period in which they keep their characteristics and should be consumed before being considered unsuitable for consuming. Thus, it is suggested for future works that the short perishability of products must be taken into account when evaluating the results obtained by the quantitative methods. To make possible not only plan the production to satisfy the forecasted demand, but also contribute to minimize the loss of products due to its short perishability and consequently, improving the profitability of the company.

## 12. FUTURE SCOPE

This method applied in this work showed its simplicity and accessibility due to the low cost and easiness of application. By having these characteristics, this method can be used by small and medium-sized companies, where is not possible to make huge investments in planning their food demand operations. Hence this work can be further expanded based on customer demand and can be provided to all area of food business at low cost.

## 13. APPENDIX

### Source Code

### app.py

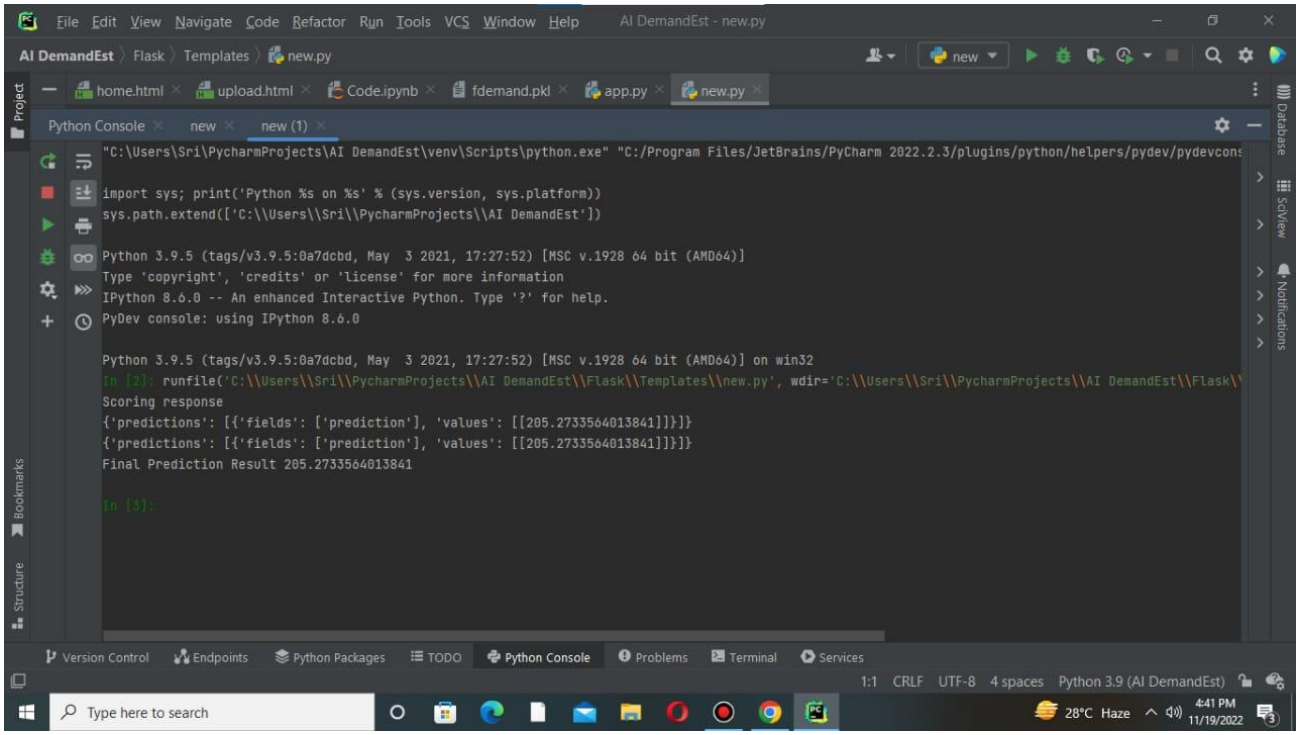
```
# import the necessary packages
import pandas as pd
import numpy as np
import pickle
import os

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('fdemand.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)
```

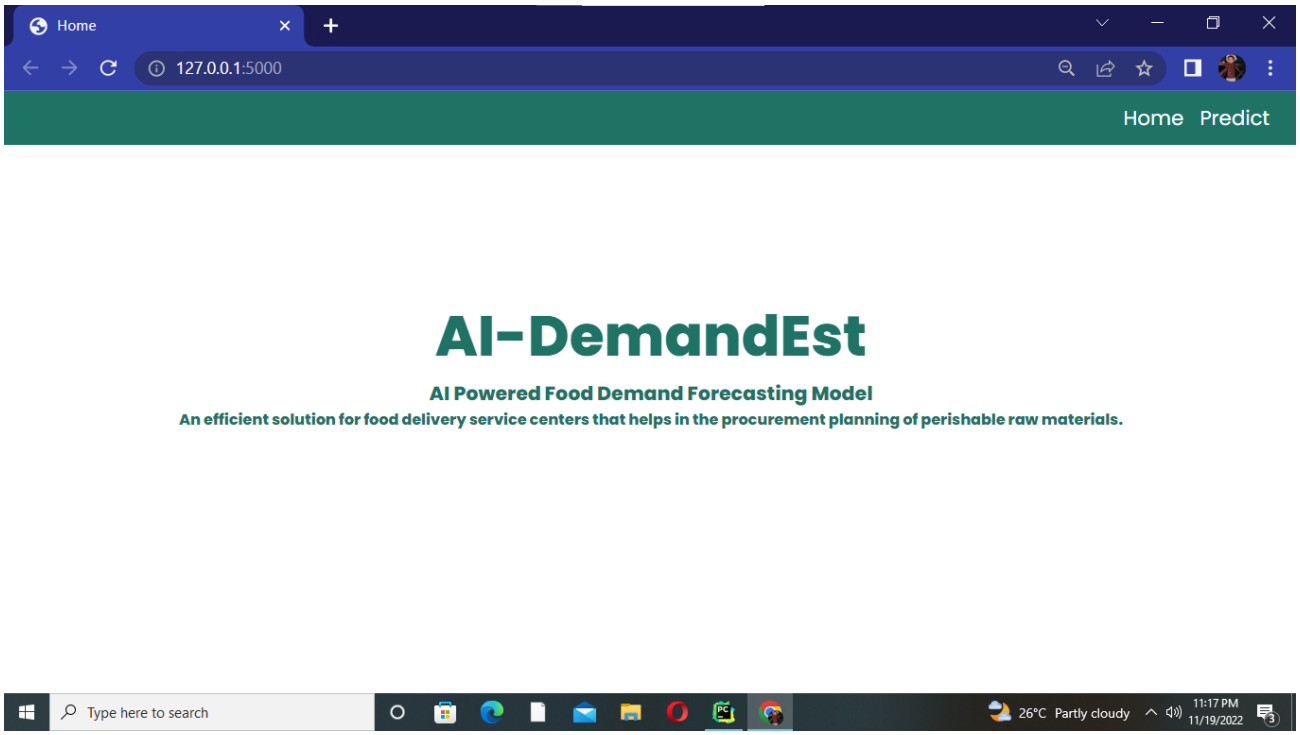
**new.py**

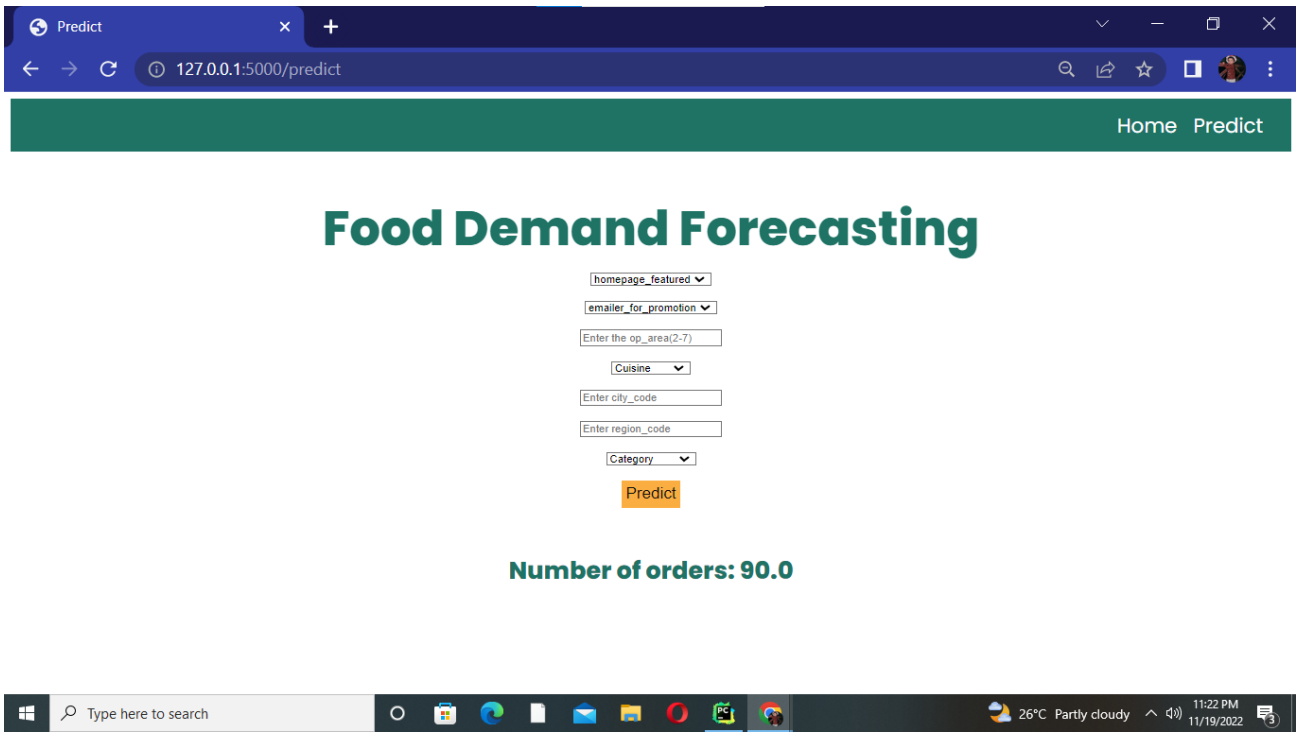
```
import requests

# NOTE: you must manually set API_KEY below using information retrieved from your
IBM Cloud account.
API_KEY = "ibm api key will be provided here"
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}

# NOTE: manually define and pass the array(s) of values to be scored in the next
line
payload_scoring = {"input_data": [{"field": [["homepage_featured",
"emailer_for_promotion", "op_area", "cuisine",
```

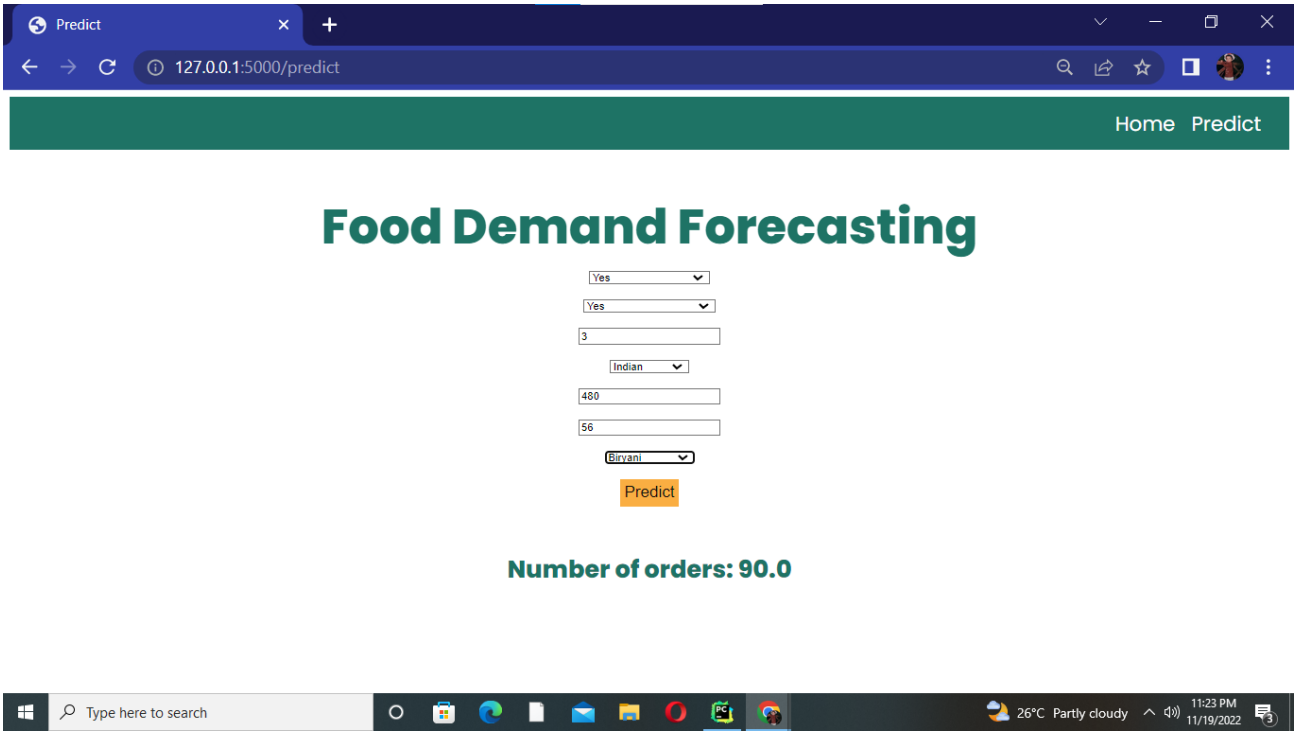
```
                                                "city_code", "region_code",
"category"]], "values": [[0, 0, 2.0, 3, 647,

                56, 0]]}]}

response_scoring = requests.post(
    'https://us-south.ml.cloud.ibm.com/ml/v4/deployments/11ac2294-65d5-4aec-af1f-
eda82b69d29d/predictions?version=2022'
    '-11-11', 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]
```



# OUTPUT


Home
127.0.0.1:5000
Home Predict
AI-DemandEst
AI Powered Food Demand Forecasting Model
An efficient solution for food delivery service centers that helps in the procurement planning of perishable raw materials.
Type here to search
26°C Partly cloudy
11:17 PM
11/19/2022


Predict
127.0.0.1:5000/predict
Home Predict
Food Demand Forecasting
homepage_featured
emailer_for_promotion
Enter the op_area(2-7)
Cuisine
Enter city_code
Enter region_code
Category
Predict
Number of orders: 90.0
Type here to search
26°C Partly cloudy
11:22 PM
11/19/2022




## GITHUB & PROJECT DEMO LINK

GITHUB LINK - https://github.com/IBM-EPBL/IBM-Project-10817-1659232384

DEMO LINK - https://drive.google.com/file/d/13YH1KpUPhs2wFv0Fsa5oFp3ejpx6d8cX/view?usp=drivesdk