DEMANDEST - AI POWERED FOOD DEMAND FORECASTER

PROJECT REPORT

SUBMITTED BY

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ANNA UNIVERSITY: CHENNAI 600 025

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CHAPTER-I INTRODUCTION

1.1 PROJECT 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 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.

CHAPTER-II

LITERATURE SURVEY

2.1 EXISTING PROBLEM :

While Satellites And Sensors Are Excellent Tools For Data Collection From Various Angles, Ai Is An Impeccable Tool For The Analysis Of This Massive Information And Making Predictions About What Is Going To Happen And Where That Event Is Most Likely To Occur. In The Same Context, Ai Is Holding The Key To Accurate Flood Forecasting. First Of All, The Data To Train The Ai System Is Gathered Through Past Data Of Rainfall And Flood Simulations

2.2 Litrature Survay :

Title : Enhanced Demand Forecasting System For Food And Raw Materials Using Ensemble Learning

Author : K. Harshini, Padmini Kousalya Madhira, Sutari Chaitra, G. Pradeep Reddy

Year : 2021

Human Needs Have Been Evolving Along With Time. There Has Been A Constant Change In The Way People Eat Food And Their Taste Pallets, With Cuisines Varying From Continent To Continent.In The Older Days,people Used To Cook With The Ingredients They Found Around Them And Ended Up With A New Dish. Food Wastage And Raw Materials Deterioration Are The Most Noteworthy Predicaments Faced By Any Food Selling Business. To Avoid Wastage, The Restaurants Should Have Prior Knowledge Of The Amount Of Foodrequired. Several Solutions With The Help Of Ai Have Been Compounded To Solve Thisproblem Of Food Wastage. Nevertheless, Much Of This Research Concentrates On Theprediction Of Sales And Its Accuracy.

It Is Important To Note That Sales Prediction Alonewon't Be Enough To Decrease Food Wastage. Predicting The Number Of Raw Materials Required Also Plays A Crucial Role In Reducing Food Wastage. Therefore, In This Paper, A Demand Forecasting System Is Proposed That Predicts The Number Ofcustomers, Sales For Particular Dishes.

Title: Demand Forecasting In Restaurants Using Machine Learning And Statistical Analysis. **Author:** Takashi Tanizaki,tomohiro Hoshino ,takeshi Shimmura,takeshi Takenaka

Year: 2018

In The Paper, Demand Forecasting In Restaurants Using Machine Learning Is Proposed. Many Researches Have Been Proposed On Demand Forecasting Innovation Utilizing Pos Information. However,in Order To Make Demand Forecasts At A Genuine Store, It Is Important To Lay Out A Store-explicit Demand Forecasting Model In Light Of Different Factors, For Example, The Store Area, The Climate, Occasions And So On .Thus, We Developed An Demand Forecasting Model That Practically Consolidates The Previously Mentioned Information Utilizing Machine Learning. In This Paper ,the Interest Determining Model Utilizing Ai And The Check Consequence Of The Model Utilizing Genuine Store Information Is Examined.

In This Paper, Demand Forecasting Techniques Utilizing Inner Information, For Example, Pos Information And Outside Information In The Omnipresent Climate Like Climate, Occasions, And So On Are Proposed. We Utilize Bayesian Straight Relapse, Helped Choice Tree Relapse, Choice Backwoods Relapse And Stepwise Technique As The Demand Forecasting Strategy. There Was No Huge Distinction In The Determining Rate Utilizing The Strategy For Bayesian, Choice, And Stepwise, And The Forecasting Rate Of Helped Was Somewhat Low. The Figure Rate Of Any Store Surpassed Around 85%.

Title: Food Demand Prediction Using Machine Learning.

Author: K.Aishwarya, Aishwarya.N.Rao, Nikita Kumari, Akshit Mishra, Mrs.Rashmi

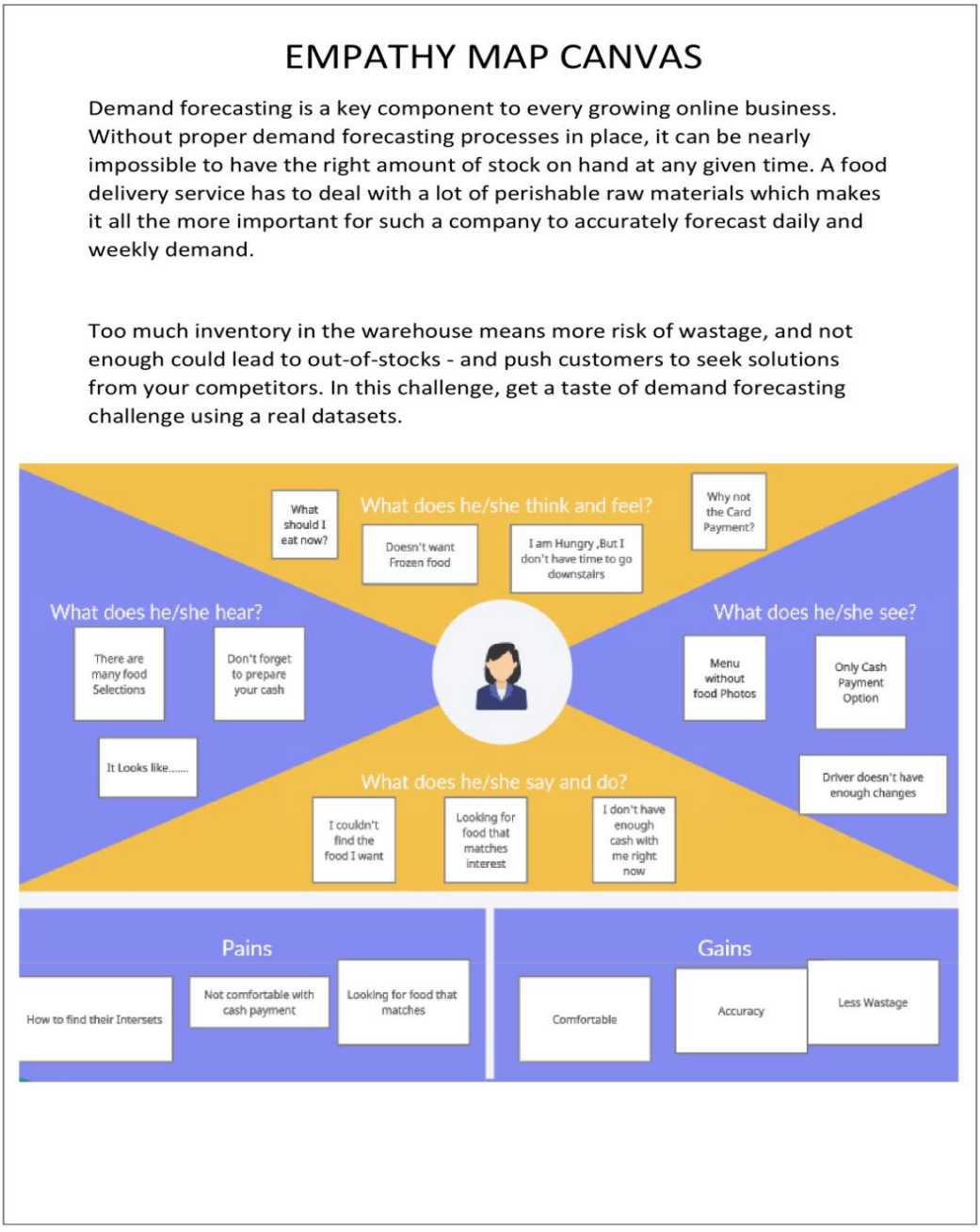
Year: 2020

Demand Forecasting Is The Cycle Where Authentic Information Is Utilized To Assess The Amount Of Item Client Will Buy. This Forecast Movement Is Utilized In Many Fields Like Retailing, Food Industry And So On. In Restaurants, Prediction Assume A Crucial Part As A Large Portion Of The Essential Fixings Have Short-time Span Of Usability. The Demand Rely On Numerous Unequivocal And Secret Setting, For Example, Season, Region And So On. In This Paper, Number Of Request Is Utilized To Estimate Supply Of Things, Utilizing Ai With Internal And External Data.In This Paper, Involving Outside And Inward Information For The Expectation Comprising Of Various Variables Like District Id, Week And So On. Food Demand Prediction Is A Significant And Testing Issue.

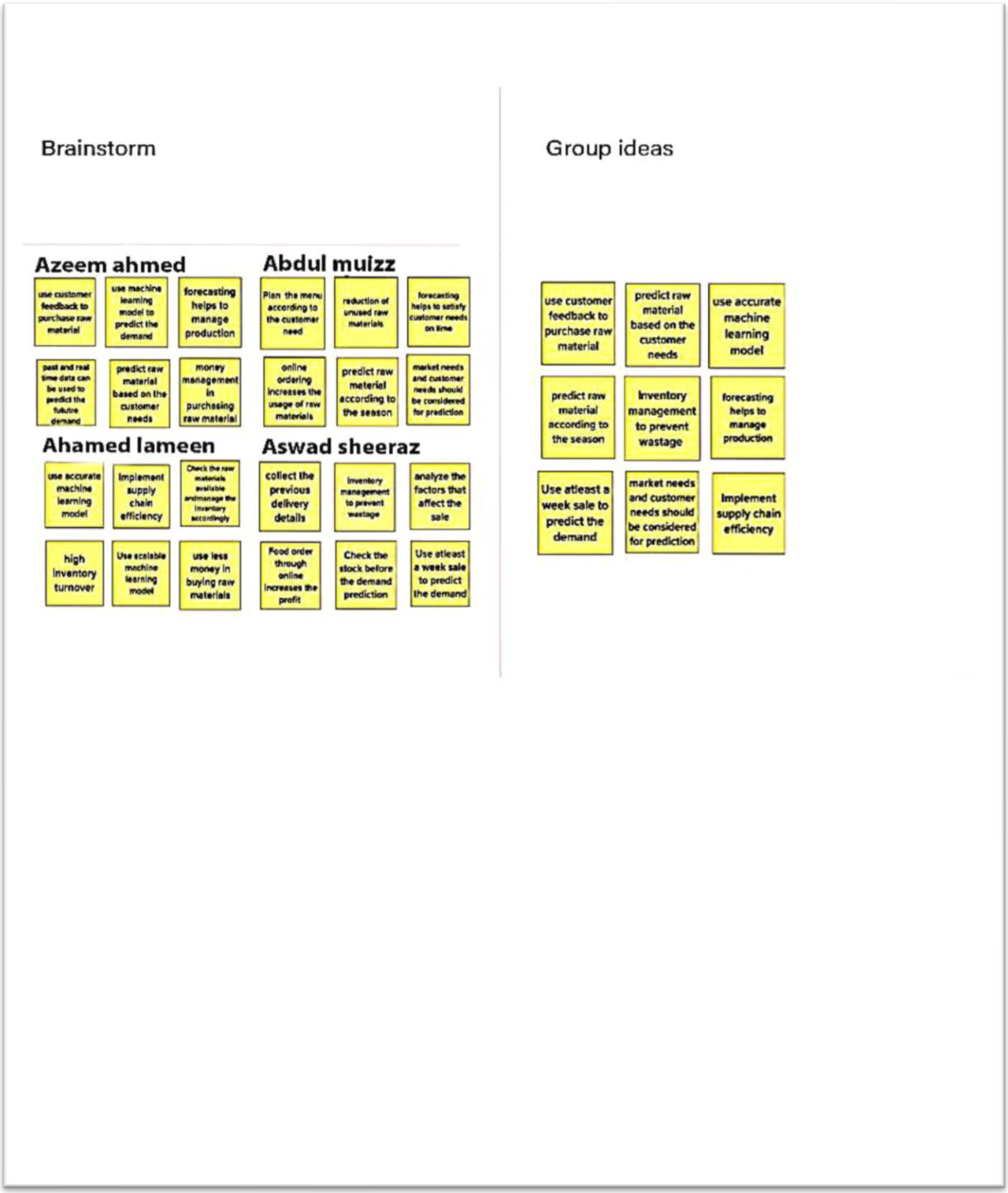
CHAPERT-III

IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS:



3.2 IDEATION & BRAINSTROMING:



Ideation Phase
Brainstorm & Idea Prioritization Template

Date	19 september 2022
Team ID	PNT2022TMID23900
Project Name	DemandEst-AI Powered Food Demand Forecaster.
Maximum Marks	4 Marks

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

3.3 PROBLEM STATEMENTS :

A client ai A meal delivery company which operates in multiple Cases.they have Various fullfilment center in these cities for dispatching meal orders to their Customers.The client Wants us to help these centers with demand Forcasting for upcoming so that these centers will plan the stock of raw materials accordingly.The replenishment of majority of raw material is done on weekly bases and since the raw material is Persiable,The procurement planning is of utmost importance.Secondly the staffing of centers is Also One area Wherein accurate demand forcast are really Helpful.Given the following information,The task is to predict the demand fir the next 10weeks(Week-146-155) For the Center-meal combination in the test set:

Problem Statement (ps)	I Am (customer)	I'm Trying To	But	Because	Which Makes Me Feel
Ps-1	Meal Delivery Or	Delivery Food	Cancelled The Delivery	Scarcity Of Stock Or Raw	Frustrated
	Service Company		Service	Material	
Ps-2	Meal Delivery Or Service Company	Purchase Raw Materials	The Stock Either Gets Wasted Or Becomes Out Of Stock	The Company Failed To Predict The Demand Accurately	Miserable

Data Dictionary

1. **Weekly Demand data (train.csv):** Contains the historical demand data for all centers, test.csv contains all the following features except the target variable

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

2. **fulfilment_center_info.csv:** Contains information for 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)

3. **meal_info.csv:** Contains information for 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/...)

PROPOSED SOLUTION TEMPLATE:

Project Design Phase-I
Proposed Solution Template

Date	20 October 2022
Team ID	PNT2022TMID23900
Project Name	Demand Est-AI Powered Food Demand Forecaster
Maximum Marks	2 marks

Proposed solution:

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.

S. No	Parameter	Description
1	Problem statement (problem to be solved)	• Perishable raw materials must be handled daily by a food delivery service provider. • Therefore, it is crucial to forecast the number of raw materials required for meal orders.
2	Idea / Solution description	• The main objective of food demand forecaster project is to build a machine learning model which uses classification algorithm to forecast the number of orders to gather raw materials for the next 10 weeks. • Appropriate data is gathered from relevant datasets which includes information about food delivery services in any area, meal information, price for each meal and discount of meals in a particular week.
3	Novelty / Uniqueness	• The system automatically updates customer information. • Data is evaluated to forecast the raw materials. • User friendly interface.
4	Social Impact / Customer Satisfaction	• The amount of food wasted in the food sector will be reduced. • Increase in client profits. • Decrease raw material waste.
5	Business Model (financial Benefit)	• After examining the food-related data for each location, it will determine which location was most in demand • Highly profitable. • High inventory turnovers can be made with proper analysis.
6	Scalability of Solution	• The customer gains advantages from the analysis of industry data. • It offers predictions on the day-to-day analysis of the food that is sold.

CHAPTER-IV

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT :

Fr No.	**Functional Requirement (epic)**	**Sub Requirement (story / Subtask)**
Fr-1	User Registration	Registration Through Form Registration Through Gmail Registration Through Linkedin
Fr-2	User Confirmation	Confirmati on Via Email Confirmati on Via Otp
Fr-3	Website Entry	Collecting User Data And Storing It In Database
Fr-4	Permissions	Location, Storage, Contacts

4.2 NON-FUNCTIONAL REQUIREMENTS :

FR NO.	NON-FUNCTIONAL REQUIREMENT	DESCRIPTION
NFR-1	**USABILITY**	THIS PARAMETER SPECIFIES HOW DIFFICULT IT WILL BE FOR A USER TO LEARN AND RUN THE SYSTEM. USABILITY MAY BE ACCESSED FROM A VARIETY OF POINTS.
NFR-2	**SECURITY**	SECURITY REQUIREMENTS ENSURE THAT SOFTWARE IS PROTECTED FROM UNWANTED SYSTEM ACCESS AND THAT IT IS SAVED IN DATA. RELIABILITY DESCRIBES HOW LIKELY IT IS THAT THE SOFTWARE WILL OPERATE WITHOUT
		FAILURE FOR A PARTICULAR AMOUNT OF TIME.
NFR-3	**RELIABILITY**	RELIABILITY SUFFERS AS A RESULT OF ERRORS IN THE CODE, HARDWARE FAILURES, AND ISSUES WITH OTHER SYSTEM COMPONENTS.
NFR-4	**PERFORMANCE**	IT IS A QUALITY ATTRIBUTE THAT DESCRIBES THE SYSTEM'S RESPONSIVENESS TO VARIOUS USER INTERACTIONS WITH IT.

NFR-5	**AVAILABILITY**	ALL OPERATIONS CAN BENEFIT FROM SERVICES. THE DATA IS EASILY ACCESSIBLE HERE. WE CAN RECEIVE INFO ANYTIME WE NEED IT.
NFR-6	**SCALABILITY**	SCALABILITY OUTLINES HOW THE SYSTEM MUST GROW WITHOUT COMPROMISING ITS PERFORMANCE. THIS ENTAILS MORE USERS, MORE DATA PROCESSING, AND MORE TRANSACTIONS. IN THIS STRATEGY, CUSTOMERS PROFIT FROM EVALUATING THEIR INDUSTRY DATA, WHICH GIVES PREDICTIONS ON DAY-TO-DAY ANALYSIS OF FOOD SOLD AND REDUCES FOOD WASTE BY PROJECTING SALES MOVEMENTS.

CHAPTER-V

PROJECT DESIGN

5.1 SOLUTION & TECHNICAL DATA FLOW DIAGRAMS :

PROJECT FLOW AND ARCHITECTURE

TEAM ID	PNT2022TMID23900
PROJECT NAME	AI POWERED FOOD DEMAND FORECASTER

AI POWERED FOOD DEMAND FORECASTER

PROJECT FLOW:

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.

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.

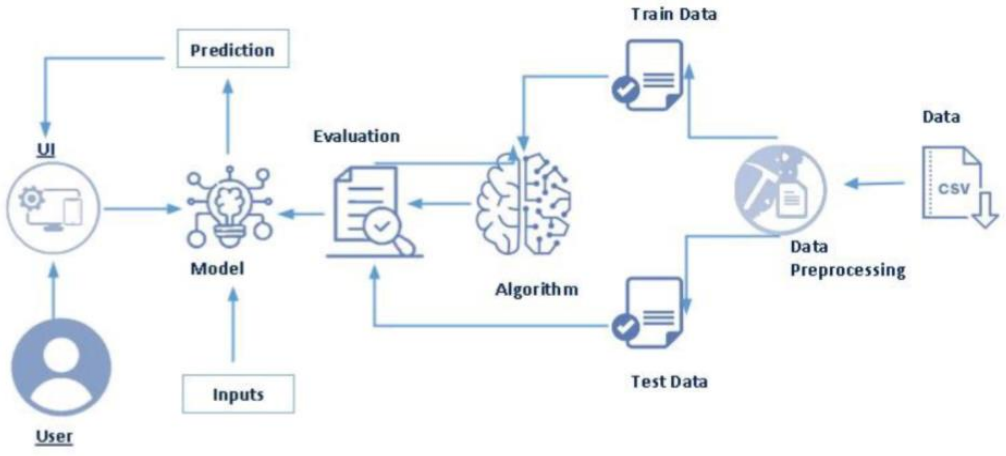
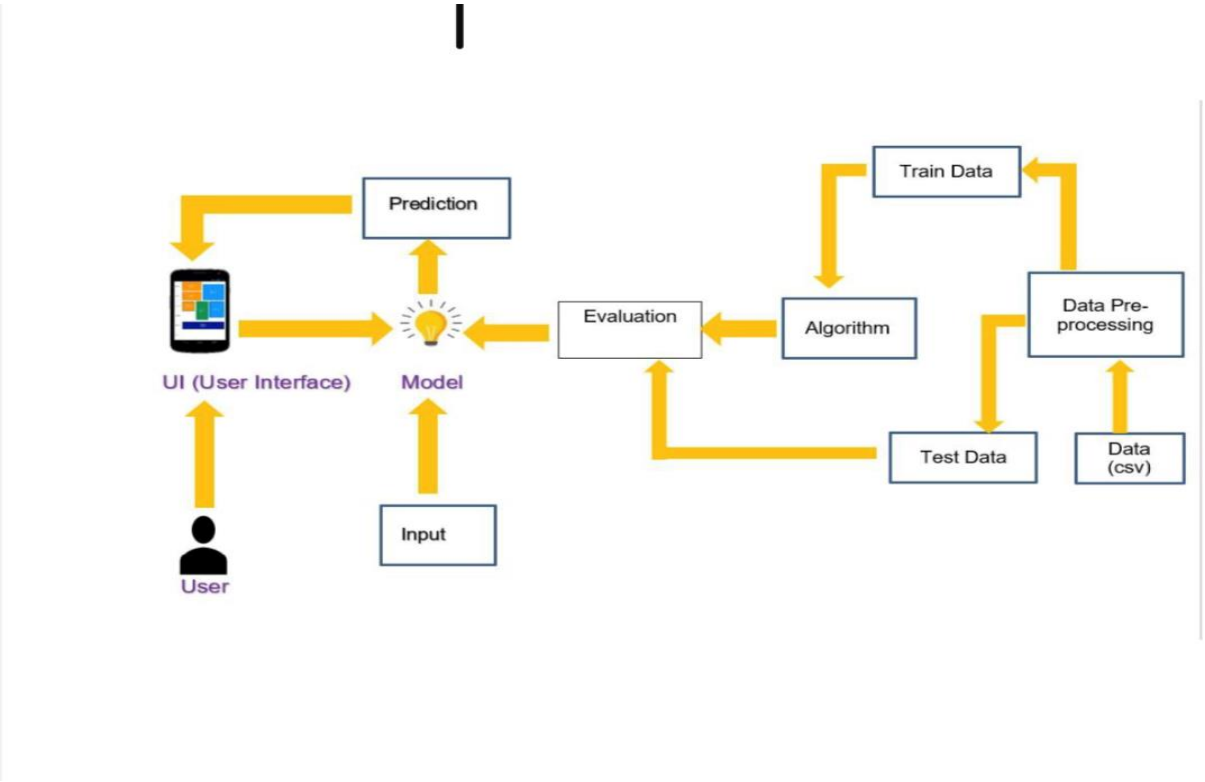


TABLE -2 CHARACTERISTIC :

1	Open-source Frameworks	No Open Source Framework	Python Flask
2	Security Implementations	Authentication Using Mail Id And Password	Password Based
	Scalable Architecture	Presentation Tierhtml Application Tierpython Model Predicts The Order Demand Based On The Food Interest And Region Easily Through Online For The Upcoming Weeks.	Ibm Cloud
4	Availability	Data Are Updated Periodically To Predict The Demand	Ibm Watson Studio

5.2 ARCHITECTURE DIAGRAM:



5.3 USER STORIES

SPRINT	FUNCTIONAL REQUIREMENT (EPIC)	USER STORY NUMBER	USER STORY / TASK	STORY POINTS
SPRINT-3	HOME	USN-1	AS A USER, I CAN VISIT FOR THE HOME PAGE OF THE FOOD PREDICTION	5
SPRINT-3		USN-2	AS A USER, I CAN PRESS PREDICTION BUTTON	5

SPRINT-3	UPLOAD	USN-3	AS A USER, I CAN VISIT THE WEB APPLICATION AND ACCESS THE DASHBOARD	5
SPRINT-3		USN-4	AS A USER, I CAN ENTER THE INFORMATION FOR THE FOOD PREDICTION	5
SPRINT-3		USN-5	AS A USER, I CAN VISIT THE WEB APPLICATION AND ACCESS THE DASHBOARD	5
SPRINT	**FUNCTIONAL REQUIREMENT**	**USER STORY NUMBER**	**USER STORY / TASK**	**STORY POINTS**
	NT (EPIC)			
SPRINT-1	MANAGEMENT	USN-6	AS AN ADMINISTRATOR, I CAN COLLECT NEW DATASETS AND KEEP THE MODEL TRAINED	3
SPRINT-1		USN-7	AS AN ADMINISTRATOR, I CAN UPDATE OTHER FEATURES OF THE APPLICATION	3

SPRINT-1		USN-8	AS AN ADMINISTRATOR, I CAN	3
			MAINTAIN THE INFORMATION ABOUT THE FOOD PREDICTION	
SPRINT-2		USN-9	AS AN ADMINISTRATOR, I CAN USE DIFFERENT ALGORITHM AND CHOOSE BEST ALGORITHM	3
SPRINT 2		USN-10	AS AN ADMINISTRATOR ,I CAN MODEL EVALUATION AND SAVE THE MODEL	3
SPRINT 2		USN-11	AS AN ADMINISTRATOR , I CAN PREDICTION THE VALUE USING THE MODEL	3
SPRINT 4		USN-12	AS AN ADMINISTRATOR , I CAN USE THE REGISTER IBM ACCOUNT	3
SPRINT 4		USN-13	AS AN ADMINISTRATOR, I CAN THE TRAIN THE ML FOR IBM	3

CHAPTER-VI

PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION :

SPRINT	FUNCTIONAL REQUIREMENT (EPIC)	USER STORY NUMBER	USER STORY / TASK	STORY POINTS	SPRINT
SPRINT-3	HOME	USN-1	AS A USER, I CAN VISIT FOR THE HOME PAGE OF THE FOOD PREDICTION	5	SPRINT-3
SPRINT-3		USN-2	AS A USER, I CAN PRESS PREDICTION BUTTON	5	SPRINT-3
SPRINT-3	UPLOAD	USN-3	AS A USER, I CAN VISIT THE WEB APPLICATION AND ACCESS THE DASHBOARD	5	SPRINT-3
SPRINT-3		USN-4	AS A USER, I CAN ENTER THE INFORMATION FOR THE FOOD PREDICTION	5	SPRINT-3

SPRINT-3		USN-5	AS A USER, I CAN	5	SPRINT-3

			VISIT THE WEB APPLICATION AND ACCESS THE DASHBOARD		
SPRINT	**FUNCTIONAL REQUIREMENT**	**USER STORY NUMBER**	**USER STORY / TASK**	**STORY POINTS**	**SPRINT**
	NT (EPIC)				
SPRINT-1	MANAGEMENT	USN-6	AS AN ADMINISTRATOR, I CAN COLLECT NEW DATASETS AND KEEP THE MODEL TRAINED	3	SPRINT-1
SPRINT-1		USN-7	AS AN ADMINISTRATOR, I CAN UPDATE OTHER FEATURES OF THE APPLICATION	3	SPRINT-1
SPRINT-1		USN-8	AS AN ADMINISTRATOR, I CAN MAINTAIN THE INFORMATION ABOUT THE FOOD PREDICTION	3	SPRINT-1

SPRINT-2		USN-9	AS AN ADMINISTRATOR, I CAN USE DIFFERENT ALGORITHM AND CHOOSE BEST ALGORITHM	3	SPRINT-2
SPRINT 2		USN-10	AS AN ADMINISTRATOR ,I CAN MODEL EVALUATION AND SAVE THE MODEL	3	SPRINT 2
SPRINT 2		USN-11	AS AN ADMINISTRATOR , I CAN PREDICTION THE VALUE USING THE MODEL	3	SPRINT 2
SPRINT 4		USN-12	AS AN ADMINISTRATOR , I CAN USE THE REGISTER IBM ACCOUNT	3	SPRINT 4
SPRINT 4		USN-13	AS AN ADMINISTRATOR, I CAN THE TRAIN THE ML FOR IBM	3	SPRINT 4

6.2 SPRINT DELIVERY SCHEDULE :

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	5	6 Days	24 Oct 2022	29 Oct 2022	5	29 Oct 2022
Sprint-2	3	6 Days	31 Oct 2022	05 Nov 2022	3	05 NOV 2022
Sprint-3	3	6 Days	07 Nov 2022	12 Nov 2022	3	12 Nov 2022
Sprint-4	3	6 Days	14 Nov 2022	19 Nov 2022	3	14 Nov 2022

CHAPTER-VII

CODING & SOLUTIONING

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

```
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")

SECONDS_IN_A_DAY = 24 * 60 * 60
SECONDS_IN_A_DAY

APP=FLASK(__NAME__,TEMPLATE_FOLDER="TEMPLATES")
@APP.ROUTE('/', METHODS=['GET'])
DEF INDEX():
                                    RETURN          RENDER_TEMPLATE('\PYTHON
SCRIPTS\TAMLATES\UPLOAD.HTML')
@APP.ROUTE('/HOME', METHODS=['GET'])
DEF ABOUT():
   RETURN RENDER_TEMPLATE('\PYTHON SCRIPTS\HOME.HTML')
@APP.ROUTE('/PRED',METHODS=['GET'])
DEF PAGE():
                                    RETURN          RENDER_TEMPLATE('\PYTHON
SCRIPTS\TAMLATES\UPLOAD.HTML')
```

```
@APP.ROUTE('/PREDICT', METHODS=['GET', 'POST'])
DEF PREDICT():
   PRINT("[INFO] LOADING MODEL...")
                                MODEL = PICKLE.LOAD(OPEN('\PYTHON
SCRIPTS\TAMLATES\FOODDEMAND.PKL', 'RB'))
   INPUT_FEATURES = [FLOAT(X) FOR X IN REQUEST.FORM.VALUES()]
   FEATURES_VALUE = [NP.ARRAY(INPUT_FEATURES)]
   PRINT(FEATURES_VALUE)

                              FEATURES_NAME = ['HOMEPAGE_FEATURED',
'EMAILER_FOR_PROMOTION', 'OP_AREA', 'CUISINE',
     'CITY_CODE', 'REGION_CODE', 'CATEGORY']
   PREDICTION = MODEL.PREDICT(FEATURES_VALUE)
   OUTPUT=PREDICTION[0]
   PRINT(OUTPUT)
                                    RETURN RENDER_TEMPLATE('\PYTHON
SCRIPTS\TAMLATES\UPLOAD.HTML', PREDICTION_TEXT=OUTPUT)

IF __NAME__ == '__MAIN__':
    APP.RUN(DEBUG=FALSE)
```

7.3 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 tobe 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 CenterIDs 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 IDsin the Meals Dataset i.e 51 unique records. Hence, there won't be any missing values while merging the datasets together

```
# 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 = "CF4MPFBOYWXF02SUFXOVZRXMY2MJBG5UG3DZUM9XPB1D"
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="/CONTENT/APP.PY")

@APP.ROUTE('/', METHODS=['GET'])
DEF INDEX():
   RETURN RENDER_TEMPLATE('/CONTENT/HOME.HTML.HTMLHOME.HTML')


@APP.ROUTE('/HOME', METHODS=['GET'])
DEF ABOUT():
   RETURN RENDER_TEMPLATE('/CONTENT/HOME.HTML.HTML')
```

```
@APP.ROUTE('/PRED', METHODS=['GET'])
DEF PAGE():
   RETURN RENDER_TEMPLATE('/CONTENT/HOME.HTML.HTML')
@APP.ROUTE('/PREDICT', METHODS=['GET', 'POST'])
DEF PREDICT():
   PRINT("[INFO] LOADING MODEL...")
   # MODEL = PICKLE.LOAD(OPEN('FDEMAND.PKL', 'RB'))
   INPUT_FEATURES = [INT(X) FOR X IN REQUEST.FORM.VALUES()]
   PRINT(INPUT_FEATURES)
   FEATURES_VALUE = [[NP.ARRAY(INPUT_FEATURES)]]
   PRINT(FEATURES_VALUE)

PAYLOAD_SCORING = {"INPUT_DATA": [{"FIELD": [['HOMEPAGE_FEATURED',
'EMAILER_FOR_PROMOTION', 'OP_AREA', 'CUISINE',
                                    'CITY_CODE', 'REGION_CODE', 'CATEGORY']],
                          "VALUES": [INPUT_FEATURES]}]}

RESPONSE_SCORING = REQUESTS.POST(
      'HTTPS://US-
SOUTH.ML.CLOUD.IBM.COM/ML/V4/DEPLOYMENTS/80AFCAAD-591D-4869-BF54-
17BBB8C70EA3/PREDICTIONS?VERSION=2022-11-14',
      JSON=PAYLOAD_SCORING, HEADERS={'AUTHORIZATION': 'BEARER ' +
MLTOKEN})
   PRINT("SCORING RESPONSE")
   PRINT(RESPONSE_SCORING.JSON())
   PREDICTIONS = RESPONSE_SCORING.JSON()
   PRINT(PREDICTIONS)
   PRINT('FINAL PREDICTION RESULT',
PREDICTIONS['PREDICTIONS'][0]['VALUES'][0][0])
   PRED = PREDICTIONS['PREDICTIONS'][0]['VALUES'][0][0]

   # PREDICTION = MODEL.PREDICT(FEATURES_VALUE)
   # OUTPUT=PREDICTION[0]
   # PRINT(OUTPUT)"'
PRINT(PRED)
```

```
RETURN RENDER_TEMPLATE('UPLOAD.HTML', PREDICTION_TEXT=PRED)


IF __NAME__ == '__MAIN__':  APP.RUN(DEBUG=FALSE)
```

CHAPTER-VIII

TESTING

8.1 TEST CASES :

Testcase _id	Feature_ Type	Compone nt	Test_ Scenario	Steps To Execute	Status	Executed By

Tc_11	Functional (feedback)	Admin	As A Customer Care Team Member, I Should Be To Get Feedback From The Users.	**Step 1:** Test Case Id. **Step 2:** Test Description **Step 3:** Assumptions And Preconditions. **Step 4:** Test Data. **Step 5:** Steps To Be Executed. . . **Step 6:** Expected Result.	Passed	Dhinesh

				. . **Step 7:** Actual Result And Postconditi ons. . . **Step 8:** Pass/fail.		

8.2 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 Ofsoftware Developmentin Which The Software Is Tested In The "real World" By The Intended Audience Or Businessrepresentative.

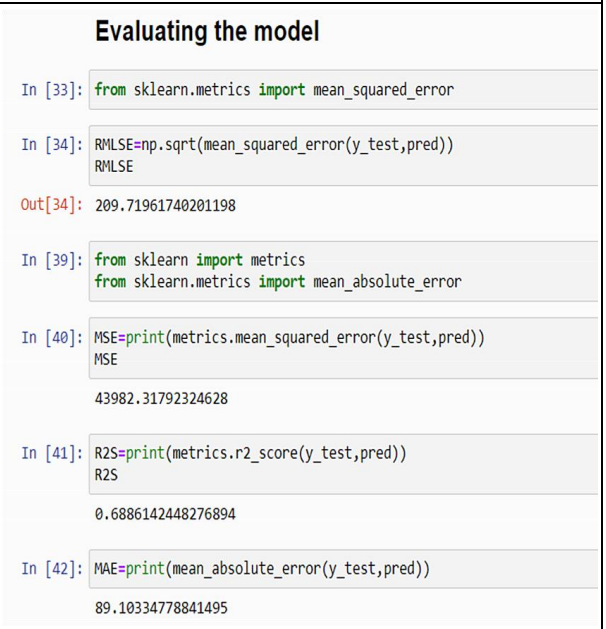
Resolution	Severity1	Severity2	Severity3	Severity4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won'tFix	0	0	0	1	1
Totals	24	9	11	26	71

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

CHAPTER-IX

RESULTS

9.1 PERFORMANCE METRICS :

S. NO	PARAMETER	VALUE	SCRENSORT
1	METRICS	**REGRESSION MODEL:** MAE 89.10334778841495, MSE - 43129.82977026746, RMSLE - 207.67722496765856, R2 SCORE - 0.6946496854280233,	
2	TUNE THE MODEL	**HYPERPARAMETER TUNING** - RMSLE- 52.85812511759974 AVG R-SQUARED- 0.123 MSE: -64230.918 TUNE THE MODEL	

CHAPTER-X ADVANTAGES & DISADVANTAGES

10.1 ADVANTAGES:

1.You'll gain valuable insight :

Forecasting gets you into the habit of looking at past and real-time data to predict future demand. And in doing so, you'll be able to anticipate demand fluctuations more effectively. But more than that, it'll give you insight into your company's health and provide you with an opportunity to course-correct or make adjustments.

2. **You'll learn from past mistakes**

You don't start from scratch after each forecast. Even if your prediction was nowhere close to what ended up coming to pass, it gives you a starting point. It's common to review where and why things didn't happen the way you predicted. Your forecasts should eventually improve. But more than that, you'll get into the habit of reflecting upon past performance as a whole. And selfreflection can be a powerful driver of company growth.

3. **It can decrease costs**

When done right, anticipating demand will help you tweak your processes to increase efficiency all along the supply chain. Because you're better able to predict what customers will want and when they'll want it, you may also be able to decrease excess inventory levels, thus increasing overall profitability.

10.2 disadvantage of forecasts :

1. Forecasts are never 100% accurate

Let's face it: it's hard to predict the future. Even if you have a great process in place and forecasting experts on your payroll, your forecasts will never be spot on. Some products and markets simply have a high level of volatility. And in general, there is just an endless number of factors that influence demand.

2. It can be time-consuming and resource-intensive

Forecasting involves a lot of data gathering, data organizing, and coordination. Companies typically employ a team of demand planners who are responsible for coming up with the forecast. But in order to do this well, demand planners need substantial input from the sales and marketing teams. In addition, it's not uncommon for processes to be manual and labor-intensive, thus taking up a lot of time. Fortunately, if you have the right technology in place, this is much less of an issue.

3. It can also be costly

On a related note, hiring a team of demand planners is a significant investment. When you add to that the cost of using good quality tools, upfront costs can add up. But investing in advanced software, high-quality talent and solid forecasting processes is just that: an investment. We're confident you'll see a return when all of that is done right.

Forecasting is a business practice that every company engages in to one extent or another. And it can be hugely valuable, providing those companies who have implemented a solid forecasting process with a leg up on their competition. What's more, even the disadvantages can be overcome with the right people, technology and processes. So learn how partnering with our Forecast Xperts and implementing our Atlas Suite can make a difference.

CHAPTER- XI CONCLUSION 11. CONCLUSION

As the world's population grows, so does the demand for food, and in recent years the number of people exposed to hunger, and even severe hunger, is increasing daily. Governments and organizations active in the food industry are planning and preparing to prevent potential problems that may arise in the way of food security for future generations. To achieve food security goals, food is mainly supplied through domestic production and import. Therefore, studying a country's potential for food supply is the first step in planning for food security. Food production prediction gives a realistic view to policy makers and activists in the agricultural and food industries for long-term and short-term planning.

Therefore, the present study tried to provide a suitable model with high predictive performance for predicting food production. The present study predicted Iran's agricultural and livestock production for the next ten years. According to the results, it is predicted that in the next ten years, the volume of both agricultural and livestock production in Iran will increase. The findings of this study provide a basis for planning the production volume required for the coming years, planning for budgeting and agricultural subsidies, planning for the active workforce in the agricultural and livestock sectors. In addition, according to forecasts, decision-makers can plan to import needed food production and export surplus domestic production. Using machine learning, researchers have come up with creative and precise solutions to a variety of food and agricultural problems, such as crop yields prediction. However, there is no research to predict food production. The present study used machine learning models to predict agricultural and livestock products in Iran. For this purpose, the performance of two models, MLP and ANFIS, was tested using time series data of agricultural and livestock production in Iran. The results of accuracy metrics revealed that the ANFIS model has higher predictive power than the MLP

model due to its higher predictive accuracy.

CHAPTER-XII FUTURE SCOPE

10.1 FUTURE SCOPE:

Using machine learning, researchers have come up with creative and precise solutions to a variety of food and agricultural problems, such as crop yields prediction. However, there is no research to predict food production.

The present study used machine learning models to predict agricultural and livestock products in Iran. For this purpose, the performance of two models, MLP and ANFIS, was tested using time series data of agricultural and livestock production in Iran.

Therefore, for future research, it is suggested that using the proposed model of the present study to predict food production in different countries and provide appropriate solutions to combat food insecurity. One of the limitations of this study is that forecasts for agricultural and livestock production are based only on time series data while other factors such as climate, government policies, and technological advances are considered constant. Another limitation of this article is the generalization of the finding that the ANFIS model outperforms the MLP model because this finding is limited to the time series data of Iran and the result may differ in data related to another country.

CHAPTER-XII

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://img.freepik.com/free-photo/grilled-chicken-rice-spicy-chickpeas-avocado-cabbage-pepper-buddha-bowl-dark-top-view_127032-1966.jpg?w=2000");
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>

</body>

</html>

OUTPUT :

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://images.pexels.com/photos/1640777/pexels-photo-1640777.jpeg?cs=srgb&dl=pexels-ella-olsson-1640777.jpg&fm=jpg");
background-size: cover;
```

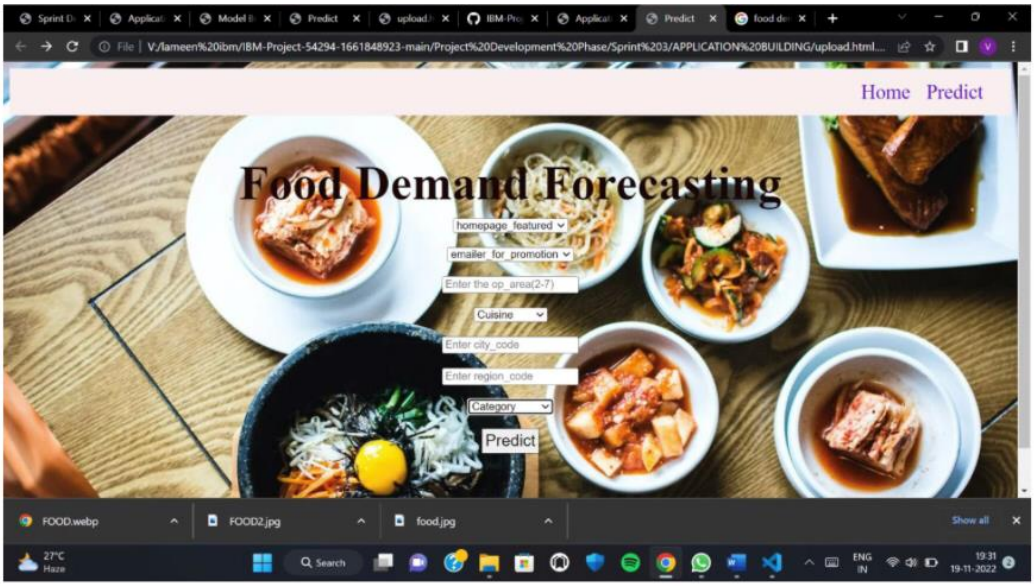
```
}
p
{
color:white;
font-style:italic;
font-size:30px;
}
h1,h2
{
 color:0101DF;
}
</style>
</head>

<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>
```

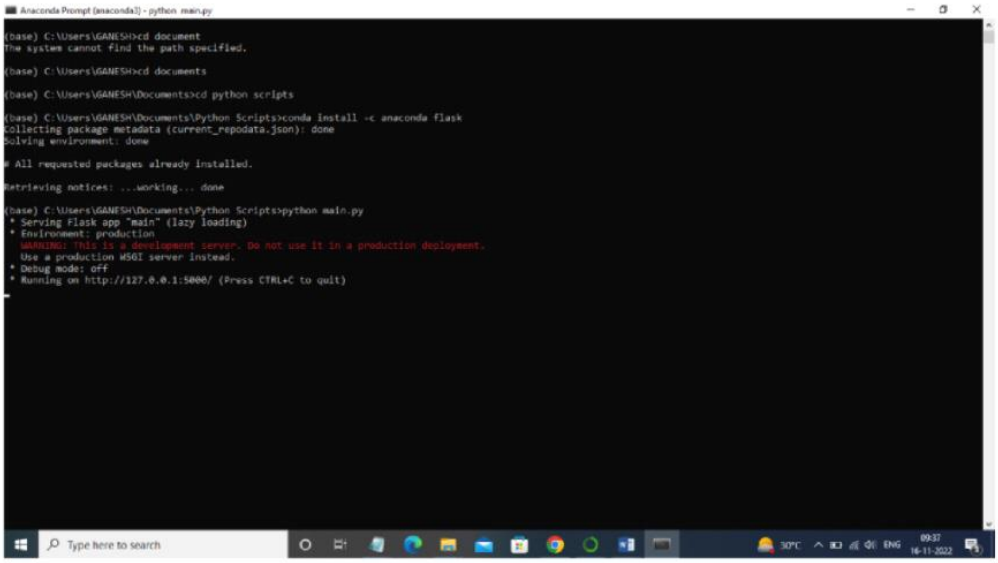
OUTPUT :



app.py

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

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

seconds_in_a_day = 24 * 60 * 60 seconds_in_a_day

app=Flask(__name__,template_folder="templates")
@app.route('/', methods=['GET'])
def index():
    return render_template('\Python Scripts\tamlates\upload.html')
@app.route('/home', methods=['GET'])
def about():
    return render_template('\Python Scripts\home.html')
@app.route('/pred',methods=['GET'])
def page():
    return render_template('\Python Scripts\tamlates\upload.html')
```

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

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

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



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GitHub&ProjectDemoLink : https://github.com/IBM-EPBL/IBM-Project-18254-1659681931

Github Link : https://github.com/IBM-EPBL/IBM-Project-18254-1659681931