

**DeamandEst-AI POWERED FOOD DEMAND FORCASTER**

**A PROJECT REPORT**

**Submitted By**

**S.JANANI (610819205016)**

**M.KOUSAR JAHAN (610819205021)**

**S.SANDYA (610819205042)**

**V.NANDHINI**

**(610819205033)**

**BACHELOR OF TECHNOLOGY**

**In**

**INFORMATION TECHNOLOGY**

**Er. PERUMAL MANIMEKALAI COOLEGE OF  
ENGINEERING**

**HOSUR-635117**

**1.INTRODUCTION:**

Demand forecasting is the process in which historical data is used to estimate the quality of product customer will purchase. This prediction

activity is used in many fields like retailing, food industry etc. In Restaurants, prediction play a vital role as most of the basic ingredients have short-shelf life.

The demand depends upon many explicit and hidden context such as season, region etc. In this paper, number of order is used to forecast stock of items, using machine learning with internal and external data. In this we provide an appropriate algorithm for demand forecasting which is capable of overpowering like Bayesian Linear Regression algorithm are used that considerably improves the forecasting performance.

The main of the project is to create an machine learning model to forecast the number of orders material for next ten weeks we should known the information about fulfillment center like area city etc. By using this data we can use any classification algorithm to forecast the quantity for ten weeks. A web application is built which is integrated with the model built.

The demand forecasting methods can be based in mathematical models that use historical data or in qualitative methods, planned according to the administrative experience and customers reviews.

### **1.1PROJECT OVERVIEW:**

“A forecast is a statement of what is expected to happen in the future, especially in relation to a particular event or situation.”

The replenishment of majority of raw materials is done on weekly basis and since the raw material is perishable, the procurement planning is of utmost importance. Secondly, staffing of the centers is also one area wherein accurate demand forecasts are really helpful. Given the following information, the task is to predict the demand for the next 10 weeks (Weeks: 146-155) for the center-meal combinations in the test set.

Demand forecasting is the process of using predictive analysis of historical data to estimate and predict customers' future demand for a product or service. Demand forecasting helps the business make better-informed supply decisions that estimate the total sales and revenue for a future period of time.

Thus, forecasting is a discipline which finds its applications in a high number of different fields. It can be used to predict from weather to volume of phone calls, from road traffic to products' demand. The best practice in each of these fields is specific and, depending on its characteristics, can be extremely straight forward or more complex. The sunrise time tomorrow can be precisely forecasted by an analytical model, on the other hand environments with high uncertainty features, like stock exchange, will have the need of more statistically approaches.

### ***1.2 PURPOSE:***

In the food industry, [planning and execution of supply chains](#) are essential to meet demand. However, in most cases, due to

the lack of accurate demand forecasting, food inventories are overstocked and lead to food wastage. To avoid this, startups are creating solutions that use point of sale (PoS) data to build models that accurately predict the level of demand.

PoS-driven solution selects forecast models and integrates with sell-through data for different stock-keeping units (SKUs) or categories. The model then identifies deviations between the forecast and consumer demand in real-time. This data is later analyzed to create responses through supply chains. The solution helps the food industry achieve high levels of supply chain efficiency while minimizing food waste.

The model is useful to all the peoples who are all educated as wells as uneducated and user friendly to use the application. Companies and businesses in the food industry allocate a higher amount of their budget towards maintaining an excess of food inventory. Their solution increases the profits of restaurants through the optimization of production and inventory planning.

## **2. LITERATURE SURVEY:**

*The application of AI in the food industry has been growing for years due to various reasons such as food sorting, classifications and prediction of the parameters, quality control,*

*and food safety. Expert system, fuzzy logic, ANN, adaptive neuro fuzzy interference system (ANFIS), and machine learning are among the popular techniques that have been utilized in the food industries.*

*The applications of AI, its advantages, and limitations as well as the integration of the algorithms with different sensors such as E-nose and E-tongue in the food industry are critically summarized. Moreover, a guideline has been proposed as a step-by-step procedure in developing the appropriate algorithm prior to using the AI model in the food industry-related field, all of which will aid and encourage researchers and industrial players to venture into the current technology that has been proven to provide better outcomes.*

## **2.2EXISTING PROBLEM:**

- *Difficult to order the dish quickly.*

- *Due to lot of process in ordering sometimes customer get frustrated.*
- *Variety and quality of items*
- Only using difference between base price and checkout price, difference between base price and checkout price as a features and not using any lag and exponentially weighed features didn't give good score.

### **2.3REFERENCES:**

Krittanawong C, Zhang H, Wang Z, Aydar M, Kitai T (2017) Artificial Intelligence in Precision Cardiovascular Medicine 69(21):2657–2664.  
<https://doi.org/10.1016/j.jacc.2017.03.571>

Hamet P, Tremblay J (2017) Artificial intelligence in medicine. Metabolism: Clinical and Experimental 69, S36–S40. <https://doi.org/10.1016/j.metabol.2017.01.01>

Garver K (2018) 6 examples of artificial intelligence in the food industry. Retrieved from <https://foodindustryexecutive.com/6-examples-of-artificial-intelligence-in-the-food-industry/>

### **2.3PROBLEM STATEMENT DEFINITION:**

The replenishment of majority of raw materials is done on weekly basis and since the raw material is perishable, the procurement

planning is of utmost importance. Secondly, staffing of the centers is also one area wherein accurate demand forecasts are really helpful.

<b>Problem statement</b>	<b>I am customer</b>	<b>I'm trying to</b>	<b>But</b>	<b>Because</b>	<b>Which makes me feel</b>
PS-1	Tourist.	Tracking the delivery status.	Unable to guess the current location.	Due to network issues.	Which makes me literally hungry.
PS-2	Homely people.	Excepting to get food quickly.	Due to traffic issues.	On vacations.	Makes me to cancel the order.

The procurement must be planned and the raw materials must perishable.

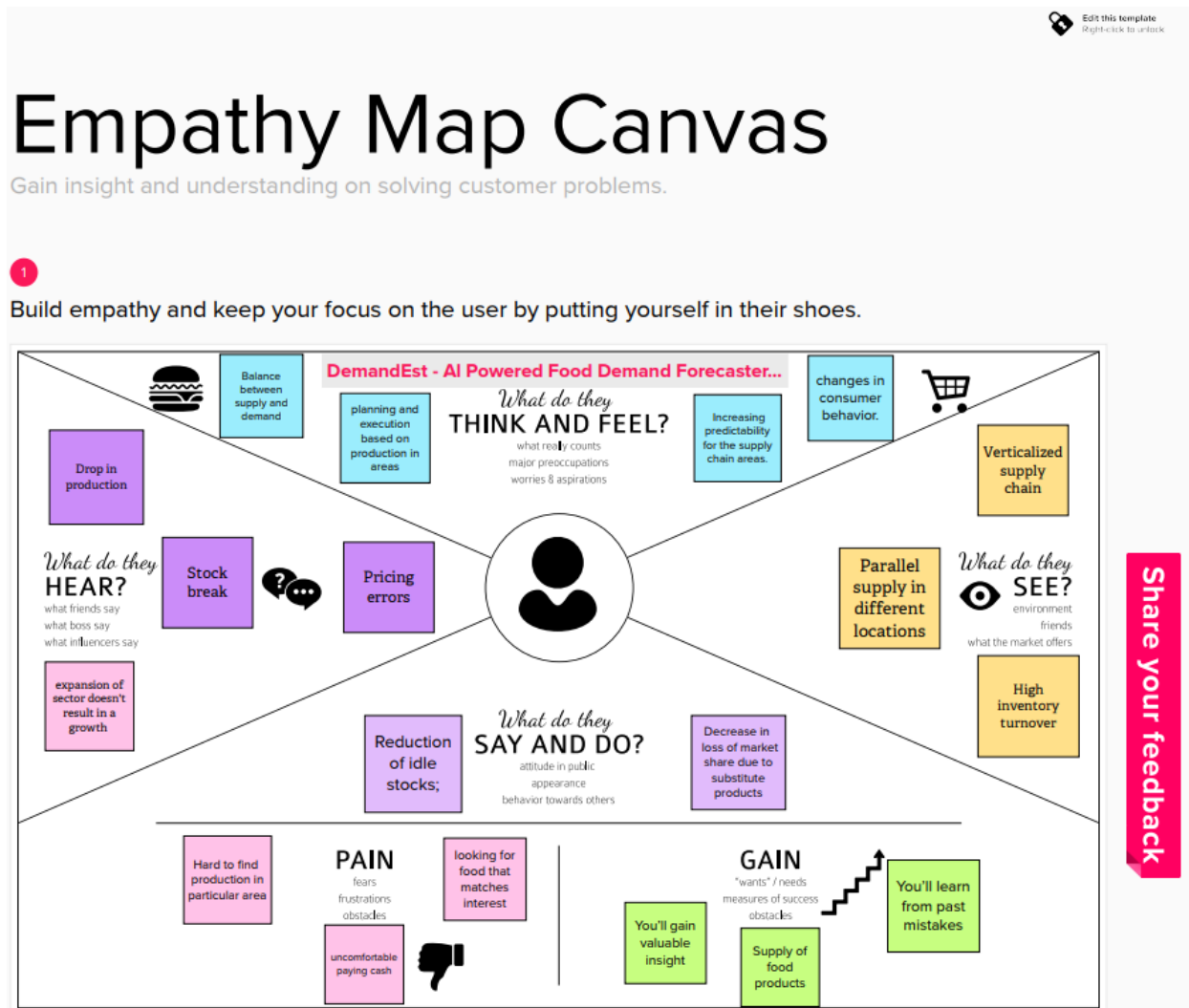
In problem statement-1 The customer (Tourist) was unable to track the delivery status due to network issues. which makes the customer literally hunger and makes them to cancel the order.

In problem statement -2 The customer (Homely people) excepting to get the food quickly, due to traffic issues the delivery arrives late makes the customer to cancel the order.

### ***3.IDEATION AND PROPOSED SOLUTION:***

This process is to check the customer's needs and requirements.

### 3.1 EMPATHY MAP CANVAS:



An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. Much like a user persona, an empathy map can represent a group of users, such as a customer segment. The empathy map was originally created by Dave Gray and has gained much popularity within the agile community.

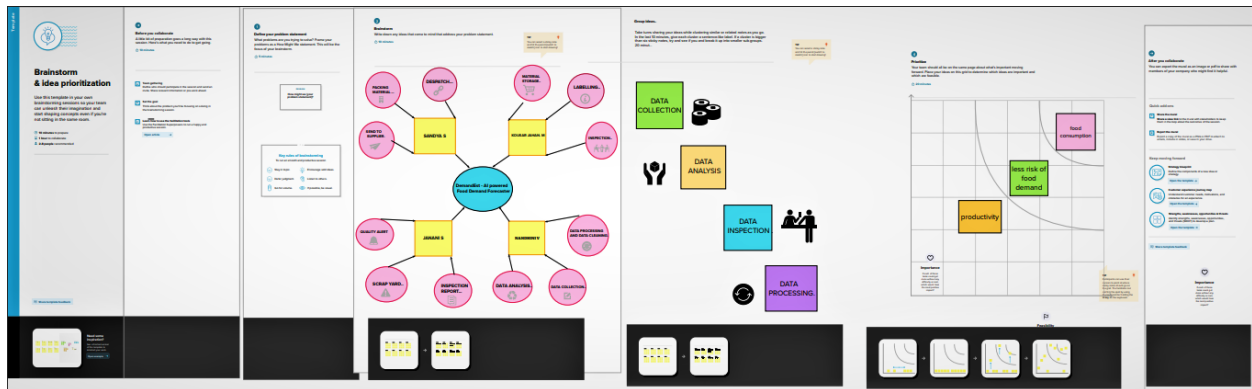
The map is based on the balance between the supply and demand which



plans and get executed based on the production in areas.

Which can increase in probability for the supply chain areas it can change the consumer behavior.

### **3.2 IDEATION AND BRAINSTROM:**



Brainstorming is a group problem-solving method that involves the spontaneous contribution of creative ideas and solutions. This technique requires intensive, freewheeling discussion in which every member of the group is encouraged to think aloud and suggest as many ideas as possible based on their diverse knowledge.

Brainstorming combines an informal approach to problem-solving with lateral thinking, which is a method for developing new concepts to solve problems by looking at them in innovative ways. Some of these ideas can be built into original, creative solutions to a problem, while others can generate additional ideas.

### **3.3 PROPOSED SOLUTION:**

Ideation is the mode of the design process in which you concentrate on idea generation. Mentally it represents a process of 'going wide' in terms of concepts and outcomes. Ideation provides both the fuel and also the source material for building prototypes and getting innovative solutions into the hands of your users.

The proposed solution is to maintain the robot's position inside, but close, to the boundary of the target's field of view. My proposed solution is to refuse these oppositions altogether. Their proposed solution is the use of complex objects, comprising several components, to express structure and relationships.

S.no	Parameter	Description
1	Problem Statement	<ol style="list-style-type: none"><li>1. Reduce the order processing time.</li><li>2. Automate redundant work.</li><li>3. Deliver a great customer experience.</li><li>4. Determine profit &amp; loss.</li></ol>
2	Idea/Solution description	<ol style="list-style-type: none"><li>1. User friendly and fast interface.</li><li>2. Inventory management.</li><li>3. Integration with other tools.</li><li>4. Order management.</li></ol>
3	Novelty/Uniqueness	<ol style="list-style-type: none"><li>1. Tracking sales.</li><li>2. Automatic analysis.</li><li>3. Enhanced productivity.</li><li>4. Improve customer relationship.</li></ol>

4	Social impact/ Customer Satisfactory	<ol style="list-style-type: none"> <li>1. Cleanliness.</li> <li>2. Service.</li> <li>3. Friendliness.</li> <li>1. Order accuracy</li> </ol>
5	Business Model	<ol style="list-style-type: none"> <li>1. Capacity management.</li> <li>2. Time management.</li> <li>3. Menu management.</li> <li>4. Price management.</li> </ol>
6	Scalability of the solution	<ol style="list-style-type: none"> <li>5. Based on quality.</li> <li>6. Based on taste.</li> <li>7. Based on maintenance.</li> </ol>

### ***3.4 PROBLEM SOLUTION FIT:***

### ***3.4 PROBLEM SOLUTION FIT:***

PROJECT TITLE: DemandEst AI Powered Food Forecaster			PROJECT DESIGN PHASE 1: Solution Fit Template		TEAM ID: PNT2022TMID30074	
Define CS, fit into CL	<b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span> <ul style="list-style-type: none"> <li>✓ Business Staff.</li> <li>✓ Homely People.</li> <li>✓ Tourists.</li> </ul>	<b>6. CUSTOMER LIMITATIONS</b> <span>CL</span> <ul style="list-style-type: none"> <li>✓ While ordering the customer need to provide valid address.</li> <li>✓ Customer need to provide the proper data's while ordering.</li> <li>✓ Avoid unnecessary comments.</li> </ul>	<b>5. AVAILABLE SOLUTIONS</b> <span>AS</span> <p><b>PLUSES &amp; MINUSES</b></p> <p><b>Present Solution:</b> Different varieties of food.</p> <p><b>Existing Solution:</b> App with different features and process, to order the food.</p>			
	<b>2. PROBLEMS / PAINS + ITS FREQUENCY</b> <span>PR</span> <ul style="list-style-type: none"> <li>✓ A Hungry customer can spend on an hour to decide what to eat.</li> <li>✓ A problem that customer face when ordering food online is regarding payment.</li> <li>✓ In some websites it is more difficult to find the menu button!</li> <li>✓ Delivery is not about delay also about quality and quantity of the food and packing.</li> </ul>	<b>9. PROBLEM ROOT / CAUSE</b> <span>RC</span> <ul style="list-style-type: none"> <li>✓ Vehicle break down, this causes delay of delivering the food.</li> <li>✓ Due to heavy traffic jam customer tends to wait.</li> <li>✓ Problem occurs due to improper location, and data of customer's.</li> </ul>	<b>7. BEHAVIOR + ITS INTENSITY</b> <span>BE</span> <ul style="list-style-type: none"> <li>✓ Due to delay of order customer's ratings may be poor.</li> <li>✓ Sometimes it leads to cancellation of the order by the customer.</li> <li>✓ Due to customer's rating it leads to bad opinion on the food.</li> </ul>			
<b>3. TRIGGERS TO ACT</b> <span>TR</span> <ul style="list-style-type: none"> <li>✓ By giving advertising through ads.</li> <li>✓ Customer's rating on food taste.</li> <li>✓ Discount Pricing.</li> </ul>	<b>10. YOUR SOLUTION</b> <span>SL</span> <ul style="list-style-type: none"> <li>✓ Having a live chat feature, simply have a pop-up window asking "what would you like to have today".</li> <li>✓ Offering convenience, speed and security based to online payment by using vault debit option.</li> <li>✓ We are ensuring the customer by packing technique for hot and cold food.</li> <li>✓ By keeping in mind of clean and hygiene.</li> </ul>	<b>8. CHANNELS of BEHAVIOR</b> <span>CH</span> <p><b>ONLINE</b></p> <ul style="list-style-type: none"> <li>✓ When there is no restaurants around the customer location, they prefer online ordering.</li> <li>✓ While there is insufficient of time period customer's prefer online mode.</li> </ul> <p><b>OFFLINE</b></p> <ul style="list-style-type: none"> <li>✓ Customers prefer offline for spending time with their family and friends.</li> </ul>				
<b>4. EMOTIONS</b> <span>EM</span> <p><b>BEFORE / AFTER</b></p> <p><b>Before:</b> Difficult to order the dish quickly.</p> <p><b>After:</b> Based on our solution customer can easily order the food and there is no investment of time.</p>						

The Problem-Solution Fit simply founds a problem with the customer and that the solution has been realized for it actually solves the customer's problem.

#### 4.REQUIREMENT ANALYSIS:

##### Five Selection Criteria for Demand Forecasting

- Demand v/s capacity.
- Integrability and configurability.
- Historical data.

- What-if analysis.
- Multi-dimensional analytics.

#### **4.1 FUNCTIONAL REQUIREMENT:**

FR NO	Functional Requirements	Sub Requirement (story/sub task)
FR-1	Customer Registration	Registration a through websites
FR-2	Customer Confirmation	Confirmation via Email
FR-3	Customer Order	Order through application
FR-4	Customer Order Delivery	Doorstep delivery

#### **4.2 NON-FUNCTIONAL REWUIREMENTS:**

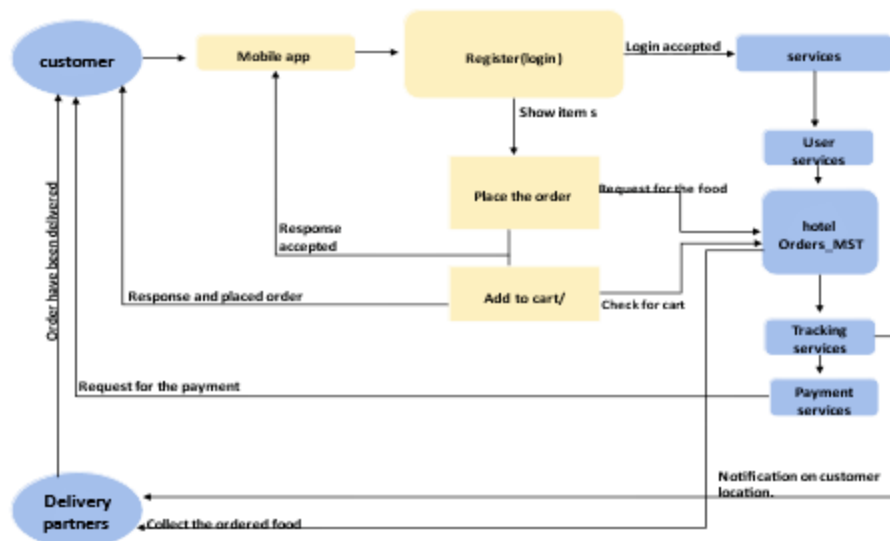
FR NO:	Nonfunctional requirement	Description
NFR-1	Usability	Restaurant profiles Geo locations.
NFR-2	Security	Secured through username and password.
NFR-3	Reliability	Delivery food in a stipulated time period.
NFR-4	Performance	Provide qualitative food.
NFR-5	Availability	Availability through online.
NFR-6	Scalability	Based on quality.

## ***5.PROJECT DESIGN:***

Project design describes the requirements from user and it predicts the input and evaluates the algorithm and trains the data with the given input for data preprocessing to get the output(result) If there is a limited supply of a high-demand product, you can use the scarcity principle to increase the price as an exclusive offer. You must keep an eye on new entrants though, as supply may increase

### ***5.1DATA FLOW DAIGRAM:***

A data-flow diagram is a way of representing a flow of data through a process or a system (usually an information system). The DFD also provides information about the outputs and inputs of each entity and the process itself. A data-flow diagram has no control flow — there are no decision rules and no loops. Specific operations based on the data can be represented by a flowchart.



1. The dataflow diagram conveys the customer's placing order through the mobile application with step by step process as registration.
2. After registration it shows the items in the menu and customer places the order. Requested order passes to the hotel management(services) the management track 's the order and places the order.
3. After the placing order pop up menu with payment services. After completion of payment the dish arrives to the step door.

## 5.2 SOLUTION AND TECHICAL ARCHITECTURE:

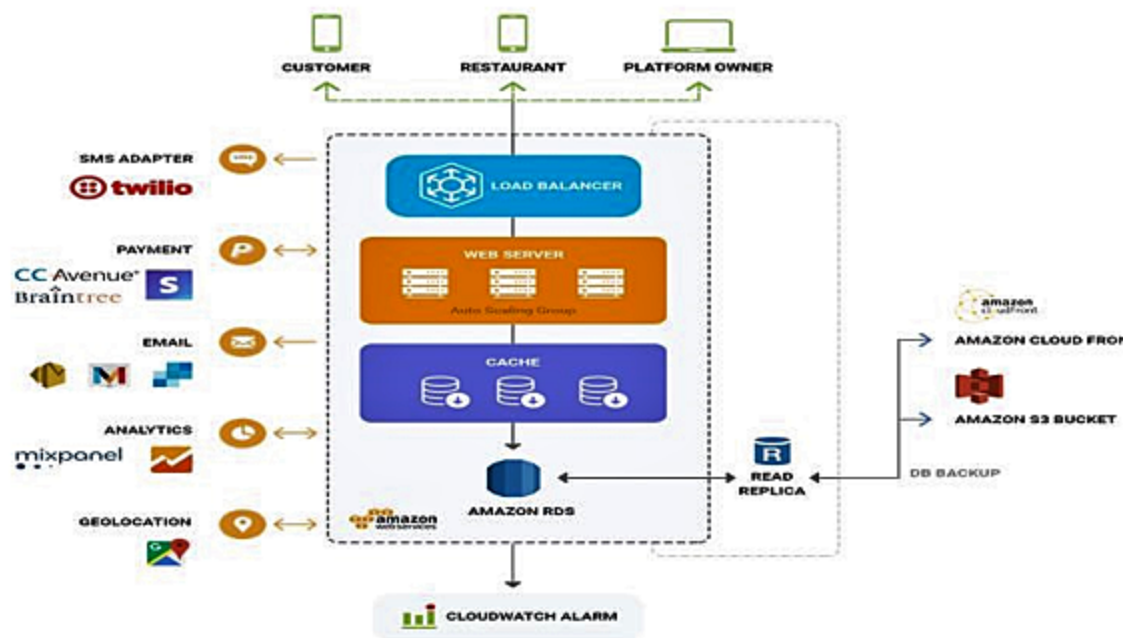


TABLE 1: Components and technologies:

S.NO	Components	Description	Technology
1.	Customer	By using mobile application, through online websites	HTML, CSS, Java script.
2.	Restaurant	It include all the goods and services.	Online transactions.
3.	Geolocation	Used to research the destination.	Google map, user address.
4.	Plat Form owner	Waits for the delivery of the destination.	Mobile phones and online websites.



**TABLE2: Application Characteristics:**

<b>S.NO</b>	<b>CHARACTERSTICS</b>	<b>DESCRIPTION</b>	<b>TECHNOLOGY</b>
1.	Opensource frameworks	Google chrome, online websites.	Technology of opensource framework.
2.	Security implementation.	Authentications through OTP.	Through mobile phone.
3.	Scalability architecture.	Based on quality. Based on taste.	Quality assurance. Quality control.
4.	Availability.	Available through online	Online
5.	Performance	Provide qualitative food.	Testing shows preference of mistakes.

### **5.3 USER STORIES:**

<b>User Type</b>	<b>Functional Requirement (Epic)</b>	<b>User Story Number</b>	<b>User Story / Task</b>	<b>Acceptance criteria</b>	<b>Priority</b>
Customer (Mobile user)	Customer Registration.	USN-1	As a user, I can register for the application by entering my email, password, and confirming by OTP.	I can access my account / dashboard	High
Business staff	Confirmation.	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
Tourist people	Accessibility.	USN-3	As a user, I can register for the application through websites, and applications.	I can register & access the dashboard with	High

				apps and websites.	
College students	Customer access through mail.	USN-4	As a user, I can confirmation through Gmail.	I can confirm the order and get the OTP through e mail.	Medium
Customer (websites)	Login	USN-5	As a user, I can log into the application by entering email & password and enabling location.	I can log into application to check either precise location or approximate location.	Medium
	Dashboard	USN - 6	Choosing the menu, Restaurant and payment process. after receiving the food rating process.	Hazard analysis and critical control point system.	Low
111	Customer orders	USN - 7	Delivery partner simply tracks the order and let the customer know when it will arrive.	Tracking through GPS make sure whether the given timeslot achieved.	Medium
Customer Care Executive	Customer order delivery	USN - 8	Door step delivery. easy process to get the order.	Rating on delivery partner and food quality.	Medium
Administrator	Hotel management, website holders	USN - 9	Choosing the restaurant. Multiple choice for restaurant profile.	Advertising through websites.	Low

## ***6.PROJECT PLANNING & SCHEDULING:***

### ***6.1 SPRINT PLANNING AND ESTIMATION:***

<b>Sprint</b>	<b>Functional Requirement (Epic)</b>	<b>User Story Number</b>	<b>User Story / Task</b>	<b>Story Points</b>
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1
Sprint-2	Dashboard	USN-5	As a user, I can access my dashboard after signing in.	1
Sprint-1	Access	USN-6	As a user, I can setup a profile, and basic details by signing in.	2
Sprint-1		USN-7	As a user, I will upload my documents regarding our applications.	1
Sprint-1	Chatbot	USN-8	As a user, I can seek guidance from the customer care executive.	1

<b>Sprint</b>	<b>Functional Requirement (Epic)</b>	<b>User Story Number</b>	<b>User Story / Task</b>	<b>Story Points</b>
Sprint-2	Online applications	USN-9	As a administrator, I can keep the applications of your organization relies on running.	1

## 6.2 SPRINT DELIVERY SCHEDULE:

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

### Reference:

<https://www.visual-paradigm.com/scrum/scrum-burndown-chart/>

<https://www.atlassian.com/agile/tutorials/burndown-charts> <https://www.atlassian.com/agile/project-management> <https://www.atlassian.com/agile/tutorials/how-to-do-scrum-with-jira-software>

## 7.CODING AND SOLUTIONING :

A problem statement contains with backlogs or demand by the customers.

### 7.1Feature 1:

```
<!DOCTYPE html>
```

```
<html lang="en">
```

```
<head>

  <meta charset="UTF-8">

  <meta name="viewport" content=
    "width=device-width, initial-scale=1.0">


  <link rel="stylesheet" href="style.css">

  <title>Rate us</title>

</head>
```

```
<body>

  <div id="RateUs">
    <h1>Rate Us</h1>
    <form action="#">
      <div class="form-shape">
        <label for="query">
          Type of Query
        </label>
        <select name="myQuery" id="query">
          <option value="sel" selected>
            Select
          </option>
          <option value="ord">
            Order related Issues
          </option>
```

```
<option value="Site">
    Site related Issues
</option>
<option value="fed">
    Complaint related Issues
</option>
<option value="others">
    Others
</option>
</select>
</div>
<div class="form-shape">
    <label for="name">Name</label>
    <input type="text" name="myName"
        id="name"
        placeholder="Enter your Name">
</div>
<div class="form-shape">
    <label for="email">Email-Id</label>
    <input type="email" name="myEmail"
        id="email"
        placeholder="Enter your email">
</div>
<div class="form-shape">
```

```
<label for="pho">Phone Number</label>
<input type="phone" name="myPhone"
      id="pho"
      placeholder="Enter your Phone no">
</div>
<div id="radio">
  Are you a member of OnlneFoodShop:
  Yes <input type="radio" name="eligible">
  No <input type="radio" name="eligible">
</div>
<div class="form-shape">
  <label for="message">
    Ellaborate your query
  </label>
  <textarea name="mesg" id="message"
    cols="30" rows="10">
  </textarea>
</div>
<input type="submit" value="Submit">
<input type="reset" value="Reset">
</form>
</div>
</body>
```

</html>

***Features:***

1.if a new loginer they need to register (or) create an account through online website “FOODIE\_HOUSE”.

***Options:***

- Registration:
- Sign in:
- Sign out:

2. If already a member they can order the dish directly without login.

- Ready to order:

Yes/No

3. Category with a menu will be available on website.

- Veg/Non-Veg

4. Fast transaction process.

5. The website will be User friendly to all.



## 7.2 FEATRURE 2:

```
<!DOCTYPE html>
```

```
<html>
```

```
<head>
```

```
<!-- Required meta tags -->
```

```
<meta charset="utf-8">
```

```
<meta name="viewport" content="width=device-width,  
    initial-scale=1, shrink-to-fit=no">
```

```
<link rel="stylesheet" href="index.css">
```

```
<!-- Bootstrap CSS -->
```

```
<link rel="stylesheet" href=  
"https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.  
css"
```

```
    integrity=  
"sha384-  
ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT  
2MZw1T"  
    crossorigin="anonymous">
```

<title>Foodie\_House</title>

<link rel="stylesheet" type="text/css" href="./food.css">

</head>

<body>

<h1> Foodie\_House</h1>

<br>

<div class="block" style="color:#ccc">



</div>

<div class="block">

<br>

<br>

<div>

<h2>Find Target Audience for our Foodie\_House Restaurant

</h2>

</div>

**<p><b>From the very beginning, you must find out your target audience.**

If there is a university near your restaurant, students and teachers will be your regulars. If there is a business centre nearby, business executives will visit your place often. So check your surroundings, age group, and their preference to find out your target audience.

Once you define your target audience, you can start the creation of your restaurant website. If your restaurant website is for students, opt for a bright design. But if it is to attract business people, pick an elegant or professional style.

You can also include “happy hours” or other discounts to draw customers. You can create a separate page, slider image or pop-up to give details.

Here are a few websites that have mentioned happy hours to keep their customers well-informed.</b>

</p>

<form>

<label>Email id</label>

<input type="text" placeholder="Enter the mail id">

<br/>

<span>Enter name</span><input type="text" name="name"/>

<br/>

<span>Enter address</span><input type="text" name="address"/>

<br>

<span>Enter mobile no</span><input type="text" name="moblie  
no"/>

<br/>

<div>

<label>Menu</label>

<select name="Menu">

<option value="veg">Veg</option>

<option value="non-veg">Non-Veg</option>

</select>

</div>

```

        <input type="submit" />

        <br/>

    </form>

</body>

</html>

```

### 7.3 DATABASE SCHEMA:

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.

S.NO	Check out_price	Base_price	Emailer_for_promotion	Homepage_featur
1	136.83	152.29	0	0
2	136.83	135.83	0	0
3	134.86	135.86	0	0
4	339.5	437.53	0	0

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

S.NO	Check out_price	Base_price	Emailer_for_promotion	Homepage_featur
1	136.83	152.29	0	0

2	136.83	135.83	0	0
3	134.86	135.86	0	0
4	339.5	437.53	0	0

- **fulfilment\_center\_info.csv:** Contains information of each fulfilment center.

S.NO	Center_id	city_code	region_code	center_type	op_area
1	11	679	56	TYPE_A	3.7
2	13	590	56	TYPE_B	6.7
3	124	590	56	TYPE_C	4.0
4	66	648	34	TYPE_A	4.1

- **meal\_info.csv:** Contains information of each meal being served.

s.no	Meal_id	category	Cuisine
1	1885	Beverages	India
2	1993	Beverages	Thailand
3	2539	Beverages	Brazil
4	1248	Beverages	India

## 8. TESTING:

### Problem Statement

Demand forecasting is a key component to every growing online business. Without proper demand forecasting processes in place, it can be nearly impossible to have the right amount of stock on hand at any given time. A food delivery service has to deal with a lot of perishable raw materials which makes it all the more important for such a company 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 client is a meal delivery company which operates in multiple cities. They have various fulfillment centers in these cities for dispatching meal orders to their customers. The client wants to forecast the demand in these centers for upcoming weeks so that these centers can plan the stock of raw materials accordingly. The replenishment of majority of raw materials is done on a weekly basis and since the raw material is perishable, the procurement planning is of utmost importance. Secondly, staffing of the centers is also one area wherein

accurate demand forecasts are really helpful. The evaluation metric for this competition is  $100 \times \text{RMSLE}$  where RMSLE is Root of Mean Squared Logarithmic Error across all entries in the test set. Since, we do not have access to the output of test set. Hence, Partial evaluation will be done on validation set and final evaluation will be done by submitting the solution in the Contest.

## 9.RESULTS:

The data consisted of 489121 rows and 88 columns. Each row represents a delivery with a unique order ID. The columns provide information regarding the region, city, food type, cuisine, price, promotional index and week number of the delivery. A detailed description of the data columns is provided in the appendix.

We first determined the most popular cuisine ordered. From fig(i), we see that the most popular cuisine ordered is Italian followed by Thai, Indian and Continental.

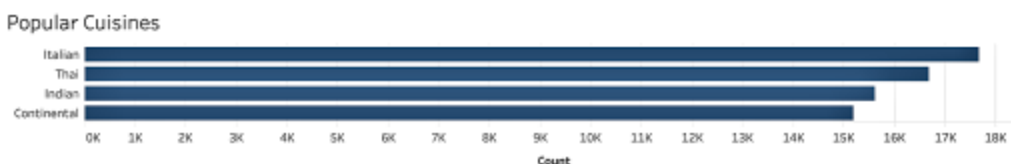


Fig (i)

Fig (i



We further looked at popular types of food to order and from fig(ii), we see that the most popular food item ordered is Beverages. The next popular food items are Rice Bowls, Salads, Sandwiches and Pizzas with their total counts being very close to each other. While starters, seafood, and biryanis are the most unpopular food items to order.

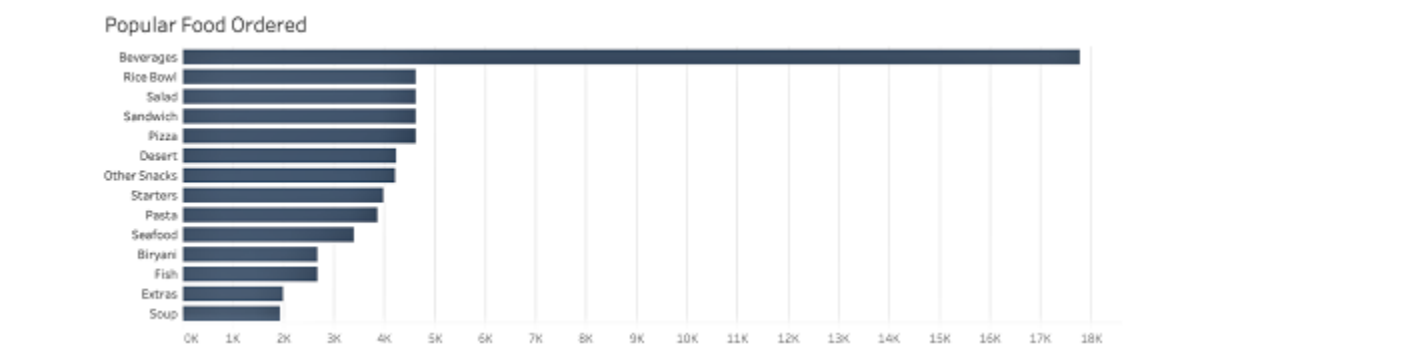
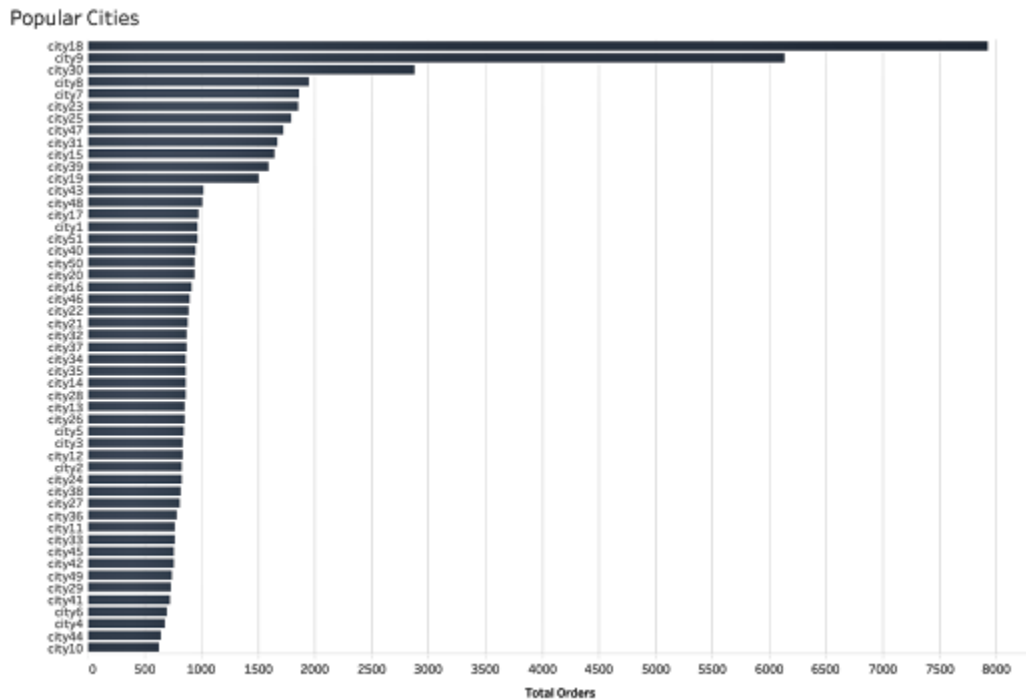


Fig (ii)

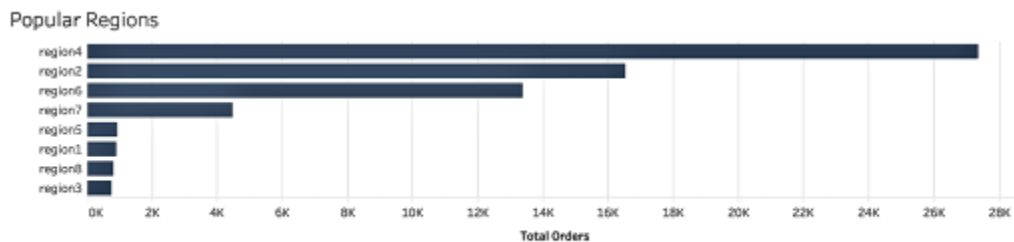
Next, we looked at popular cities with most orders and from fig(iii), we see that orders in city18 and city9 are overpowering all other cities while city30 follows closely. The next few cities have an average order count range between 1500–2000 while the remaining cities have a relative lower order count with a range of 600–1000.



**Fig (iii)**

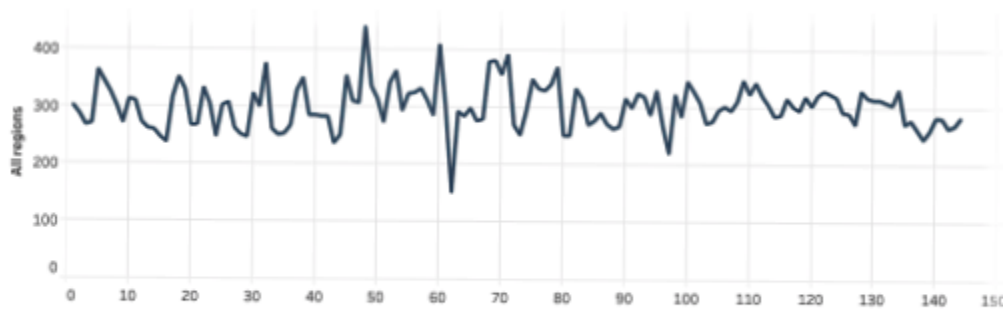
Fig (iii)

We further looked at popular regions to order and from fig(iv), we see that the most popular region is region4 followed by region2, region6 and region7. The most unpopular regions with the least order counts are region1, region8 and region4.



**Fig (iv)**

Let us take a look at the trend of orders per week. From the plot, we see that the graph spikes in week 50 and dips unusually low in week 65. From the graph, the time-series looks stationary with no trend seen as such.



**Fig (v)**

We then decided to look at the trend of orders in each region to determine if they follow the same trend as seen in the above plot. From Fig (vi), we see that the popular regions somewhat follow the series especially the dip in week

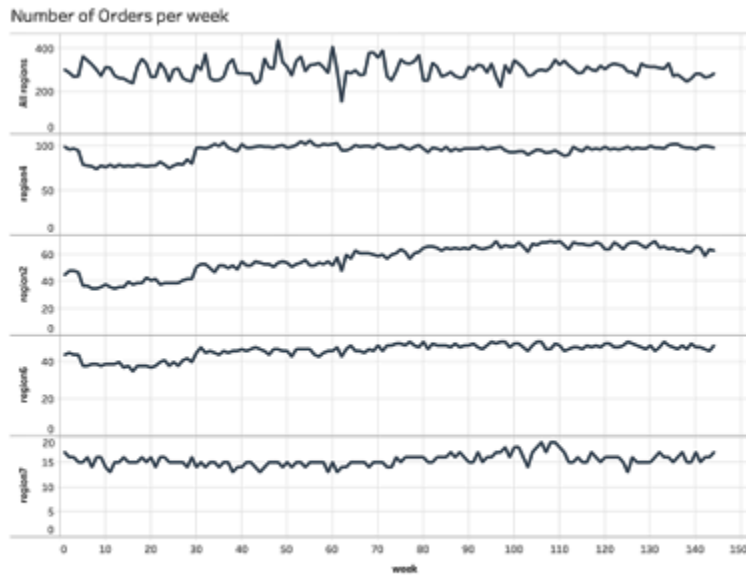


Fig (vi)

### **10.ADVANTAGES:**

1. While it might seem like more paperwork to determine something you're going to find out anyway, don't underestimate the **importance of demand forecasting**. As it can save your company money and increase your profits.
2. Many small business owners mistakenly believe that an annual budget that projects revenues is comparable to projecting demand.
3. But a more thorough analysis of the market will help determine the timing of sales, which can help you better plan production,

financing, labor and marketing.

***DISADVANTAGES:***

1. One of the disadvantages of demand forecasting is that not every situation can be predicted. For example, a severe weather event could impact product or material supply availability or transportation logistics.
  2. Challenges in Demand Forecasting Leading to Lost Market Share.
  3. The most stubborn, expensive issues retailers face are due to poor demand forecasting.
- 
1. Retailers who rely on approximated demand disappoint customers, bleed profits, and lose market share to more tuned-in competitors.
  2. Limitations of Demand Forecasting are: Lack of historical sales data. Unrealistic assumptions. Cost incurred.

## ***11.CONCLUSION:***

We are using external and internal data for the prediction consisting of different factors like region ID, week etc. Food demand prediction is an important and challenging problem. we presented penalized approach as a food demand method. As we go through different algorithm for prediction the accuracy rate keeps on improving. There was not big difference other than precision rate of forecasting. is a food demand decision-based boosting algorithm which is used for increasing the accuracy rate.

This evaluation is used practically for restaurants. Furthermore, in future more refined prediction can be done based on many other factors like cultural habits, religious holiday, consumer preferences etc. In future, this method can be used for predicting work force requirement, automated food ordering based on forecasting results.

## ***12.FEATURE SCOPE:***

Predicting future food demand is a critical step for formulating the agricultural, economic and conservation policies required to feed over 9 billion people by 2050 while doing minimal harm to the environment. However, published future food demand estimates range substantially, making it difficult to determine optimal policies. Here we present a systematic review of the food demand literature-including a meta-analysis of papers reporting average global food demand predictions-and test the effect of model complexity on predictions. We show that while

estimates of future global kilocalorie demand have a broad range, they are not consistently dependent on model complexity or form. Indeed, time-series and simple income-based models often make similar predictions to integrated assessments (e.g., with expert opinions, future prices or climate influencing forecasts), despite having different underlying assumptions and mechanisms. However, reporting of model accuracy and uncertainty was uncommon, leading to difficulties in making evidence-based decisions about which forecasts to trust. We argue for improved model reporting and transparency to reduce this problem and improve the pace of development in this field.

Moreover, in their review of food demand forecasting models, that dealt with food demand focused on the impacts on land use, climate change, and agricultural supply, rather than issues related to poverty, food access, and food consumption disparities within or between countries. From the same only five focused on issues such as human health, hunger, food security, and nutrition.

only five focused on issues such as human health, hunger, food security, and nutrition. Furthermore, Flies as the main determinant of per capita food demand or in combination with prices from partial or general equilibrium models, with fewer including other variables such as income inequality/disparity.

### ***13.APPENDIX:***

Food delivery and restaurants benefit from forecasting food demand since

it reduces uncertainty and waste increasing margins for the industry. Restaurants in particular need around eighty percent filled-capacity to be profitable and many have not started or partnered with delivery services. By helping restaurants forecast weekly demand we aim to increase the net profit for the industry.

The largest benefit of food demand forecasting is the reduction of inventory, or food waste in the restaurant industry. Food is the highest cost for a restaurant, especially perishable food with a low shelf life. Therefore, reducing food waste has a large environmental and monetary effect for a given restaurant. It also has a marketing benefit, depending on the city the company is located in, since it can be marketed as a green business. Forecasting also helps with understocking since either too much inventory or not enough inventory can lead to customers choosing another restaurant.

Forecasting sales in a given week can help with labor scheduling and cost. The restaurant industry employs around fifteen million people in the US. Since many workers in the industry are part time or depend on hours set around a week to a month ahead some labor cost can be reduced if demand is predicted to be low in a future week or increased if the demand is expected to spike over the average orders.

Reducing uncertainty is a benefit for forecasting in any industry. However, uncertainty in the restaurant and delivery industry has an effect on real



lives, since many service jobs in the US are restaurant jobs. Excluding food and labor costs, which are the two largest costs in running a restaurant, reducing uncertainty can help restaurant owners arrange payroll, utilities, marketing and expansion plans. The savings from forecasting demand can be used for expansion or to add new menu items to draw more customers.

Forecasting food demand has a direct effect on restaurant profits by reducing food and labor costs and reducing uncertainty for other costs. Implementing the forecasting methods in this paper will help the restaurant and food delivery industries manage profits. This project focuses on one food delivery client, such as Favor, which delivers food in many different cities through distribution networks and fulfillment centers, i.e. local restaurants.

### ***SOURCE CODE:***

```
import numpy as np
```

```
import pandas as pd
```

```
import numpy as np
```

```
import plotly.express as px
```

```
import plotly.graph_objects as go
```

```
import matplotlib.pyplot as plt

import seaborn as sns

sns.set_theme(style="whitegrid")


data = pd.read_csv("onlinefoods.csv")

print(data.head())

buying_again_data = data.query("Output == 'Yes'")

print(buying_again_data.head())


plt.figure(figsize=(15, 10))

plt.title("Online Food Order Decisions")

sns.histplot(x="members", hue="Output", data=data)

plt.show()

gender = buying_again_data["Gender"].value_counts()

label = gender.index
```

```
counts = gender.values
```

```
colors = ['gold','lightgreen']
```

```
fig = go.Figure(data=[go.Pie(labels=label, values=counts)])
```

```
fig.update_layout(title_text='Who Orders Food Online More: veg vs non-veg')
```

```
fig.update_traces(hoverinfo='label+percent', textinfo='value',  
textfont_size=30,
```

```
marker=dict(colors=colors, line=dict(color='black', width=3)))
```

```
fig.show()
```

```
print("Enter Customer Details to Predict If the Customer Will Order  
Again")
```

```
a = int(input("Enter the name Customer: "))
```

```
b = int(input("Enter num of veg Customer (1 = veg, 0 = non veg): "))
```

```
h = int(input("Pin Code: "))
```

```
i = int(input("Review of the Last Order (1 = Positive, 0 = Negative): "))
```

```
features = np.array([[a, b, c, d, e, f, g, h, i]])
```

```
print("Finding if the customer will order again: ", model.predict(features))
```

GITHUBLINK:[https://github.com/IBM-EPBL/IBM-Project-22157-](https://github.com/IBM-EPBL/IBM-Project-22157-1659806150)

[1659806150](https://github.com/IBM-EPBL/IBM-Project-22157-1659806150)

Youtube : <https://youtu.be/yn8K7Fy-sU0>

Drive:

<https://drive.google.com/file/d/1tYND0m4DDeJVUaRHdsRMSF7Yyyqxx>

[PI3/view?usp=share\\_link](https://drive.google.com/file/d/1tYND0m4DDeJVUaRHdsRMSF7Yyyqxx)

