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1. INTRODUCTION

a. Project Overview

In India, Agriculture contributes major role to Indian economy. For agriculture, Rainfall is important but during these days' rainfall prediction has become a major challenging problem. Good prediction of rainfall provides knowledge and know in advance to take precautions and have better strategy about theirs crops.

Rainfall has been a major concern these days. Weather conditions have been changing for time being. Rainfall forecasting is important otherwise, it may lead to many disasters. Irregular heavy rainfall may lead to the destruction of crops, heavy floods that can cause harm to human life. It is important to exactly determine the rainfall for effective use of water resources, crop productivity, and pre-planning of water structures.

This comparative study is conducted concentrating on the following aspects: modeling inputs, Visualizing the data, modeling methods, and pre-processing techniques. The results provide a comparison of various evaluation metrics of these machine learning techniques and their reliability to predict rainfall by analyzing the weather data.

We will be using classification algorithms such as Decision tree, Random forest, KNN, and xgboost. We will train and test the data with these algorithms. From this best model is selected and saved in pkl format. Once the model is saved, we integrate it with flask application and also deploy the model in IBM.

Rainfall remains one of the most influential meteorological parameters in many aspects of our daily lives. With effects ranging from damage to infrastructure in the event of a flood to disruptions in the transport network, the socio-economic impacts of rainfall are noteworthy.

Rainfall forecasting has been around for years using traditional methods that employ statistical techniques to assess the correlation between rainfall, geographic coordinates (such as latitude and longitude), and other atmospheric factors (like pressure, temperature, wind speed, and humidity). However, the complexity of rainfall such as its non-linearity makes it difficult to predict.

b. Purpose

It is very important to predict rainfall because it is directly linked to the conservation of water resources, operations of the reservoir and in detection of flood level in nearby body. Water level due to rainfall affects the human activities such as sewer and traffic.Rainfall forecasting is very important because heavy and irregular rainfall can have many impacts like destruction of crops and farms.

2. LITERATURE SURVEY

a. Existing problem

Singh and Borah (2013), trained five architectures of a Feed-forward Back-propagation Neural Network algorithm containing only three layers (1 input, 1 hidden, and 1 output layer) to forecast the mean rainfall of the summer monsoon in India on a monthly and seasonal basis.

Kim and Bae proposed an LSTM-Networks model to forecast one hour of rainfall into the future (Kim & Bae, 2017). To train and validate the forecast model, weather data from 2012 from Gangneung, Gangwon-do region (Korea) was used. The climatic features that integrate the weather dataset were temperature, wind speed, humidity, and sea surface pressure.

Aswin, Geetha, and Vinayakumar (2018) proposed an approach that uses an LSTM-Networks model and a ConvNet model to perform monthly rainfall predictions. Microwave data, infrared data, and rain gauge measurements were used to extract precipitation estimation features. Weather data from July 1979 to January 2018 from the Global Precipitation Climatology Project was used to train and test the models. Results showed that according to the RMSE and Mean Absolute Percentage Error (MAPE) metrics, the ConvNet and the LSTM-Networks models obtained similar values.

Later, Chao et al. (2018) compared five models based on Auto-regressive and Moving Average, Random Forest, Back-propagation Neural Networks, Support Vector Machines, and LSTM-Networks in the task of predicting rainfall amounts in five, 10, and 15 min into the future.

b. **References**

Demeke Endalie,Getamesay Haile,Wondmagegn Taye (2022) : Rainfall estimation can be used for a variety of purposes, including reducing traffic accidents and congestion, increasing water management, reducingflooding, and so on. Meteorologists have long strived for weather forecasting that is both reliable and timely. Traditional theory-driven numerical weatherprediction (NWP) approaches, on the other hand, face a slew of issues, including a lack of understanding of physical processes, difficulty extracting useful knowledge from a flood of observational data, and the need for powerful computational resources (Pu & Kalnay 2018).Their rainfall prediction model was createdusing ANN and KNN. The three basic rainfall parameters used were maximum temperature, minimum temperature, and average rainfall.

Chalachew Muluken Liyew & Haileyesus Amsaya Melese (2021) :The study by Arnav Garg and Kanchipuram shows three machine learning algorithm experiments such as supportvector machine (SVM), support vector regression (SVR), and K-nearest neighbor (KNN) using the patterns of rainfall in the year. The SVM algorithm performs best among the three machine learning algorithms. This research did not show the experiment result that which environmental features impact the intensityof rainfall.

WanieM.Ridwan,MichelleSapitang,AwatifAziz,KhairulFaizalKushiar,AliNajahAhmed,AhmedEl-Shafie(June 2021): The comparative study was conductedfocusing on developing and comparing severalMachine Learning (ML) models, evaluating different scenarios and time horizon, and forecasting rainfall using two types of methods.Data involvedfor this researchconsist of taking the averagerainfall from 10 stations around the study area using Thiessen polygonto weight the station area and projectedrainfall. The forecasting model uses four different ML algorithms, which are BayesianLinear Regression (BLR), Boosted DecisionTree Regression (BDTR), Decision Forest Regression (DFR) and Neural Network Regression (NNR).

c. **Problem Statement Definition**

Exploratory Analysis of Rainfall is very important because heavy and irregular rainfall can have many impacts like destruction of crops and farms,damage of property so a better forecasting model isessential for an early warning that canminimize risks to life and property and also managing the agricultural farms in better way.

Whom does the problem affect?

The problem mainly affect the farmers as the prediction of the rain fall is the major key to get a better yield of crops. If its been mislead it could affect the harvesting of the crops which may leadto in crease in the price of food resources.

What are the boundaries of the problems?

a. Data of rainfall could be difficult analysis
b. For the analysispart ,we will need reliable data
c. Prediction of rain fall some times may varies
d. Optimizing pricingstructure

What is the issue?

If any wrong prediction happens, then it will totallyaffect the production of thecropsand wrong decisions could lead to a massive affect in the urban cities.

When does the issue occur?

-Excess or poor rainfallas prediction is not always true
-Rainfall fails as on perdiction for a certain period of crops
-Harvesting gets affected if there is excessiverain inspite of prediction

Why is it important to fix the issue?

-It is necessary to fix the issues immediately when found because the issusesgivesa negative resultapart from expected result
-If such issues occurs the farmers get mostly affected in cropping andharvesting.
-Sometimes it may also leads to a huge impact which results in loss oflives or loss of food and shelter also.

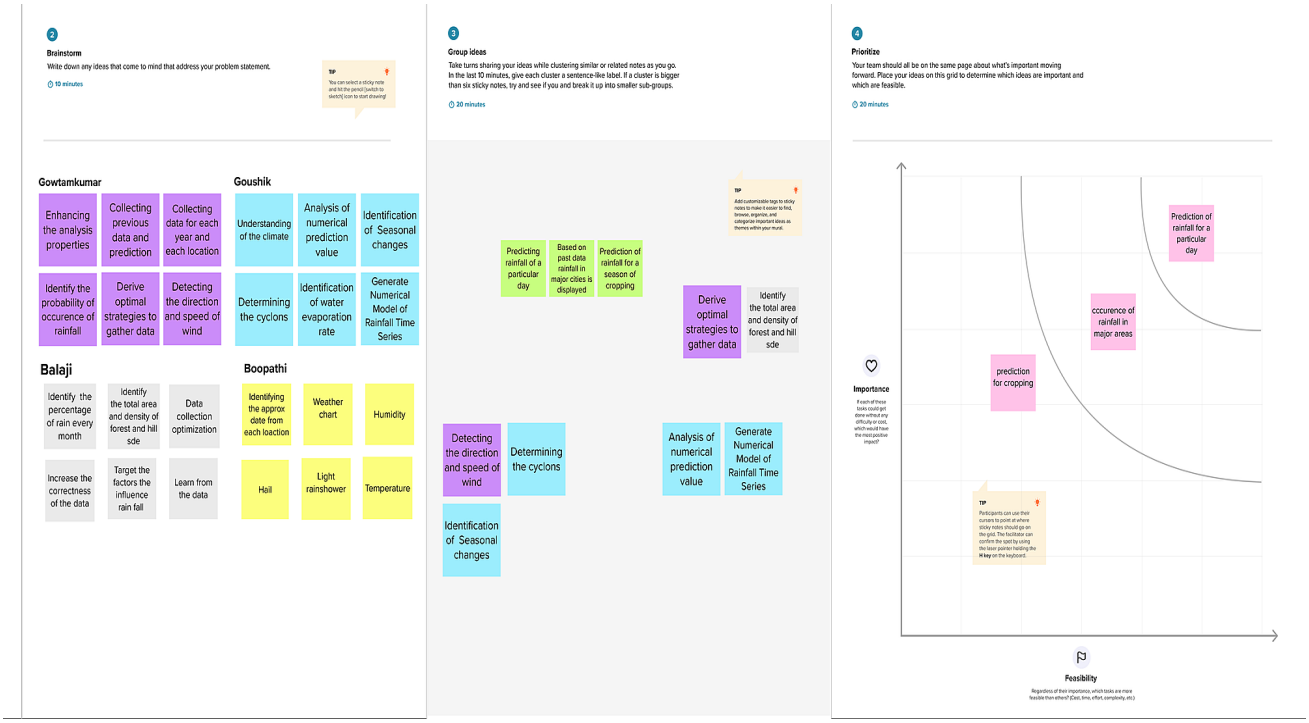
Where the issue occurs?

-The improper collection of data could be able to lead the wrong prediction of the rainfall

3. IDEATION & PROPOSED SOLUTION

a. Empathy Map Canvas

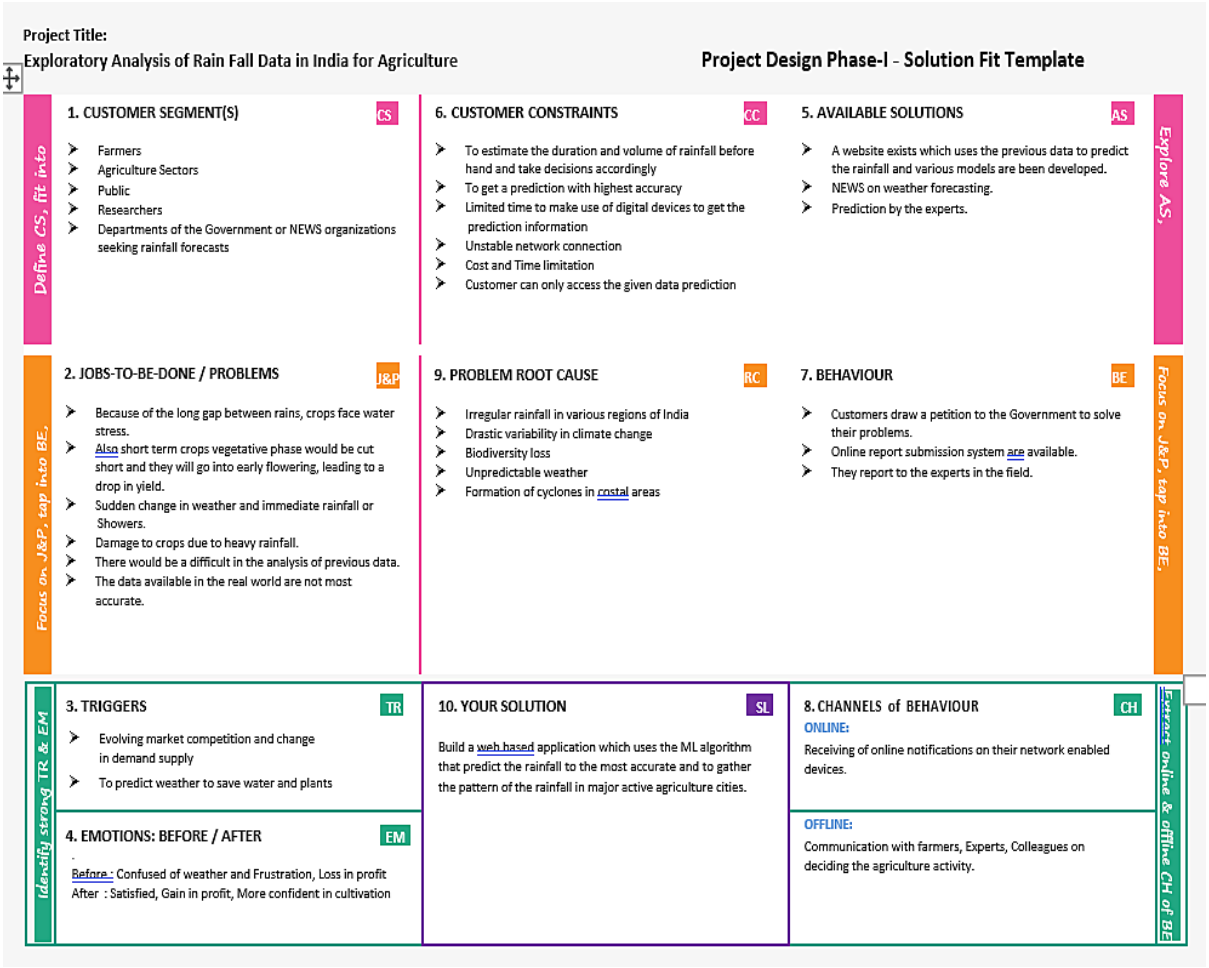
b. **Ideation & Brainstorming**



c. **Proposed Solution**

S.No.	Parameter	Description
1.	Problem Statement (Problem to besolved)	Analysing the rainfall based on past data. It is important to exactly determine the rainfall for effective use of waterresources, crop productivity, and pre-planning of water structures.
2.	Idea / Solution description	The most widely use empirical approaches used for climate prediction are Regression, artificial neural network, fuzzy logic and group method of data handling. The dynamical approach, predictions are generated by physical models based on system of equations that predict the future Rainfall.
3.	Novelty / Uniqueness	We plan to add a new feature which helps thefarmers to plant right crops In right time. i.e. rainfall prediction for a particular duration.
4.	Social Impact/ Customer Satisfaction	It helps the farmers to crop right crops in right time. Also,it helps peopleto plan theirtrips andevents.
5.	Business Model(Revenue Model)	The model generates a good income if theprediction is true .
6.	Scalability of the Solution	In future,when a new feature is added it suitsto the application.

d. **Problem Solution fit**



4. REQUIREMENT ANALYSIS

a. Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Registration Process	Registration throughPhone Number
FR-2	Confirmation	Confirmation viaOTP message
FR-3	Updating Profile	Enter the personal details
FR-4	Home Page	Able to viewthe • Profile • Crop details • Rainfall prediction
FR-5	Rainfall Prediction	• Enter the month • Enter the Year • Click on predict
FR-6	ML Model	The user datais sent to the Machinelearning model.
FR-7	Preprocessing data	• Data exploration • Feature selection • Missing values • Feature scaling • Splitting of train and test data
FR-8	Building ML Model	• Random forestalgorithm is applied • Train the model usingtraining data • The model is evaluated with the testdata.
FR-9	Result	Shows the predicted rainfall data.

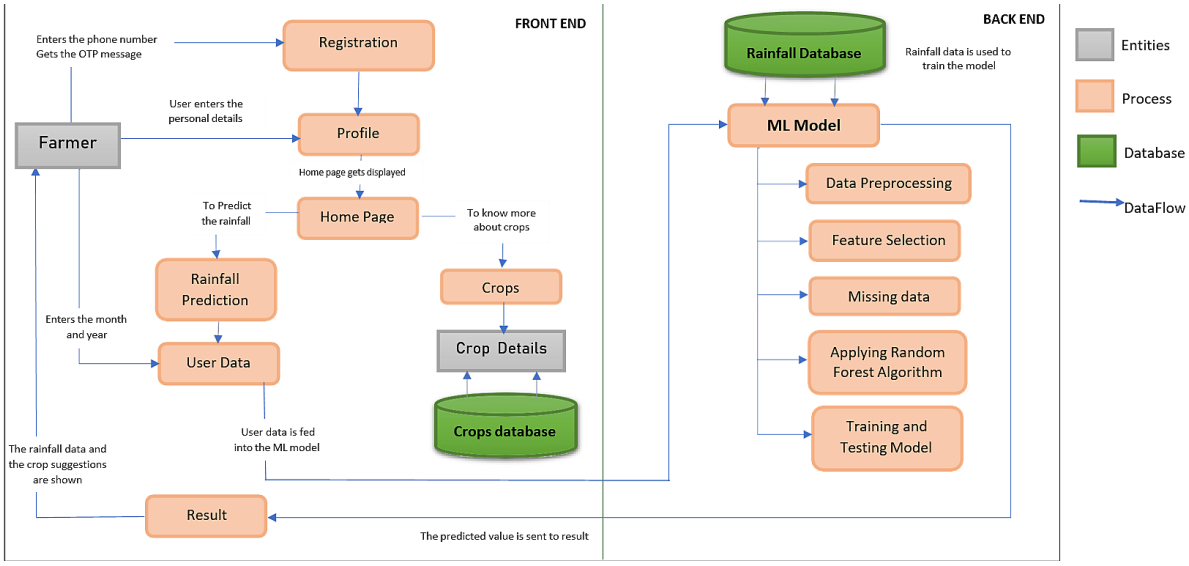
b. **Non-Functional requirements**

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It's a user-friendly application which enable people to use without anytechnical knowledge.
NFR-2	**Security**	User data will be protected from unauthorised access and the data are secured.
NFR-3	**Reliability**	The application will operate effectively without causing any failure and errors, so maintance won'tbe big problem.
NFR-4	**Performance**	Overall performance of system is efficient to predict the rainfall withmuch speed without delay.
NFR-5	**Availability**	The availability of the application is that it will be active and available to all the users.
NFR-6	**Scalability**	The scalability of our systemis one that can handlerapid changes to workloads and user demands.

5. PROJECT DESIGN

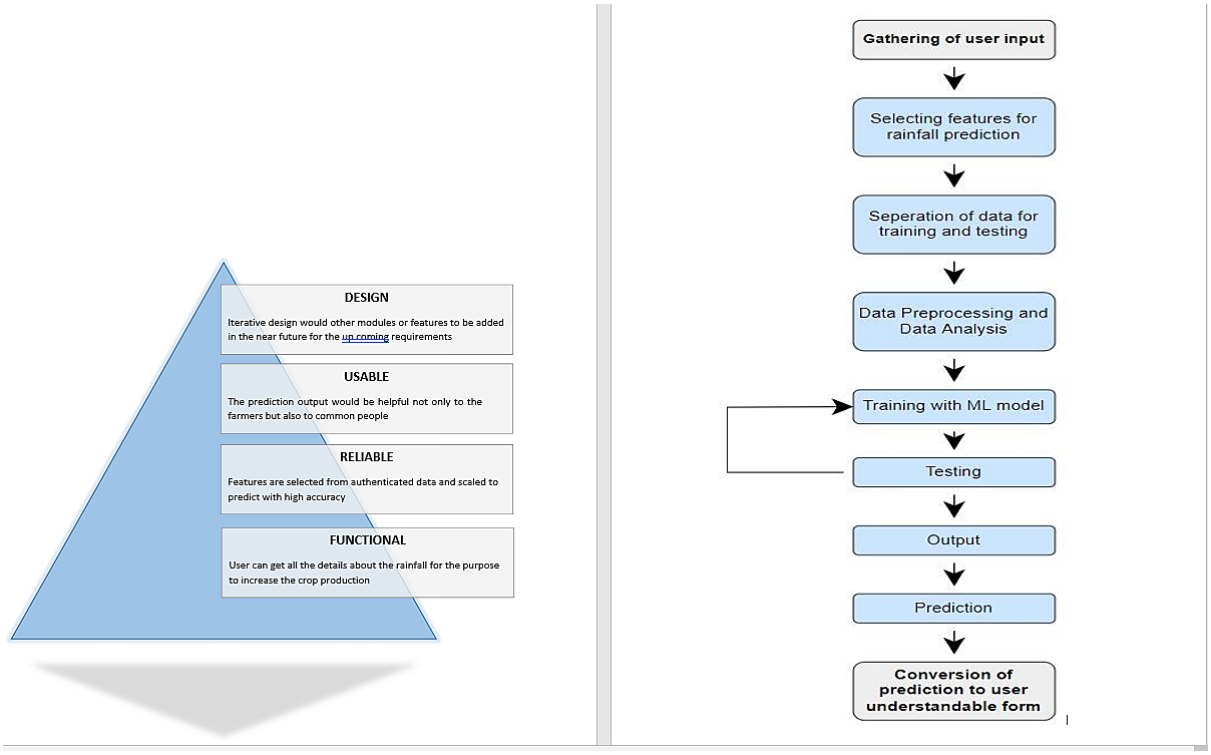
a. Data Flow Diagrams

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

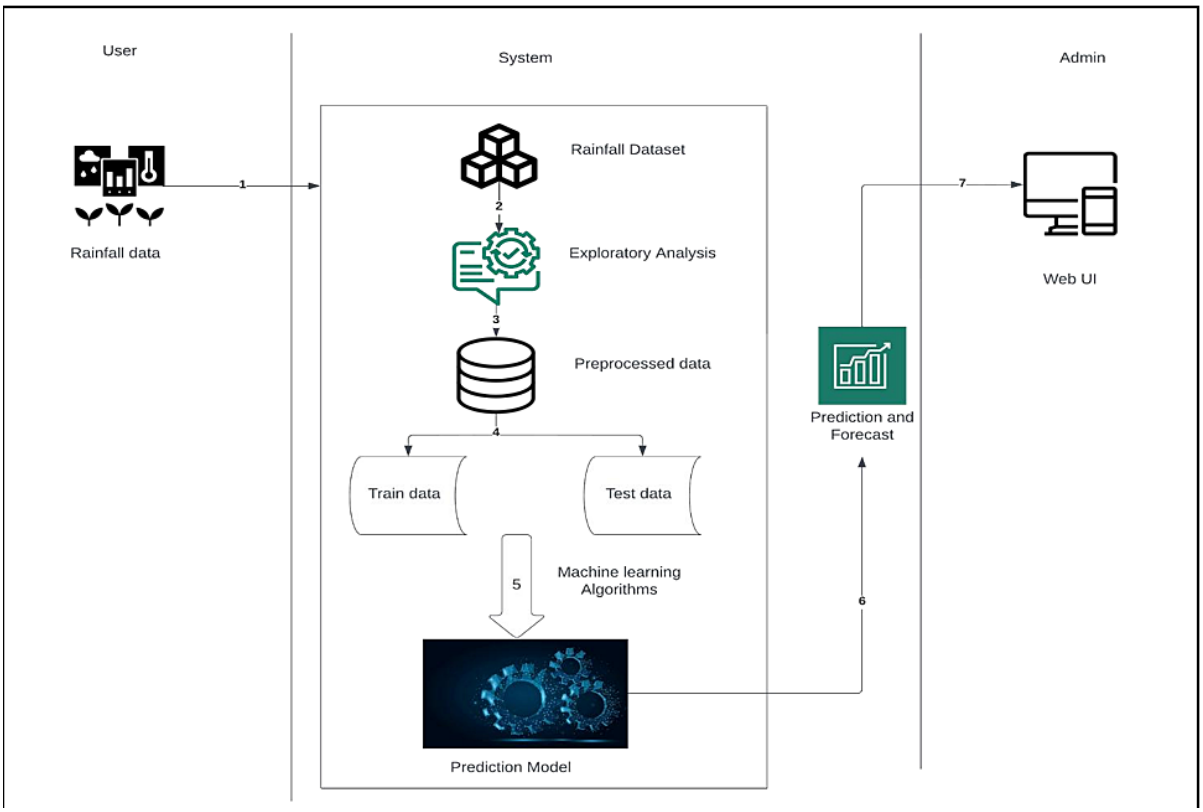


b. **Solution & Technical Architecture**

Solution Architecture Diagram:



Technical Architecture:



c. **User Stories**

User Type	Functional Requirement(Epic)	User Story Number	User Story/ Task	Acceptance criteria	Priority	Release
Farmers (webprofile user)	Registration	USN-1	As a user, I can register for the application by using phonenumber	I can access the profile and homepage	High	Sprint-1
		USN-2	As a user, I will receiveOTP message, Once I haveregistered for the application	I can receive confirmation message	High	Sprint-1
	Profile	USN-3	As a user, I have to enter my personaldetails	I can access my homepage	High	Sprint-1
	Home page	USN-4	As a user, I can either click on rainfallprediction or crops button	I can go to thedesired page	Medium	Sprint-2
		USN-5	As a user, I can click on the "moreaction" button	I can view my personal information	Medium	Sprint-2
	Rainfall predction	USN-6	As a user, I have to enter the desiredmonth and the year	To know the rainfallon the given month	High	Sprint-3
	Crops	USN-7	As a user, I can view the details ofthecrops	To know more aboutthe cropcultivations	Medium	Sprint-3

6. PROJECT PLANNING & SCHEDULING

a. Sprint Planning & Estimation

Project Tracker, Velocity & Burndown Chart:

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	8	6 Days	24 Oct 2022	29 Oct 2022	6	29 Oct 2022
Sprint-2	14	6 Days	31 Oct 2022	05 Nov 2022	12	05 Nov 2022
Sprint-3	16	6 Days	07 Nov2022	12 Nov 2022	11	12 Nov 2022
Sprint-4	12	6 Days	14 Nov2022	19 Nov 2022	12	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)

Sprint-1 the Average Velocity (AV) is: AV = Sprint Duration / velocity = 8 / 6 = 1.3V
Sprint-2 the Average Velocity (AV) is: AV = Sprint Duration / velocity = 14 / 6 = 2.3V
Sprint-3 the Average Velocity (AV) is: AV = Sprint Duration / velocity = 16 / 6 = 2.6V
Sprint-4 the Average Velocity (AV) is: AV = Sprint Duration / velocity = 12/ 6 = 2.0V

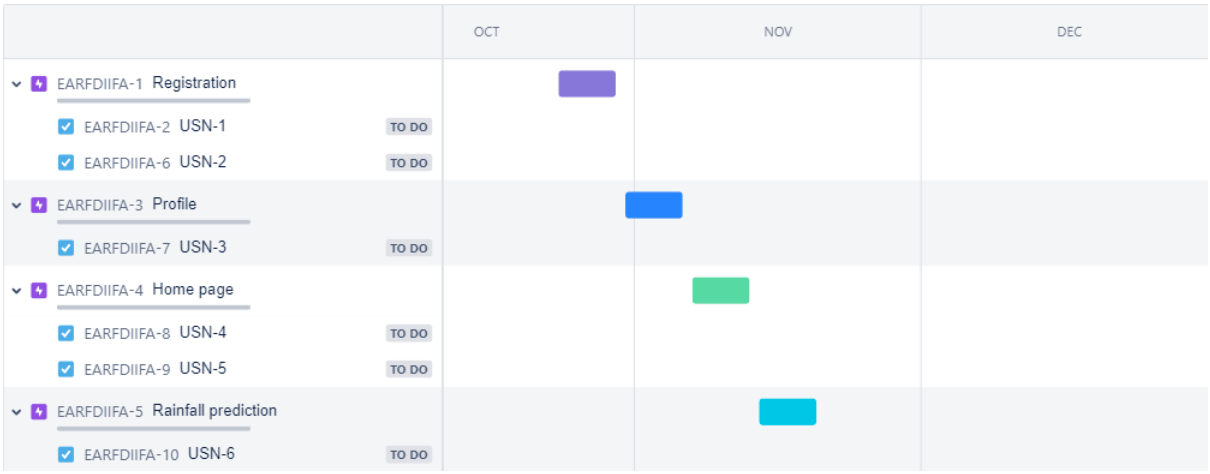
TOTAL TEAM AVERAGE VELOCITY = 2.08

b. **Sprint Delivery Schedule**

Product Backlog, Sprint Schedule, and Estimation:

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 Phone number/Gmail,Username password, and confirmingmy password.	2	High	Goushik A
Sprint-1	Registration	USN-2	As a user, I will receive confirmation in phone or gmail once I have registered for the application	1	High	Gowtamkumar S S
Sprint-1	Login	USN-3	As a user, I can log into the application by entering email & password	1	High	Gowtamkumar S S
Sprint-2	Dataset Collect	USN-4	Collect number of datasets and get accuracy	2	Medium	Goushik A
Sprint-2	Pre-processing	USN-5	The dataset is extracted	2	High	Balaji V
Sprint-2	Train the model	USN-6	Train the model.	4	High	Boopathi T
Sprint-2	Test the model	USN-7	Test the model	6	High	Boopathi T
Sprint-3	Detection	USN-8	Load the trained model.	3	High	Gowtamkumar S S
Sprint-3	Detection	USN-9	Prediction of rain fall using trained model	5	Medium	Balaji V
Sprint-3	Detection	USN-10	classify it by using a trained model to predict the output	8	High	Balaji V
Sprint-4	Detection	USN-11	Alerts the user about the condition of Rainfall	7	High	Goushik A
Sprint-4	Detection	USN-12	As a User,I can detect the rainfall.	3	Medium	Gowtamkumar S S
Sprint-4	Logout	USN-13	As a User,I can logout the application.	2	Low	Boopathi T

c. **Reports from JIRA**



Reference link:

https://giushik11.atlassian.net/jira/software/projects/EARFDIIFA/boards/1/roadmap?shared=&atlOrigin=eyJpIjoiMDQ0ZGVkNDA3MTE2NDA4ZmEyMzJjNGE4NzE5YmM5YjciLCJwIjoiaiJ9

7. CODING & SOLUTIONING

a. Feature 1

Rainfall has been a major concern these days. Weather conditions have been changing for time being. Rainfall forecasting is important otherwise, it may lead to many disasters. Irregular heavy rainfall may lead to the destruction of crops, heavy floods that can cause harm to human life. It is important to exactly determine the rainfall for effective use of water resources, crop productivity, and pre-planning of water structures.

This comparative study is conducted concentrating on the following aspects: modeling inputs, Visualizing the data, modeling methods, and pre-processing techniques. The results provide a comparison of various evaluation metrics of these machine learning techniques and their reliability to predict rainfall by analyzing the weather data.

We will be using classification algorithms such as Decision tree, Random forest, KNN, and xgboost. We will train and test the data with these algorithms. From this best model is selected and saved in pkl format. Once the model is saved, we integrate it with flask application and also deploy the model in IBM.

Software Requirements:

1.Python flask
2.MongoDB
3.Jupyter Notebook
4.WebBrowser (Chrome,Edge,..)

Hardware Requirements:

1.RAM -4GB
2.Harddisk -10GB

b. **Feature 2**

To design a system the predicts rainfall occurences in major areas and rainfall for crops so that the farmers can plan their crops and users can plan their trips accordingly.

This system is more suited for farmers because rainfall plays an important role in agriculture.

8. **TESTING**

a. **Test Cases**

Test Scenario	Expected Results
Verify User is Login by entering email,password and confirming password	Login/registering for the application.
verify the can access the dashboard with the linked in login	Application should show below UI elements: a.email text box b.password text box c.join now button d.shows the dashboard page.
Verify user is able to log into application with Valid credentials and get the conforming mail	Application should be send the conformation mail.
Verify user is able to log into application with InValid credentials	User should nevigate to the homepage.
Verify user is able to log into application with InValid credentials	Application should show 'Incorrect email or password ' validation message.
Verify user is able to log into application with InValid credentials	Application should show 'Incorrect email or password ' validation message.

b. **User Acceptance Testing**

Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the Exploratory AnalysisOf Rainfall Data In India For Agriculture project at the time ofthe release to User Acceptance Testing (UAT).

Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

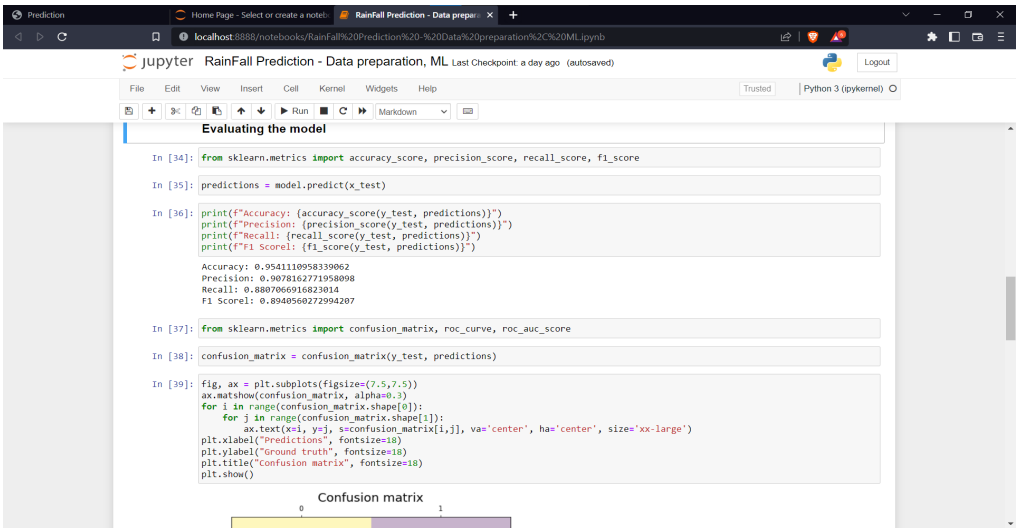
Resolution	Severity1	Severity 2	Severity3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

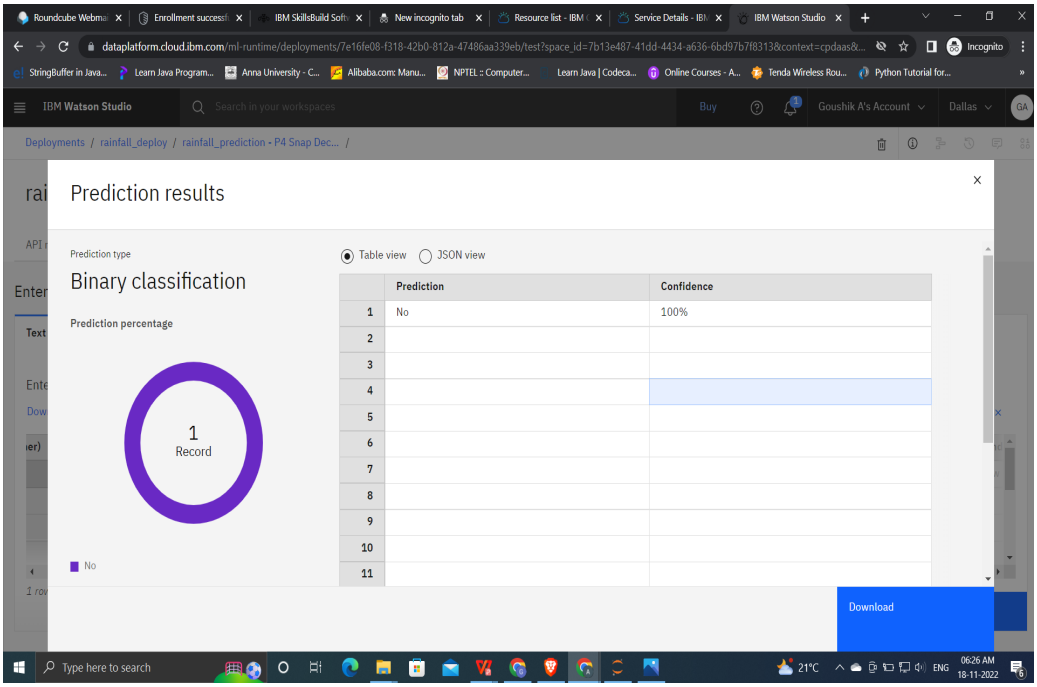
Test Case Analysis

This reportshows the numberof test cases that have passed, failed,and untested.

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	30	0	0	30
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4

9. RESULTS


RainFall Prediction - Data preparation, ML
Evaluating the model
In [34]: from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score
In [35]: predictions = model.predict(x_test)
In [36]: print(f"Accuracy: {accuracy_score(y_test, predictions)}")
print(f"Precision: {precision_score(y_test, predictions)}")
print(f"Recall: {recall_score(y_test, predictions)}")
print(f"F1 Score1: {f1_score(y_test, predictions)}")
Accuracy: 0.9541110958339062
Precision: 0.9078162771958098
Recall: 0.8807066916823014
F1 Score1: 0.8940560272994207
In [37]: from sklearn.metrics import confusion_matrix, roc_curve, roc_auc_score
In [38]: confusion_matrix = confusion_matrix(y_test, predictions)
In [39]: fig, ax = plt.subplots(figsize=(7.5,7.5))
ax.matshow(confusion_matrix, alpha=0.3)
for i in range(confusion_matrix.shape[0]):
for j in range(confusion_matrix.shape[1]):
ax.text(x=i, y=j, s=confusion_matrix[i,j], va='center', ha='center', size='xx-large')
plt.xlabel("Predictions", fontsize=18)
plt.ylabel("Ground truth", fontsize=18)
plt.title("Confusion matrix", fontsize=18)
plt.show()
Confusion matrix


IBM Watson Studio
Prediction results
Prediction type
Binary classification
Prediction percentage
1
Record
No
Table view
JSON view
Prediction
Confidence
1
No
100%
Download

Prediction

There is a chance for rain today :(

Prediction

There is no chance for rain today :)

10. ADVANTAGES & DISADVANTAGES

Advantages:

Rainfall forecasting is very important because heavy and irregular rainfall can have many impacts like destruction of crops and farms, damage of property so a better forecasting model is essential for an early warning that can minimize risks to life and property and also managing the agricultural farms in better way.

Disadvantages:

1. Forecasts are never 100% accurate
2. It can be time-consuming and resource-intensive
3. It can also be costly

11. CONCLUSION

This study set out to compare the prediction performance of rainfall forecasting models based on LSTM-Networks architectures with modern Machine Learning algorithms. To achieve this objective, 2 models based on LSTM-Networks, 3 models based on Stacked-LSTM, and 1 Bidirectional-LSTM Networks model were compared with an XGBoost (baseline model) and an ensemble model that resulted from carrying out an Automated Machine Learning approach.

12. FUTURE SCOPE

The development of advanced nowcasting systems for severe weather events is ongoing in several countries. Researchers are exploring several approaches to the problem of very short-range forecasts that are highly specific in time and space. These approaches vary widely, ranging from extrapolation to expert systems to explicit numerical modeling of storm cells. They all share three common needs: data, data and even more data! The observational data must be sufficient to characterize the storm and its environment in great detail.

13. APPENDIX

a. Source Code

app.py

```
from flask import Flask, render_template, url_for,request,session , redirect
import random
import smtplib
import db
import numpy as np
import pickle
import joblib
import time
import pandas
import os
import warnings
warnings.filterwarnings('ignore')


app = Flask(__name__)
app.secret_key = 'RainfallPrediction'
model = pickle.load(open("models/model.pkl", "rb"))
scaler = pickle.load(open("models/scaler.pkl", "rb"))


@app.route('/login')
def login():
    return render_template('login.html')


@app.route('/prediction_Data')
def predictToday():
```

```
    return render_template('prediction_Data.html')

@app.route('/profile')
def profile():

    return render_template('profile.html',name = session['realname'],email =
session['realemail'])


@app.route('/register')
def register():
    return render_template('register.html')


@app.route('/forgetpassword')
def forgetpassword():
    return render_template('forgetpassword.html')


@app.route('/resulttoday')
def resulttoday():
    return render_template('resultYes.html')


@app.route('/verify',methods=['POST'])
def verify():
    otp = "".join([str(random.randint(0,9)) for i in range(4)])
    session['current_otp']=otp
    name=request.form['name']
    email=request.form['email']
    password = request.form['password']
    session['user']=name
    session['email']=email
    session['password']=password
    datacheck = db.check_ifavailable(email)
    print(datacheck)


     if(datacheck==1):
        server = smtplib.SMTP('smtp.gmail.com',587)
        server.starttls()
        server.login('rainfallpproject@gmail.com','ikqqssrlvqnjutgu')
        message = "Your OTP for the site is : "+otp
        message = 'Subject: {}\n\n{}'.format("Rainfall Prediction", message)
        server.sendmail('rainfallpproject@gmail.com',email,message)
        server.quit()
        return render_template('verify.html')
    else:
        return '<script> alert("You are registering again so PLEASE LOGIN ");
window.location.href="/login";</script>'

@app.route('/validate',methods=['POST'])
def validate():
```

```
    user_otp=request.form['otp']
    otp = session['current_otp']

    if otp==(user_otp):
        db.insert_database(session['user'],session['email'],session['password'])
        return '<script> alert("Registration SUCCESSFULL login");
window.location.href="/login";</script>'
    return '<script> alert("Mismatchh OTP Try Again");</script>'+render_template('verify.html')


@app.route('/sendpassword',methods=['POST'] )
def sendpassword():
    email=request.form['email']
    password = db.check_for_password(email)
    if(password==0):
        return '<script> alert("There is no such email registered \'SORRY\'");
window.location.href="/login";</script>'
    else:
        server = smtplib.SMTP('smtp.gmail.com',587)
        server.starttls()
        server.login('rainfallpproject@gmail.com','ikqqssrlvqnjutgu')
        message = "Your PASSWORD for the site is : "+password
        message = 'Subject: {}\n\n{}'.format("Rainfall Prediction(Forget Password", message)
        server.sendmail('rainfallpproject@gmail.com',email,message)
        server.quit()
        return '<script> alert("Please Check your mail for Password");
window.location.href="/login";</script>'


@app.route('/userlogin',methods=['POST'])
def userlogin():
    email=request.form['email']
    password=request.form['password']


    checkava = db.check_ifavailable(email)
    if(checkava==0):
        realpassword = db.check_for_password(email)
        if(realpassword==password):
            session['realemail'] = email
            session['realname'] = db.get_userame(email)
            return '<script> window.location.href="/profile";</script>'
        else:
            return '<script> alert("Invalid Passsword"); window.location.href="/login";</script>'
    else:
        return '<script> alert("There is no such user Please check your email or Register");
window.location.href="/login";</script>'


@app.route('/predict', methods=["POST"])
def predict():
    column_names = ['MinTemp', 'MaxTemp', 'Rainfall', 'WindGustSpeed', 'WindSpeed9am',
      'WindSpeed3pm', 'Humidity9am', 'Humidity3pm', 'Pressure9am',
```

```
      'Pressure3pm', 'Temp9am', 'Temp3pm', 'WindGustDir',
      'WindDir9am', 'WindDir3pm']

    feature_values = [int(request.values.get(name)) for name in column_names]
    print(f"input: {feature_values}")
    feature_values = [np.array(feature_values)]
    data = pandas.DataFrame(feature_values, columns=[column_names])
    data = scaler.fit_transform(data)
    data = pandas.DataFrame(data, columns=[column_names])
    prediction = model.predict(data)
    print(f"prediction: {prediction}")


    if (prediction == 0):
        return render_template("resultNo.html")
    else:
        return render_template("resultYes.html")

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

db.py

```
from pymongo import MongoClient, cursor

CONNECTION_STRING = "mongodb://127.0.0.1:27017/"
client = MongoClient(CONNECTION_STRING)
mydb = client['user']
information = mydb.userinformation

def check_ifavailable(email):
    query={'email':email}
    a = information.find(query)
    l=0
    for i in a:
        print(i)
        l=l+1

    if(l==0):
        return 1
    else:
        return 0
```

```
def insert_database(name,email,password):
 records = {
     'name':name,
     'email':email,
     'password':password
  }
  information.insert_one(records)

def check_for_password(email):
  query={'email':email}
  a = information.find(query)
  t = ""
  for i in a:
    t = i['password']

  if(t==""):
    return 0
  else:
    return t

def get_userame(email):
  query={'email':email}
  a = information.find(query)
  t = ""
  for i in a:
    t = i['name']
  return t
```

index.html

```
<!DOCTYPE html>
<html>
<head>
<title>RainFall Prediction</title>

<meta name="description" content="Page Description Here" />
<!--<meta http-equiv="X-UA-Compatible content="IE=edge">-->
<meta name="viewport" content="width=device-width, initial-scale=1">
<meta charset="UTF-8">
```

<!-- CSS File-->

```
<link rel="stylesheet" href="https://cdn.jsdelivr.net/npm/bootstrap@5.0.0-alpha1/dist/css/bootstrap.min.css">
<link rel="stylesheet" href="https://cdn.jsdelivr.net/npm/bootstrap@5.0.0-alpha1/dist/js/bootstrap.bundle.min.js">
<link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/jquery/3.2.1/jquery.min.js">
<!-- <link rel="stylesheet" href="style.css"> -->


<script  src="https://cdnjs.cloudflare.com/ajax/libs/axios/0.18.0/axios.js"></script>

</head>

<body>
    <div class="container rounded bg-white mt-5 mb-5">
        <div class="col-md-10">
            <div class = "card">
            <div class="p-3 py-5">
                <div class="d-flex justify-content-between align-items-center mb-3">
                    <h4 class="text-right">Enter the required parameters for Rainfall Prediction</h4>
                </div>
                <form action="{{ url_for('predict')}}" method="POST">
                <div class="row mt-1">
                    <div class="col-md-6"><label class="labels">MinTemp</label><input name="MinTemp" type="text" class="form-control" placeholder=""  value="" id="MinTemp" required></div>
                    <div class="col-md-6"><label class="labels">MaxTemp</label><input name="MaxTemp" type="text" class="form-control" value="" placeholder="" id="MaxTemp" required></div>
                </div>
                <div class="row mt-3">
                    <div class="col-md-6"><label class="labels">WindGustSpeed</label><input name="WindGustSpeed" type="text" class="form-control" placeholder=""  value="" id="WindGustSpeed" required></div>
                </div>
                <div class="row mt-4">
                    <div class="row mt-4-0">
                        <div class="col-md-6"><label
```

```
class="labels">WindSpeed9am</label><input name="WindSpeed9am" type="text"
class="form-control" placeholder=""  value="" id="WindSpeed9am" required></div>
                    <div class="col-md-6"><label
class="labels">WindSpeed3pm</label><input name="WindSpeed3pm" type="text"
class="form-control" value="" placeholder="" id="WindSpeed3pm" required></div>
                </div>
                <div class="row mt-4-1">
                    <div class="col-md-6"><label
class="labels">Humidity9am</label><input name="Humidity9am" type="text"
class="form-control" placeholder=""  value="" id="Humidity9am" required></div>
                    <div class="col-md-6"><label
class="labels">Humidity3pm</label><input name="Humidity3pm" type="text"
class="form-control" value="" placeholder="" id="Humidity3pm" required></div>
                </div>
                <div class="row mt-4-2">
                    <div class="col-md-6"><label
class="labels">Pressure9am</label><input name="Pressure9am" type="text"
class="form-control" placeholder=""  value="" id="Pressure9am" required></div>
                    <div class="col-md-6"><label
class="labels">Pressure3pm</label><input name="Pressure3pm" type="text"
class="form-control" value="" placeholder="" id="Pressure3pm" required></div>
                </div>
                <div class="row mt-4-3">
                    <div class="col-md-6"><label
class="labels">Temp9am</label><input name="Temp9am" type="text" class="form-
control" placeholder=""  value="" id="Temp9am" required></div>
                    <div class="col-md-6"><label
class="labels">Temp3pm</label><input name="Temp3pm" type="text" class="form-
control" value="" placeholder="" id="Temp3pm" required></div>
                </div>
            </div>
            <div class="row mt-5">
                <div class="col-md-6"><label class="labels">WindGustDir</label>
                    <select name="WindGustDir" class="form-control"
id="WindGustDir" required>
                        <option value="0">N</option>
                        <option value="1">E</option>
                        <option value="2">S</option>
                        <option value="3">W</option>
                        <option value="4">NE</option>
```

```
                    <option value="5">NW</option>
                    <option value="6">SE</option>
                    <option value="7">SW</option>
                    <option value="8">NNE</option>
                    <option value="9">NNW</option>
                    <option value="10">ENE</option>
                    <option value="11">ESE</option>
                    <option value="12">SSE</option>
                    <option value="13">SSW</option>
                    <option value="14">WNW</option>
                    <option value="15">WSW</option>
                    </select></div>

                <div class="col-md-6"><label class="labels">WindDir9am</label>
                  <select name="WindDir9am" class="form-control" id="WindDir9am"
required>
                    <option value="0">N</option>
                    <option value="1">E</option>
                    <option value="2">S</option>
                    <option value="3">W</option>
                    <option value="4">NE</option>
                    <option value="5">NW</option>
                    <option value="6">SE</option>
                    <option value="7">SW</option>
                    <option value="8">NNE</option>
                    <option value="9">NNW</option>
                    <option value="10">ENE</option>
                    <option value="11">ESE</option>
                    <option value="12">SSE</option>
                    <option value="13">SSW</option>
                    <option value="14">WNW</option>
                    <option value="15">WSW</option>
                    </select></div>

                <div class="col-md-6"><label class="labels">WindDir3pm</label>
                  <select name="WindDir3pm" class="form-control" id="WindDir3pm"
required>
                    <option value="0">N</option>
                    <option value="1">E</option>
                    <option value="2">S</option>
```

```
                        <option value="3">W</option>
                        <option value="4">NE</option>
                        <option value="5">NW</option>
                        <option value="6">SE</option>
                        <option value="7">SW</option>
                        <option value="8">NNE</option>
                        <option value="9">NNW</option>
                        <option value="10">ENE</option>
                        <option value="11">ESE</option>
                        <option value="12">SSE</option>
                        <option value="13">SSW</option>
                        <option value="14">WNW</option>
                        <option value="15">WSW</option>
                        </select></div>
                    </div>
                    <div class="mt-5 text-center"><button class="btn btn-primary profile-
  button" type="submit">Predict</button></div>
                  </div></form></div>
              </div>
            </div>
          </div>
  </body>
  </html>
```

chance.html

```
<!DOCTYPE html>
<html>
<head>
  <title>Profile</title>
</head>

<body>
   <div class="prediction">
     <center><h2>There is a chance for rain today</h2></center>
   </div>
</body>
```

Nochance.html

```
<!DOCTYPE html>
<html>
<head>
  <title>Profile</title>
</head>

<body>
    <div class="prediction">
      <center><h2>No chances of rain today</h2><center>
    </div>
</body>
```

GitHub & Project Demo Link:

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-1471-1658389283

Project Demo Link:

https://youtu.be/ysS1cpQHlFo