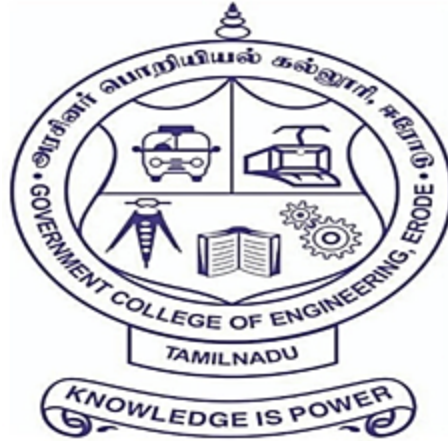


# **GOVERNMENT COLLEGE OF ENGINEERING**

**(Formerly IRTT)**

**ERODE-638 316**



## **BONAFIDE CERTIFICATE**

Certified that this project titled **“EXPLORATORY ANALYSIS OF RAINFALL DATA IN INDIA FOR AGRICULTURE”** is the bonafide work of **"KEERTHI VENNILA.S(731119106014), BALA PRIYADHARSHINI.M (731119106004),GOKULAPRIYA.M(731119106007),SRUTHI.M (731119106034)”** who carried out the project work under my supervision.

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## **A.ABSTRACT**

Exploratory Analysis Of RainFall Data In India For Agriculture 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.

Focus of this research is to use the machine learning regression models that can predict rainfall in the most effective way on the given data. Regression is the statistical empirical technique that is vastly used in many areas like in business, behavioral sciences, and climatic prediction[Kannan et al., 2010]. Regression is supervised learning, it is a statistical approach that finds the relation between the variables and is used for predicting the outcome based on the relationship between the variable that is acquired by the data. There are five machine learning regression models that will be used named Decision tree regression, KNN regression, Multiple linear regression, RFE(Random forest regression), and Support Vector Machine regression and compare which models perform well. Hence after applying the models, we can see the measurement of the rainfall in MM(millimeter), and according to the need for crops, the prediction can be used. In the current dataset, we do not have features for the season of the crop that are Kharif, Rabi, and Zaid, so more features will also be added according to the season of the crops which will be more help-full for the agriculture sectors to understand more about rainfall. There are various research that has been done and various numerical weather forecasts have been introduced for predicting the weather but they have some limitations

By deploying the model we can integrate the flask with the Endpoint scoring. Using this flask Framework we can create a web application which displays or predicts Chance of Rain today and No chance for rain today.

## **CHAPTER 1**

### **1.INTRODUCTION**

#### **1.1 PROJECT OVERVIEW**

India is an agriculture country, the economic growth of each year depends on the amount of duration of monsoon rain, bad monsoon can lead to destruction of some crops, which may result in scarcity of some agricultural products which in turn can cause food inflation, insecurity and public unrest. 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.

Weather plays a very important role in agriculture production and has an influence on the growth development, and yield of crops. Weather aberration can cause physical damage to crops and soil erosion. The quality of crops from the field to the market depends on the weather. Bad weather can adversely affect the quality of crop during transportation or storage. The findings brought about by shifting through databases and studies to conclude things like this in agricultural processes can bring about remarkable changes.

## **1.2 PURPOSE**

Agriculture is the backbone of the Indian economy. For agriculture, the most important thing is water source, i.e. rainfall. The prediction of the amount of rainfall gives alertness to farmers by knowing early they can protect their crops from rain. The main motive of the project is to predict the amount of rainfall in a particular division or state well in advance. We predict the amount of rainfall using past data. Rainfall prediction is one of the challenging tasks in weather forecasting process. Accurate rainfall prediction is now more difficult than before due to the extreme climate variations. Machine learning techniques can predict rainfall by extracting hidden patterns from historical weather data. Good prediction of rainfall provides knowledge and know in advance to take precautions and have better strategy about their crops. Rainfall also depends on geographic locations hence is an arduous task to predict. The main aim of this study is to develop the rainfall prediction system and predict the rainfall with better accuracy with the use of Machine Learning classification algorithms. Rainfall of a location based on input parameters that will be provided by the user. The parameters include date, location, maximum temperature, minimum temperature, humidity, wind direction, evaporation etc.

## **CHAPTER 2 LITERATURE SURVEY**

### **2.1 EXISTING PROBLEM**

A bad rainfall prediction can affect the agriculture mostly farmers as their whole crop is depend on the rainfall and agriculture is always an important part of every economy. So, making an accurate prediction of the rainfall somewhat good. There are number of techniques are used of machine learning but accuracy is always a matter of concern in prediction made in rainfall. So our project helps to predict the correct rainfall.

## **2.2 REFERENCES**

1.Kumar Abhishek. Abhay Kumar, Rajeev Ranjan, Sarthak Kumar,\" A Rainfall Prediction Model using Artificial Neural Network\", 2012 IEEE Control and System Graduate Research Colloquium (ICSGRC2012), pp. 82-87, 2012.

2. G. Geetha and R. S. Selvaraj, "Prediction of monthly rainfall in Chennai using Back Propagation Neural Network model," Int. J. of Eng. Sci. and Technology, vol.

3.Gupta D, Ghose U. A Comparative Study of Classification Algorithms for Forecasting Rainfall. IEEE. 2015.

## **2.3 PROBLEM SOLUTION DEFINITION**

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. Thus, our problem is to analyse the rainfall data in India in order to help the growth of agriculture by predicting the occurrence of heavy rainfall to prevent flooding and damage in crops.

## CHAPTER 3

### IDEATION AND PROPOSED SOLUTION

#### 3.1 EMPATHY MAP CANVAS





## 3.2 IDEATION AND BRAINSTROMING:



### Brainstorm & idea prioritization

Exploratory Analysis of Rainfall Data  
For Agriculture in India

TEAM

Keerthi vennila  
Gokula priya  
Bala priyadarshini  
Sruthi

 Share template feedback

1

#### problem statement

Rainfall has been a major concern these days. Weather conditions have been changing for time being. It may lead to many disasters. Irregular heavy rainfall may lead to the destruction of crops, ~~Severe floods~~ that can cause harm to human life.


#### PROBLEM

How might we provide a solution for irregular rainfall



#### Key rules of brainstorming

To run a smooth and productive session

-  Stay in topic.
-  Encourage wild ideas.
-  Defer judgment.
-  Listen to others.
-  Go for volume.
-  If possible, be visual.

2

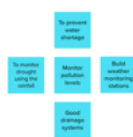
**Brainstorm**

Write down any ideas that come to mind that address your problem statement.

⌚ 10 minutes

**TIP**

You can select a sticky note and hit the pencil (switch to sketch) icon to start drawing!

**Bala priyadharshini****Gokulapriya****Sruthi****Keerthi vennila**

3

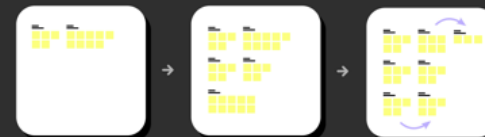
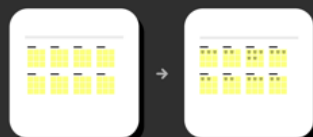
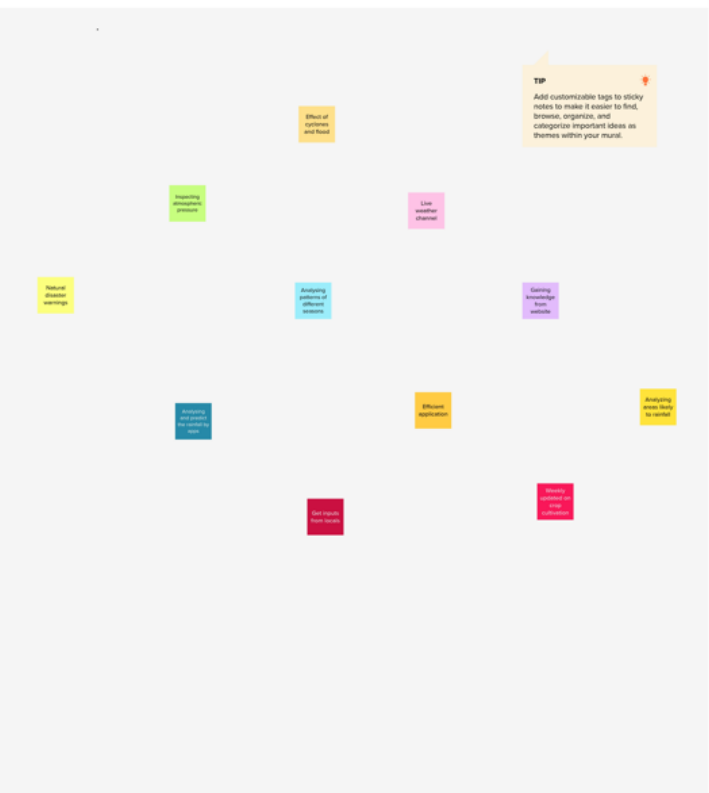
**Group ideas**

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

⌚ 20 minutes

**TIP**

Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

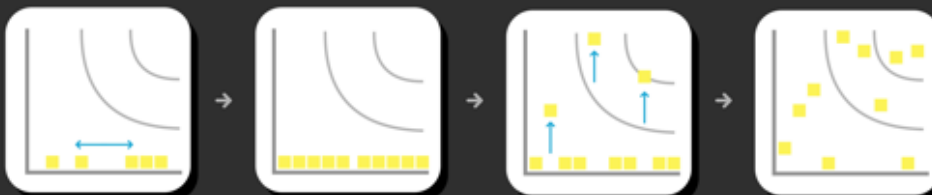


4

## Prioritize

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

🕒 20 minutes



### 3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	<ul style="list-style-type: none"><li>●Heavy and irregular rainfall can have many impacts like destruction of crops and farming lands.</li><li>●Limited Food Access</li><li>●Unsustainable Agriculture Practices</li><li>●Leading to poor growth and overall health of crop</li></ul>
2.	Idea / Solution description	<ul style="list-style-type: none"><li>● NWP models are used as the primary tools for the prediction of irregular heavy rainfall events.</li><li>● We use the machine learning algorithm, as we can process big data and real-time data streams with mixed value types.</li></ul>
3.	Novelty / Uniqueness	<ul style="list-style-type: none"><li>●Easily predict the rainfall</li><li>●precipitation and other Earth observing datasets are used for tropical cyclones</li></ul>
4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"><li>● It will help the farmers to take precautionary steps to minimize the losses and consider technological solutions to improve their production</li></ul>
5.	5. Business Model (Revenue Model)	<ul style="list-style-type: none"><li>●Collaboration in agriculture-sector</li><li>● Providing technological solution</li></ul>
6.	Scalability of the Solution	<ul style="list-style-type: none"><li>● it facilitates policy decisions regarding the cropping pattern, sowing date, construction of roads and providing drinking water to urban and rural</li></ul>

## 3.4 PROBLEM SOLUTION FIT

### Project Design Phase-I - Solution Fit

Project Title: Exploratory analysis of rainfall data in india for agriculture  
Team ID: PNT2022TMID44338

Define CS, fit into CC	1.CUSTOMER SEGMENT(S) <b>CS</b> <ul style="list-style-type: none"><li>Public</li><li>Farmers</li><li>Sales people</li></ul>	6.CUSTOMER CONSTRAINS <b>CC</b> <ul style="list-style-type: none"><li>Cost limitation</li><li>Time limitation</li><li>Agriculture supply limitation</li></ul>	5. AVAILABLE SOLUTIONS <b>AS</b> <ul style="list-style-type: none"><li>Rainfall prediction</li><li>Devices</li><li>Knowledge</li></ul>	Explore AS, differentiate
	2. JOBS-TO-BE-DONE / PROBLEMS <b>J&amp;P</b> <ul style="list-style-type: none"><li>To optimize the rainfall prediction</li><li>To prevent the crop from the water logging</li><li>Dryland agriculture</li></ul>	9. PROBLEM ROOT CAUSE <b>RC</b> <ul style="list-style-type: none"><li>Climate changes</li><li>Biodiversity loss</li><li>Contamination of resources</li></ul>	7.BEHAVIOUR <i>i.e. directly related find the right color panel installer calculate.</i> <b>BE</b> <ul style="list-style-type: none"><li>Focuses on the nature of decision making by the farmers and the factors that influence such</li></ul>	
Focus on J&P, tap into BE.	3. TRIGGERS <b>TR</b> <p>To create an innovation to predict weather to save water and crops</p>	10. YOUR SOLUTION <b>SL</b> <ul style="list-style-type: none"><li>Significant need for an appropriate water irrigation system taking consider of the rising water scarcity.</li><li>Reducing on-harvesting and post-harvesting losses.</li></ul>	8. CHANNELS of BEHAVIOUR <b>CH</b> <p>8.1 ONLINE</p> <ul style="list-style-type: none"><li>E-Commerce for agriculture business</li><li>Expanded customer base</li></ul> <p>8.2 OFFLINE</p> <ul style="list-style-type: none"><li>Your local newspapers or area magazines.</li><li>By visiting a farmer's market contact</li></ul>	Extract online and offline CH of BE
Identify strong TR and EM	4.EMOTIONS:BEFORE/AFTER <b>EM</b> <p>Lack of stored water available in dryland-rainfall harvesting</p>			

Identify

## CHAPTER-4

### REQUIREMENT ANALYSIS

#### 4.1 FUNCTIONAL REQUIREMENT

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form and Gmail Registration through LinkedIn
FR-2	User Confirmation	Confirmation via Email and OTP
FR-3	User Login	Using the registered email id and password as login credentials.
FR-4	Profile Dashboard	Viewing the profile and changing password
FR-5	Visualization	Visualize the user specific data in different forms
FR-6	Feedback and support	Collecting feedback against the accuracy of the prediction for further improvement and feature inclusion in other modules or functionalities.

## 4.2 NON FUNCTIONAL REQUIREMENT

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

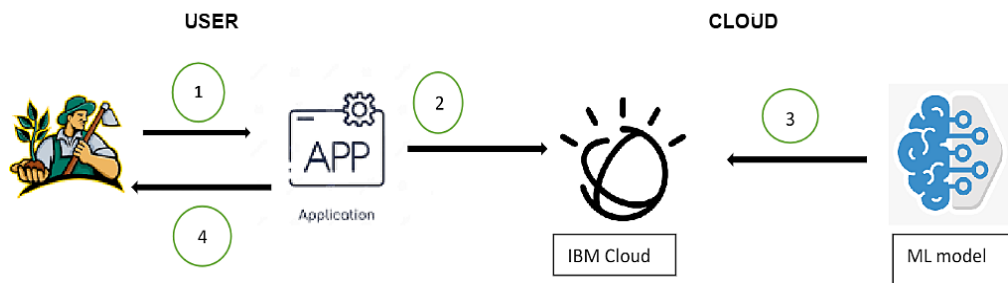
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The Farmer and other people can easily use the application and it is user friendly to prior knowledge is required for using it.
NFR-2	Security	Providing secure system requirements and then determine authenticity, originality and security.
NFR-3	Reliability	The system will provide the prediction without any errors and failures for a specific time.
NFR-4	Performance	Predictions are as same as the true values, so the performance is higher.
NFR-5	Availability	Available to different group of farmers for 24/7.
NFR-6	Scalability	The Application should be in the way of adding new functionalities or modules without affecting the existing functionalities

## CHAPTER-5

### PROJECT DESIGN

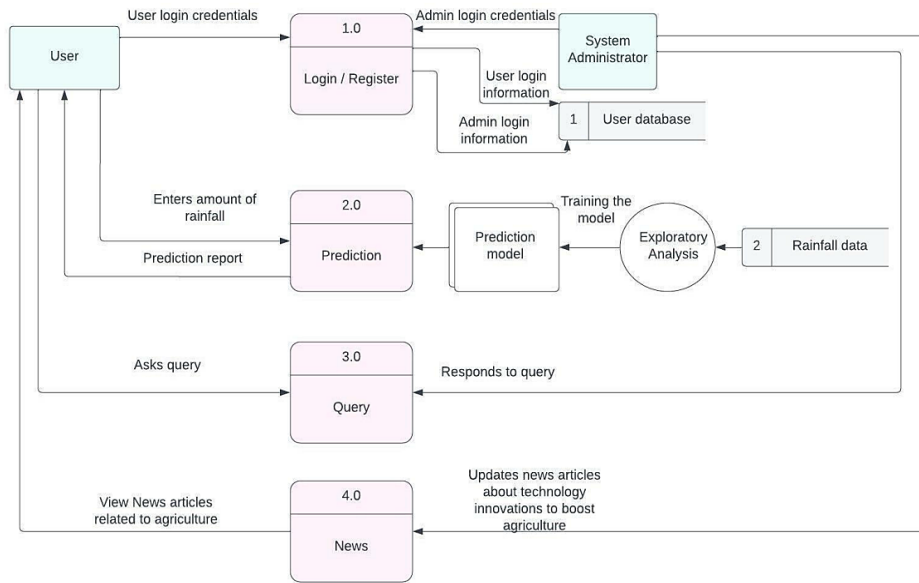
#### 5.1 DATA FLOW DIAGRAMS

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



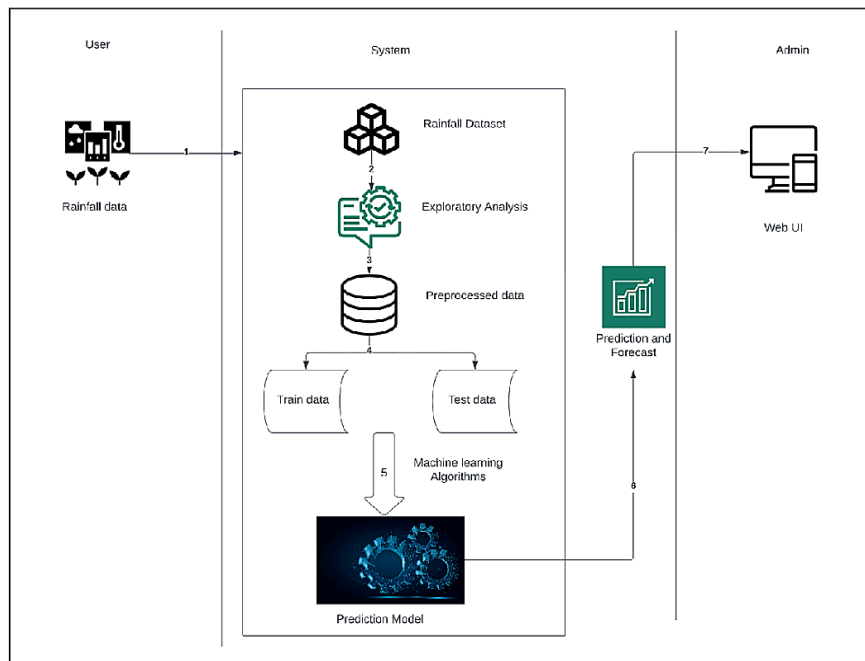


Example: DFD Level 0 (Industry Standard):



## 5.2 SOLUTION AND TECHNICAL ARCHITECTURE

Technical Architecture:



### 5.3 USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (web user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
	Registration	USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	Medium	Sprint-2
	Login	USN-3	As a user, I can log into the application by entering email & password	I can access the system	High	Sprint-1
	Dashboard	USN-4	As a user, I can view the details about the system and can navigate through the pages.	I can navigate through pages	High	Sprint-3
	Prediction	USN-5	As a user, I can enter the rainfall amount and get the prediction results	I can get the prediction result	High	Sprint-4

	News	USN-6	As a user, I can view latest news articles related to agriculture	I can view the articles	Medium	Sprint-3
Customer Care Executive	Contact	USN-7	As a user, I can ask queries regarding the system	I can clarify my doubts	High	Sprint-3
	Chat bot	USN-8	As a user, I can interact with chatbot to ask queries	I can get my queries clear instantly	Low	Sprint-4
Administrator	Login	USN-9	As a user, I can register for the application by entering my email, password, and confirming my password.	I can view and update the system	High	Sprint-1
	Prediction	USN-10	As a user, I can see the prediction result from the model trained by the system administrator	I can train the prediction model	High	Sprint-3

## CHAPTER-6

### PROJECT PLANNING & SCHEDULING

#### 6.1 SPRINT PLANNING & ESTIMATION

<b>Sprint</b>	<b>Functional Requirements</b>	<b>User Story Number</b>	<b>User Story/Task</b>	<b>Story Points</b>	<b>Priority</b>	<b>Team Members</b>
Sprint-1	Data Collection	USN-1	The data collection will be done by downloading the weatherAUS dataset which was available	4	High	S.Keethi Vennila
Sprint-1	Data Preprocessing	USN-2	To do pre-processing we will perform data cleaning removing data and do the exploratory analysis	5	High	M.Sruthi
Sprint-1	Data visualization	USN-3	Grapics,Pie-charts,bar plots will be used to visualize the data for better understanding	6	High	M. Bala Priyadharshini
Sprint-1	Feature Scaling	USN-4	Before training our dataset want our data in normalized and standard	7	Medium	M. Gokulapriya
Sprint-2	Splitting data into train and test	USN-5	We split the entire dataset into train and test	5	Medium	M.Sruthi
Sprint-2	Training and Testing the model	USN-6	Training of the model is done after model creation	3	Medium	S.Keerthi Vennila

Sprint-2	Model Evaluation	USN-7	Evaluating different models by comparing their accuracy and precision	6	Low	M.Bala Priyadharshini
Sprint-3	Build HTML code	USN-8	Further HTML pages will be developed using the same user interface and will connected to the main page	7	High	M.Gokulapriya
Sprint-3	Python code for building the web application	USN-9	Backend of the web page will be done using python	8	High	M.Sruthi
Sprint-4	Train the model on IBM Cloud	USN-10	Using IBM cloud Watson to store our machine learning model and connect it with the web page	9	High	S.Keerthi Vennila
Sprint-4	Integrate Flask with scoring end points	USN-11	Integrating the web page with ML model using flask	10	High	M.Bala priyadharshini

## 6.2 SPRINT DELIVERY SCHEDULE

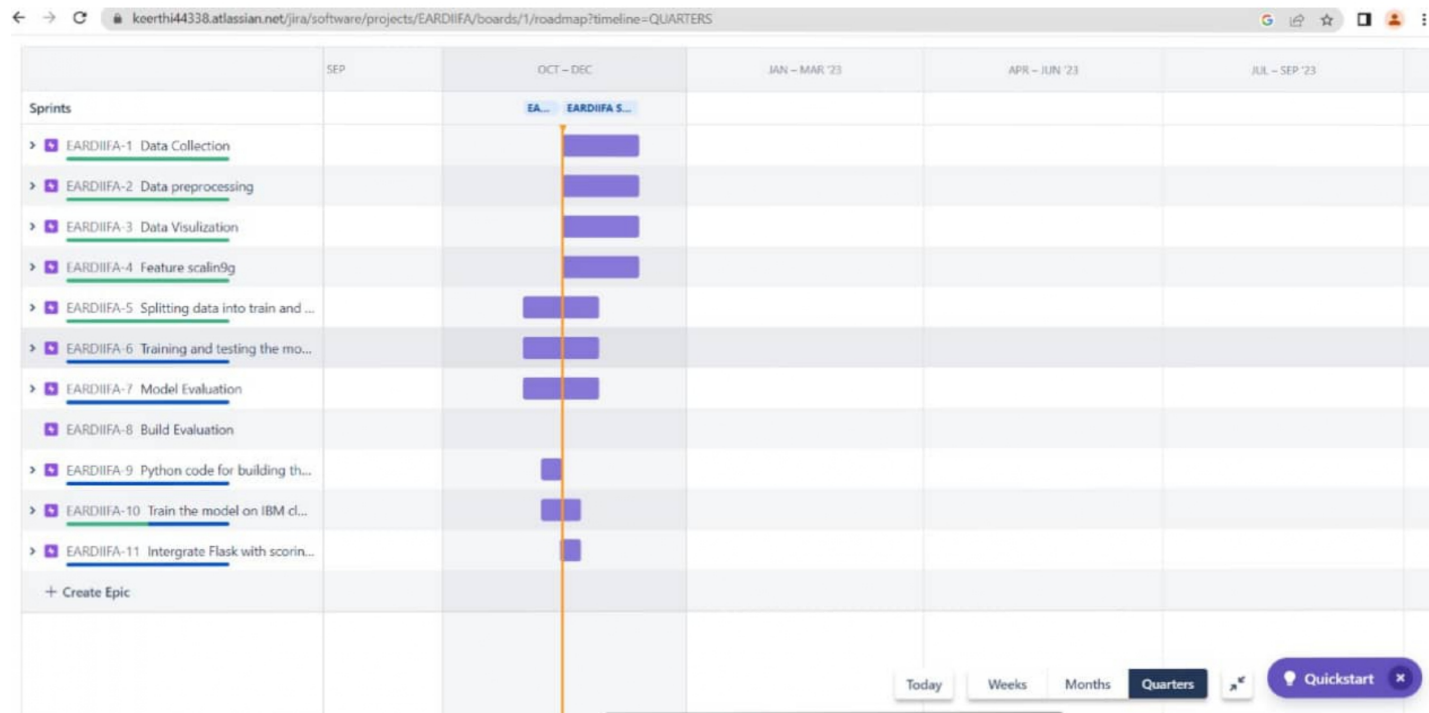
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date(Planned)	Story Points Completed	Sprint Release Date(Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2002	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

## 6.3 REPORTS FROM JIRA

The screenshot displays the Jira Software interface for a project named "Exploratory Analysis Of RainFall Data In India For Agriculture". The left sidebar shows the project navigation menu with options like Roadmap, Backlog (selected), Board, Code, Project pages, Add shortcut, and Project settings. The main content area shows the Backlog with two sprints:

- EARDIIFA Sprint 1** (15 Nov – 13 Dec, 4 issues):
  - EARDIIFA-14: graphs, pie-charts, bar plots will be used to visualize the data for better understanding. **DATA VISUALIZATION**. Status: DONE.
  - EARDIIFA-12: the datacollection will be done by downloading the weather AUS dataset which was available. **DATA COLLECTION**. Status: DONE.
  - EARDIIFA-13: To do pre-processing we will perform data cleaning removing noisy data and do the exploratory analysis. **DATA PREPROCESSING**. Status: DONE.
  - EARDIIFA-15: Before training our dataset want our data in normalized and standard form. **FEATURE SCALING**. Status: DONE.
- EARDIIFA Sprint 2** (31 Oct – 28 Nov, 3 issues):
  - EARDIIFA-16: we split the entire dataset into train and test. **SPLITTING DATA INTO TRAIN AND...**. Status: DONE.
  - EARDIIFA-17: training of the model is done after model creation. **TRAINING AND TESTING THE MO...**. Status: IN PROGRESS.
  - EARDIIFA-18: Evaluating different models by comparing their accuracy and precision. **MODEL EVALUATION**. Status: IN PROGRESS.

The interface also includes a top navigation bar with "Jira Software", "Your work", "Projects", "Filters", "Dashboards", "People", "Apps", and a "Create" button. A search bar is located on the right. A "Quickstart" tooltip is visible in the bottom right corner. The bottom status bar shows the system clock as 21:39 on 15-11-2022.



## CHAPTER-7

### CODING & SOLUTIONING(EXPLAIN THE FEATURES ADDED IN THE PROJCT ALONG WITH CODE)

#### 7.1 FEATURE 1

The application has an interactive user interface where user needs to upload all the necessary details to predict the rainfall.

##### **index.html**

```
<!DOCTYPE html>
<html>
<head>
<meta charset="UTF-8">
<title>Rainfall Prediction</title>
</head>
<body background="https://wallpaperaccess.com/full/701614.jpg" text="black">
<div class="login">
<center><h1>Rainfall Prediction</h1></center>
<b> <h2>Please enter the following details</h2></b>
<!-- Main Input For Receiving Query to our ML -->
<form action="{{ url_for('predict')}}" method="post">

</style></head>

<label for="Location">Location:</label>
<select id="Location" name="Location">
  <option value=2>Albury</option>
  <option value=4> BadgerysCreek</option>
  <option value=10>Cobar</option>
  <option value=11>CoffsHarbour</option>
  <option value=21>Moree</option>
  <option value=24>Newcastle</option>
  <option value=26>NorahHead</option>
  <option value=27>NorfolkIsland</option>
  <option value=3e>Penrith</option>
  <option value=34>Richmond</option>
```



```

<option value=37>Sydney</option>
<option value=38>SydneyAirport</option>
<option value=42>Waggawagga</option>
<option value=45>Williamtown</option>
<option value=47>Wollongong</option>
<option value=9>Canberra</option>
<option value=48>Tuggeranong</option>
<option value=23>MountGinini</option>
<option value=5>Ballarat</option>
<option value=6>Bendigo</option>
<option value=35>Sale</option>
<option value=19>MelbourneAirport</option>
<option value=18>Melbourne</option>
<option value=2>Mildura</option>
<option value=25>Nhil</option>
<option value=33>Portland</option>
<option value=44>Watsonia</option>
<input type="text" id="temp" placeholder="MinTemp">
<input type="text" id="temp" placeholder="MaxTemp">
<input type="text" id="temp" placeholder="Rainfall">
<input type="text" id="temp" placeholder="WindGustSpeed"> <br><br>
    &nbsp;
<input type="text" id="temp" placeholder="WindSpeed9am"> &nbsp;
<input type="text" id="temp" placeholder="WindSpeed3pm"> &nbsp;
<input type="text" id="temp" placeholder="Humidity9am"> &nbsp;
<input type="text" id="temp" placeholder="Humidity3pm"> &nbsp;
<input type="text" id="temp" placeholder="Pressure9am"> <br><br>&nbsp;
<input type="text" id="temp" placeholder="Pressure3pm"> &nbsp;
<input type="text" id="temp" placeholder="Temp9am">&nbsp;
<input type="text" id="temp" placeholder="Temp3pm"> &nbsp;
<input type="text" id="temp" placeholder="WindSpeed3pm">&nbsp;
<input type="text" id="temp" placeholder="year"> <br><br> &nbsp;
<input type="text" id="temp" placeholder="month">&nbsp;
<input type="text" id="temp" placeholder="day">
</style></head>
<br><br>&nbsp;

```





```
<button type="submit" class="btn btn-primary btn-block btn-large" style="height:30px;width:200px">Predict</button>
```

```
</form>
```

```
<br>
```

```
{{ prediction_text }}
```

```
<br>
```

```
<br>
```

```

```

```

```

```

```

```
<br>
```

```
<br>
```

```

```

```
</div>
```

```
</body>
```

```
</html>
```

## 7.2 FEATURE 2

### app.py

```
import numpy as np
import pickle
import joblib
import matplotlib
import matplotlib.pyplot as plt
import time
import pandas
import os
from flask import Flask, request, jsonify, render_template
app = Flask(__name__)
model = pickle.load(open('C:\\Users\\intec\\rainfall.pkl', 'rb'))
scale = pickle.load(open('C:\\Users\\intec\\scale.pkl', 'rb'))
@app.route('/')# route to display the home page
def home():
    return render_template('index.html') #rendering the home page
@app.route('/predict', methods=[ "POST", "GET"])# route to show the predictions in a
web UI
def predict():
    # reading the inputs given by the user
    input_feature=[x for x in request.form.values() ]
    features_values=[np.array(input_feature)]
    names=[['Location','Mintemp','Maxtemp','Rainfall','WindGustSpeed',
'Windspeed9am', 'WindSpeed3pm', 'Humidity9am', 'Humidity3pm',
'Pressure9am', 'Pressure3pm', 'Temp9am', 'Temp3pm', 'RainToday',
'WindGustDir', 'WindDir9am', 'WindDir3pm', 'year', 'month', 'day']]
    data = pandas.DataFrame(features_values, columns=names)
    data = scale.fit_transform(data)
    data = pandas.DataFrame(data,columns = names)
    # predictions using the loaded model file
    prediction = model.predict(data)
    pred_prob = model.predict_proba(data)
    print(prediction)
    if prediction == "Yes":
```

```
        return render_template("chance.html")
    else:
        return render_template("nochance.html")
    # showing the prediction results in a UI
if __name__ == "__main__":
    app.run(host='127.0.0.1',debug=False)
```

## CHAPTER-8

### 8. TESTING

#### 8.1 TEST CASES

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

#### 8.2 USER ACCEPTANCE TESTING

##### Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the Exploratory Analysis of Rainfall Data in India for Agriculture project at the time of the 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

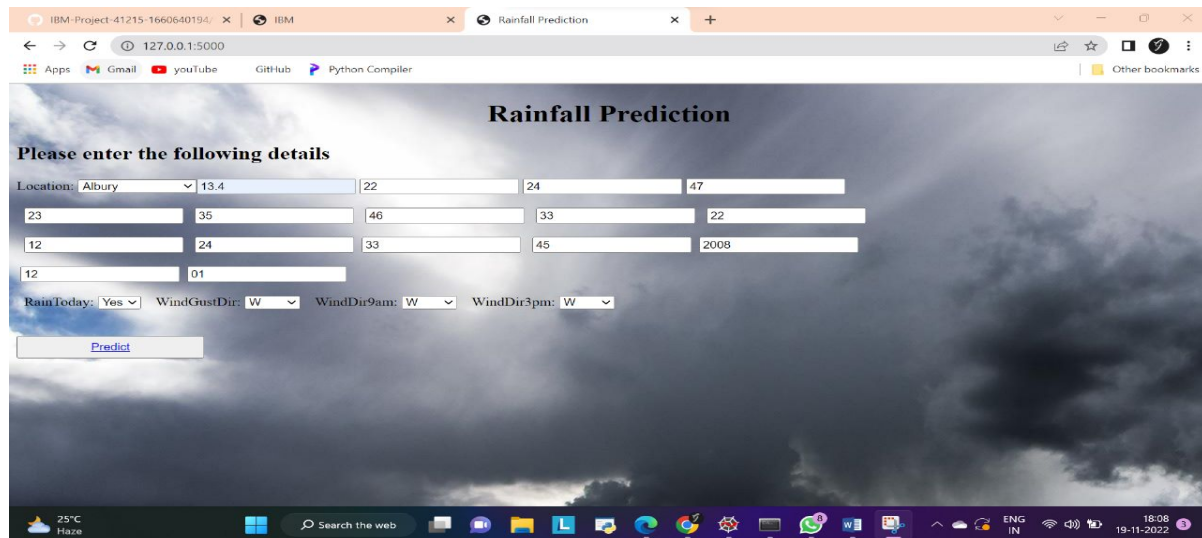
Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77



## CHAPTER-9

## RESULTS

### 9.1 PERFORMANCE METRICS



**Rainfall Prediction**

Please enter the following details

Location: Albury 13.4 22 24 47

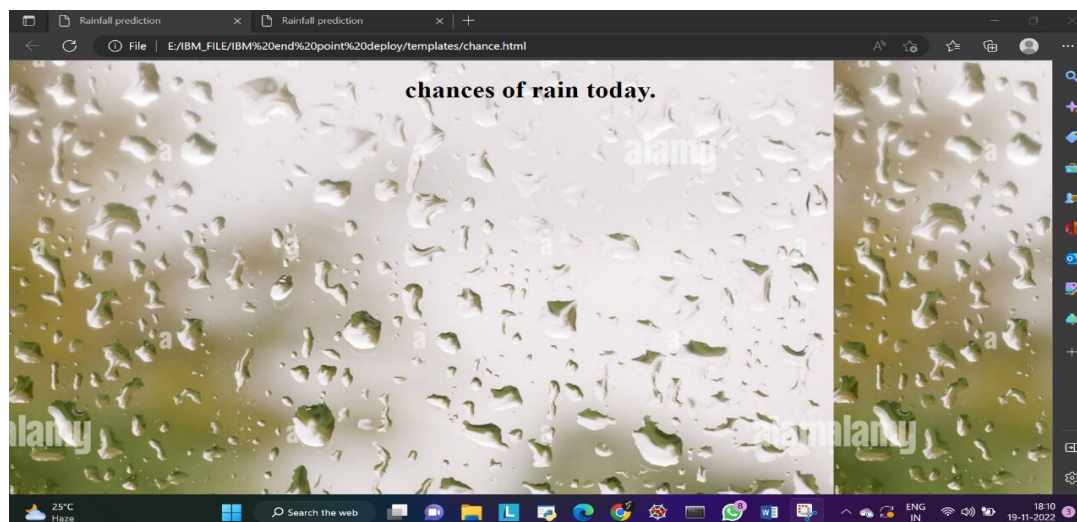
23 35 46 33 22

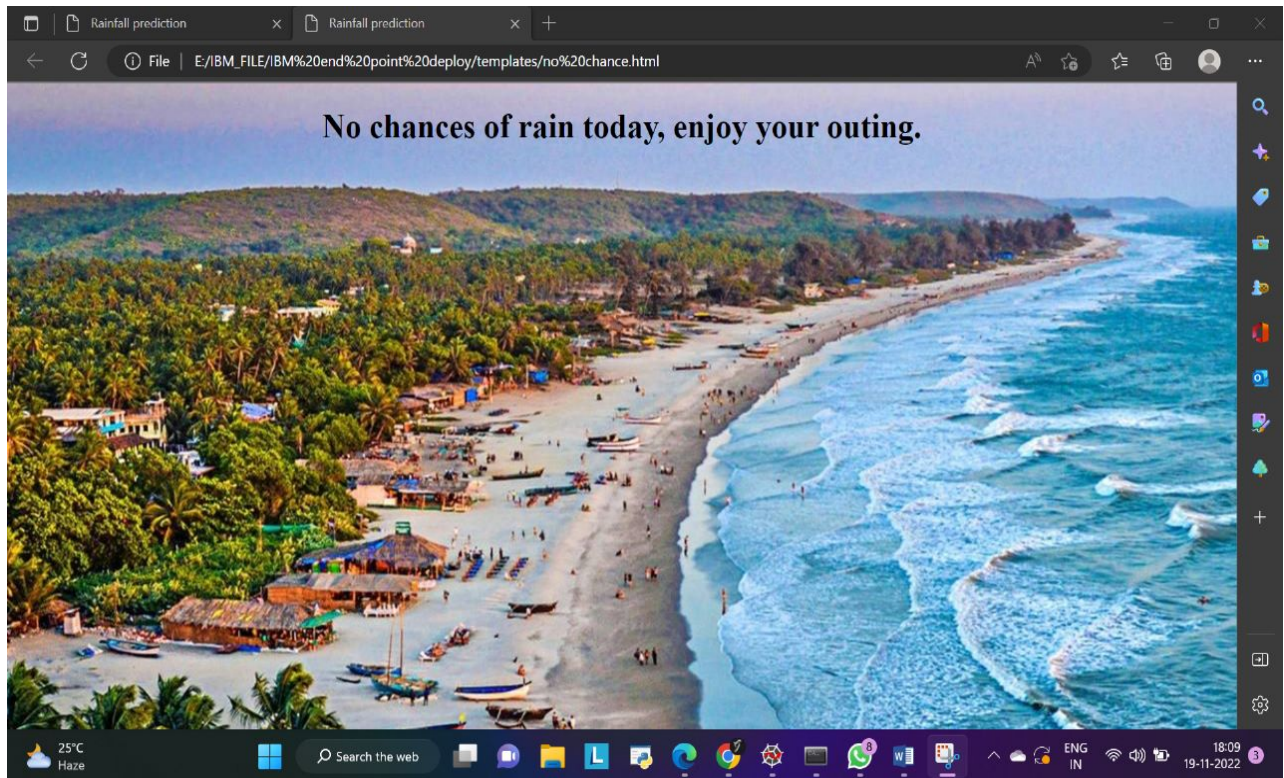
12 24 33 45 2008

12 01

Rain Today: Yes WindGustDir: W WindDir9am: W WindDir3pm: W

[Predict](#)





## **CHAPTER-10**

### **ADVANTAGES & DISADVANTAGES**

#### **ADVANTAGES:**

##### **1.Keeping Your Plants and Grass Well-Watered.**

- Rainfall totals matter most when you're trying to keep your lawn and garden healthy. Too much or too little water can cause issues for your yard.

##### **2.Identifying Weather Patterns and Trends for Your Neighborhood.**

Monitoring rainfall amounts can even help you determine what outdoor activities to plan for the day.

##### **3. Knowing the Best Times for Planting.**

- Since some plants need more water than others, every type of plant has an ideal rainfall amount for seed germination and to stay healthy throughout the season, with some plants needing more water than others.

##### **4.Identifying Potential Conditions for Flooding.**

- Monitoring rainfall totals becomes even more critical if you're in an area that's prone to flooding. A rain gauge lets you identify potential flooding conditions that could adversely impact your yard and home.

##### **5.Getting Better Rainfall Data.**

- Though there are some ways to track rainfall -- such as local weather channels and news websites -- they usually don't have very precise data. Their measurements are often limited to specific regions and geographical locations.

## **DISADVANTAGES:**

1.Forecasts are never 100% accurate.

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.

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.

3.It can also be costly.

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.

## **11. CONCLUSION**

Rainfall Prediction is the application area of data science and machine learning to predict the state of the atmosphere. It is important to predict the rainfall intensity for effective use of water resources and crop production to reduce mortality due to flood and any disease caused by rain. This paper analyzed various machine learning algorithms for rainfall prediction such as MLR.

## **12.FUTURE SCOPE**

Predicting weather accurately doesn't just help our daily lives but has deeper impact for food security and disaster management. Good news for monsoon-dependent India is that we are getting better at predicting. New technologies, such as Internet of Things (IoT) and [Artificial Intelligence](#) (AI) are helping meteorological experts to give better information to predict agricultural output and natural disasters.

## CHAPTER 13

### APPENDIX

#### SOURCE CODE

##### index.html

```
<!DOCTYPE html>
<html>
<head>
<meta charset="UTF-8">
<title>Rainfall Prediction</title>
</head>
<body background="https://wallpaperaccess.com/full/701614.jpg" text="black">
<div class="login">
<center><h1>Rainfall Prediction</h1></center>
<b> <h2>Please enter the following details</h2></b>

<!-- Main Input For Receiving Query to our ML -->
<form action="{{ url_for('predict')}}" method="post">

</style></head>

<label for="Location">Location:</label>
<select id="Location" name="Location">
  <option value=2>Albury</option>
  <option value=4> BadgerysCreek</option>
  <option value=10>Cobar</option>
  <option value=11>CoffsHarbour</option>
  <option value=21>Moree</option>
  <option value=24>Newcastle</option>
  <option value=26>NorahHead</option>
  <option value=27>NorfolkIsland</option>
  <option value=3e>Penrith</option>
  <option value=34>Richmond</option>
  <option value=37>Sydney</option>
  <option value=38>SydneyAirport</option>
  <option value=42>Waggawagga</option>
  <option value=45>Williamtown</option>
```

```

<option value=47>Wollongong</option>
<option value=9>Canberra</option>
<option value=48>Tuggeranong</option>
<option value=23>MountGinini</option>
<option value=5>Ballarat</option>
<option value=6>Bendigo</option>
<option value=35>Sale</option>
<option value=19>MelbourneAirport</option>
<option value=18>Melbourne</option>
<option value=2>Mildura</option>
<option value=25>Nhil</option>
<option value=33>Portland</option>
<option value=44>Watsonia</option>
<input type="text" id="temp" placeholder="MinTemp">
<input type="text" id="temp" placeholder="MaxTemp">
<input type="text" id="temp" placeholder="Rainfall">
<input type="text" id="temp" placeholder="WindGustSpeed"> <br><br>
    &nbsp;
<input type="text" id="temp" placeholder="WindSpeed9am"> &nbsp;
<input type="text" id="temp" placeholder="WindSpeed3pm"> &nbsp;
<input type="text" id="temp" placeholder="Humidity9am"> &nbsp;
<input type="text" id="temp" placeholder="Humidity3pm"> &nbsp;
<input type="text" id="temp" placeholder="Pressure9am"> <br><br>&nbsp;
<input type="text" id="temp" placeholder="Pressure3pm"> &nbsp;
<input type="text" id="temp" placeholder="Temp9am">&nbsp;
<input type="text" id="temp" placeholder="Temp3pm"> &nbsp;
<input type="text" id="temp" placeholder="WindSpeed3pm">&nbsp;
<input type="text" id="temp" placeholder="year"> <br><br> &nbsp;
<input type="text" id="temp" placeholder="month">&nbsp;
<input type="text" id="temp" placeholder="day">
</style></head>
<br><br>&nbsp;

<label for="RainToday"> RainToday:</label>
<select id=RainToday name= "RainToday" >
<option value=2>No</option>

```

```
<option value=4>Yes</option>  
</select> &nbsp;&nbsp;&nbsp;
```

```
<label for="windGustDir"> WindGustDir:</label>  
<select id=WindGustDir name= "windGustDir" >  
    <option value=14>W</option>  
    <option value=15>WNW</option>  
    <option value=0>WSW</option>  
    <option value=7>NE</option>  
    <option value=13>NNW</option>  
    <option value=10>N</option>  
    <option value=2>NNE</option>  
    <option value=1>SW</option>  
    <option value=6>ENE</option>  
    <option value=11>SSE</option>  
    <option value=12>S</option>  
    <option value=9>NW</option>  
    <option value=3>SE</option>  
    <option value=8>ESE</option>  
    <option value=5>E</option>  
    <option value=4>SSW</option>  
</select> &nbsp;&nbsp;&nbsp;
```

```
<label for="windDir9am"> WindDir9am:</label>
<select id=windDir9am  name= "windDir9am" >
    <option value=14>W<option>
    <option value=15>WNW<option>
    <option value=16>WSW<option>
    <option value=23>NE<option>
    <option value=29>NNW<option>
    <option value=26>N<option>
    <option value=18>NNE<option>
    <option value=17>SW<option>
    <option value=22>ENE<option>
    <option value=27>SSE<option>
    <option value=28>S<option>
```





<br>

{{ prediction\_text }}

<br>

<br>







<br>

<br>



</div>

</body>

</html>

### **Chance.html**

<!DOCTYPE html>

<html>

<head>

<meta charset="UTF-8">

<title>Rainfall prediction</title>

</head>

<body background="C:\Users\intec\OneDrive\Desktop\Rain.jpg" text="black">

<div class="login">

<center><h1>chances of rain today.</h1></center>

</body>

</html>

## Nochance.html

```
<!DOCTYPE html>
<html>
<head>
  <meta charset="UTF-8">
  <title>Rainfall prediction</title>
</head>

<body
background="https://cdn.tourradar.com/s3/tour/1500x800/139566_d97baf8c.jpg"
text="black">
<div class="login">
<center><h1>No chances of rain today, enjoy your outing.</h1></center>
</body>
</html>
```

## app.py

```
import numpy as np
import pickle
import joblib
import matplotlib
import matplotlib.pyplot as plt
import time
import pandas
import os
from flask import Flask, request, jsonify, render_template

app = Flask(__name__)
model = pickle.load(open('C:\\Users\\intec\\rainfall.pkl', 'rb'))
scale = pickle.load(open('C:\\Users\\intec\\scale.pkl', 'rb'))
@app.route('/')# route to display the home page
def home():
    return render_template('index.html') #rendering the home page
@app.route('/predict', methods=[ "POST", "GET"])# route to show the predictions in a
web UI
```

```

def predict():
    # reading the inputs given by the user
    input_feature=[x for x in request.form.values() ]
    features_values=[np.array(input_feature)]
    names=[['Location','Mintemp','Maxtemp','Rainfall','WindGustSpeed',
    'Windspeed9am', 'WindSpeed3pm', 'Humidity9am', 'Humidity3pm',
    'Pressure9am', 'Pressure3pm', 'Temp9am', 'Temp3pm', 'RainToday',
    'WindGustDir', 'WindDir9am', 'WindDir3pm', 'year', 'month', 'day']]
    data = pandas.DataFrame(features_values, columns=names)
    data = scale.fit_transform(data)
    data = pandas.DataFrame(data,columns = names)
    # predictions using the loaded model file
    prediction = model.predict(data)
    pred_prob = model.predict_proba(data)
    print(prediction)
    if prediction == "Yes":
        return render_template("chance.html")
    else:
        return render_template("nochance.html")
    # showing the prediction results in a UI
if __name__ == "__main__":
    app.run(host='127.0.0.1',debug=False)

```

**Github link:** <https://github.com/IBM-EPBL/IBM-Project-617-1658310273>

## Project

**Demonstration:**[https://drive.google.com/file/d/1NOPqYAtojxhmlyG5c5W3gmP\\_R3BxG-2/view?usp=drivesdk](https://drive.google.com/file/d/1NOPqYAtojxhmlyG5c5W3gmP_R3BxG-2/view?usp=drivesdk)

