WEATHER PREDICTION

A MINI PROJECT REPORT

18CSC305J - ARTIFICIAL INTELLIGENCE

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in partial fulfillment for the award of the degree

of

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE & ENGINEERING

of

FACULTY OF ENGINEERING AND TECHNOLOGY

S.R.M. Nagar, Kattankulathur, Chengalpattu District

MAY 2023

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

(Under Section 3 of UGC Act, 1956)

BONAFIDE CERTIFICATE

Certified that Mini project report titled **"WEATHER PREDICTION"** is the bona fide work of **KHUSHI BAJAJ [RA2011003011145], P CHENNA REDDY [RA2011003011130], ASHWIN G [RA2011003011148]** who carried out the minor project under my supervision. Certified further, that to the best of my knowledge, the work reported herein does not form any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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ABSTRACT

Weather prediction plays a crucial role in our daily lives. With the advancements in machine learning and AI, weather prediction has seen significant improvements in recent years, the algorithms can be trained to identify severe weather events, such as hurricanes and tornadoes, and provide advanced warning to those in their path. Overall, the development of AI-based weather prediction systems has significant potential to improve the accuracy and reliability of weather forecasts, helping individuals and organizations make better decisions based on weather data.

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ABBREVIATIONS

AI	Artificial Intelligence
API	Application Programming Interface
HTML	Hypertext Markup Language
CSS	Cascading Style Sheets

CHAPTER 1

INTRODUCTION

This project involves the development of an AI-based weather prediction system. The AI algorithms are trained on large datasets of weather patterns to learn the relationships between different weather variables. The system provides users with real-time weather updates and alerts for various locations around the world. The AI algorithms are also capable of identifying and tracking wind speed and humidity of a particular location along with its temperature. Overall, this weather prediction AI project aims to improve the accuracy of weather forecasting and provide timely and reliable information to individuals and organizations that rely on weather data for decision making.

CHAPTER 2

LITERATURE SURVEY

There are many research papers that have been published related to predicting the weather.

1. A paper was published on 'The Weather Forecast Using Data Mining Research Based on Cloud Computing' This paper proposes a modern method to develop a service oriented architecture for the weather information systems which forecast weather using these data mining techniques. This can be carried out by using Artificial Neural Network and Decision tree Algorithms and meteorological data collected in Specific time. Algorithms have presented the best results to generate classification rules for the mean weather variables. The results showed that these data mining techniques can be enough for weather forecasting.
2. Another paper was published on 'Analysis on The Weather Forecasting and Techniques' where they decided that artificial neural networks and the concept of fuzzy logic provides a best solution and prediction comparatively. They decided to take temperature, humidity, pressure, wind and various other attributes into consideration.
3. Another research paper titled 'Issues with weather prediction' discussed the major problems with weather prediction. Even the simplest weather prediction is not perfect. The one-day forecast typically falls within two degrees of the actual temperature. Although this accuracy isn't bad, as predictions are made further in time. For example, in a place like New England where temperatures have a great variance the temperature prediction is more inaccurate than a place like the tropics.
4. Another research paper titled 'Current weather prediction' used numerical methods to simulate what is most likely going to happen based on the known state of the atmosphere. For example, if a forecaster is looking at three different numerical models, and two models predict that a storm is going to hit a certain place, the forecaster would most likely predict that the storm is going to hit the area. These numerical models work well and are being tweaked all the time, but they still have errors because some of the equations used by the models aren't precise.

CHAPTER 3

SYSTEM ARCHITECTURE AND DESIGN

Architecture Diagram:

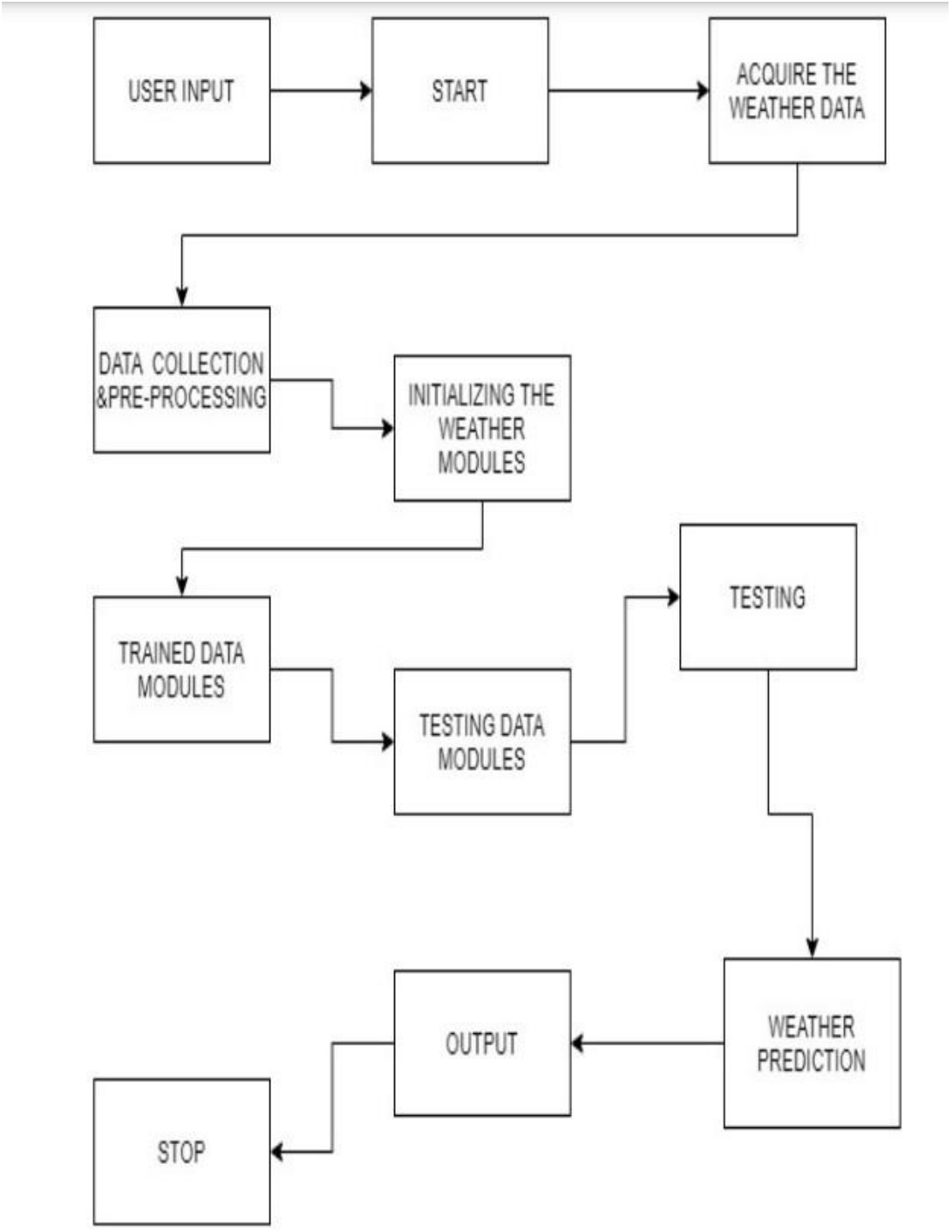
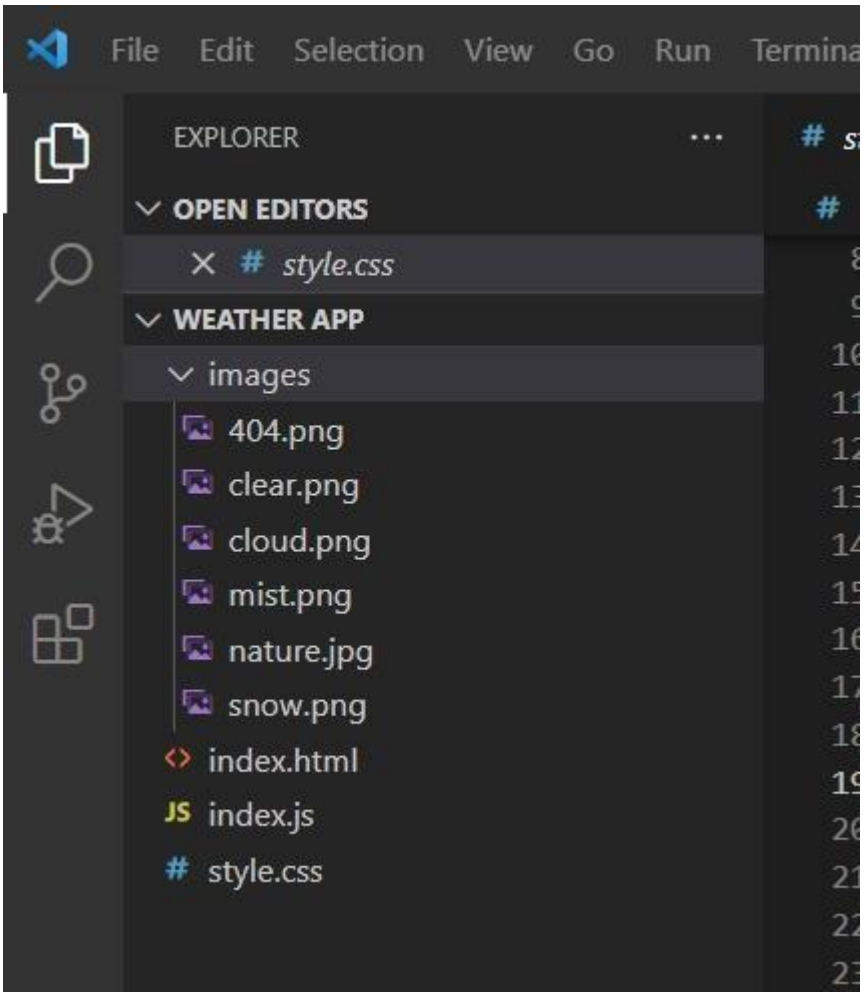


Fig 3.1 Architecture block diagram

Description of Module and Components:

The project is based on HTML, CSS as frontend and JavaScript as Backend and Openweathermap API key has been used to fetch the data which shows the information according to the user requirement.

Module Structure:



CHAPTER 4

METHODOLOGY

Implementation of Algorithms

The algorithms used in our project are Linear Regression [1] and Naïve Bayes Algorithm [2].

Linear Regression

Regression is a method of modeling a target value based on independent predictors. This method is mostly used for forecasting and finding out the cause and effect relationship between variables. Regression techniques mostly differ based on the number of independent variables and the type of relationship between the independent and dependent variables.

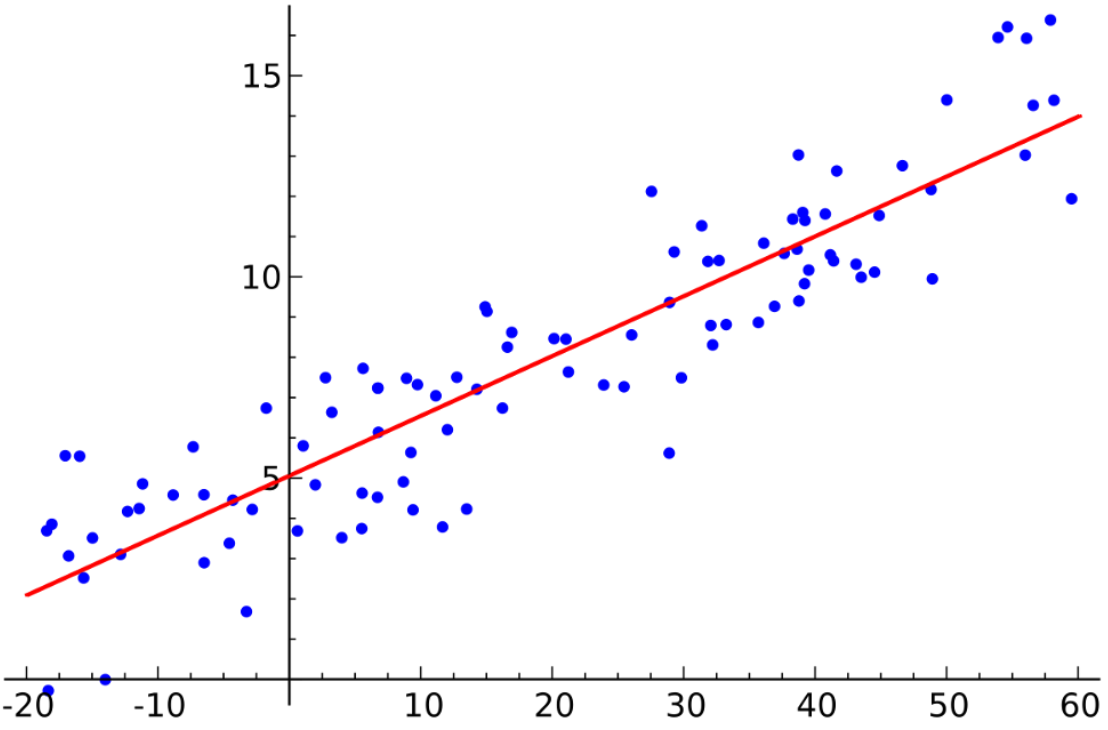


Fig 4.1 Linear Regression

Naïve Bayes Algorithm

Naïve Bayes Algorithm is a probabilistic machine learning algorithm which can be widely used in various classification tasks which is based on Bayes Theorem. The term naïve is given because it assumes the data that is given to the model are independent of each other, that is they have independent distribution. So, if we change the value of one feature then it doesn't affect the value of other features used in the algorithm.

There are many applications of Naïve Bayes Algorithm like real time prediction, multi class prediction, text classification, spam filtering, recommendation system etc.

However, the algorithm is getting its popularity because of its robustness, ability to noise and outliers as well as to irrelevant attributes. The missing values are easily handled. The predictions are made real-quick because of which, it is easily scalable.

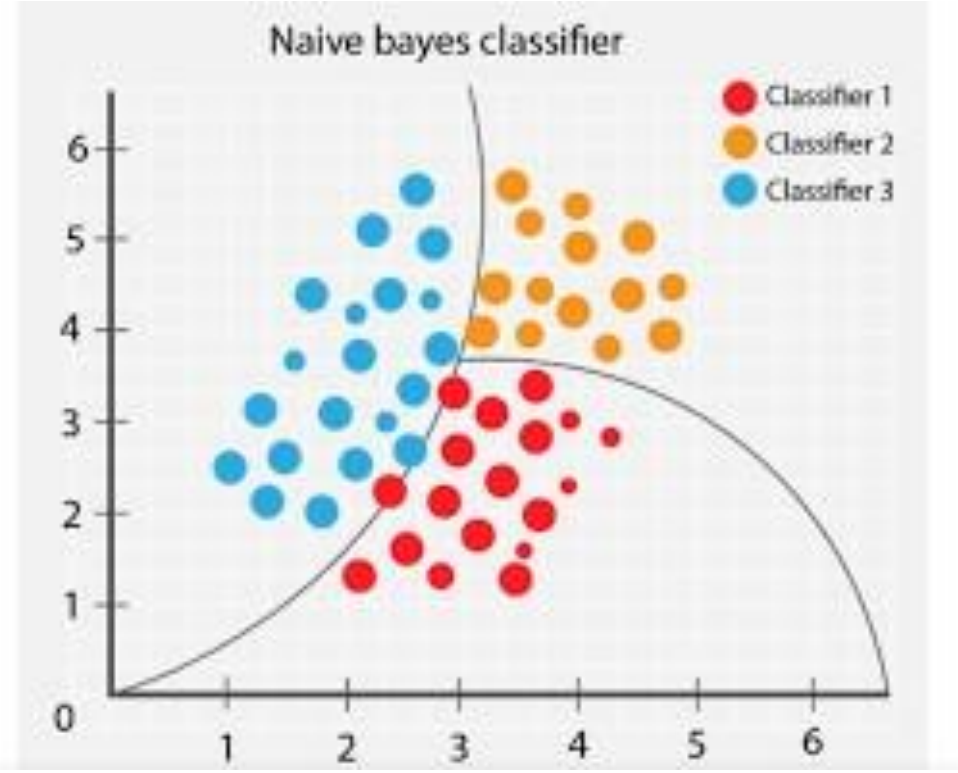


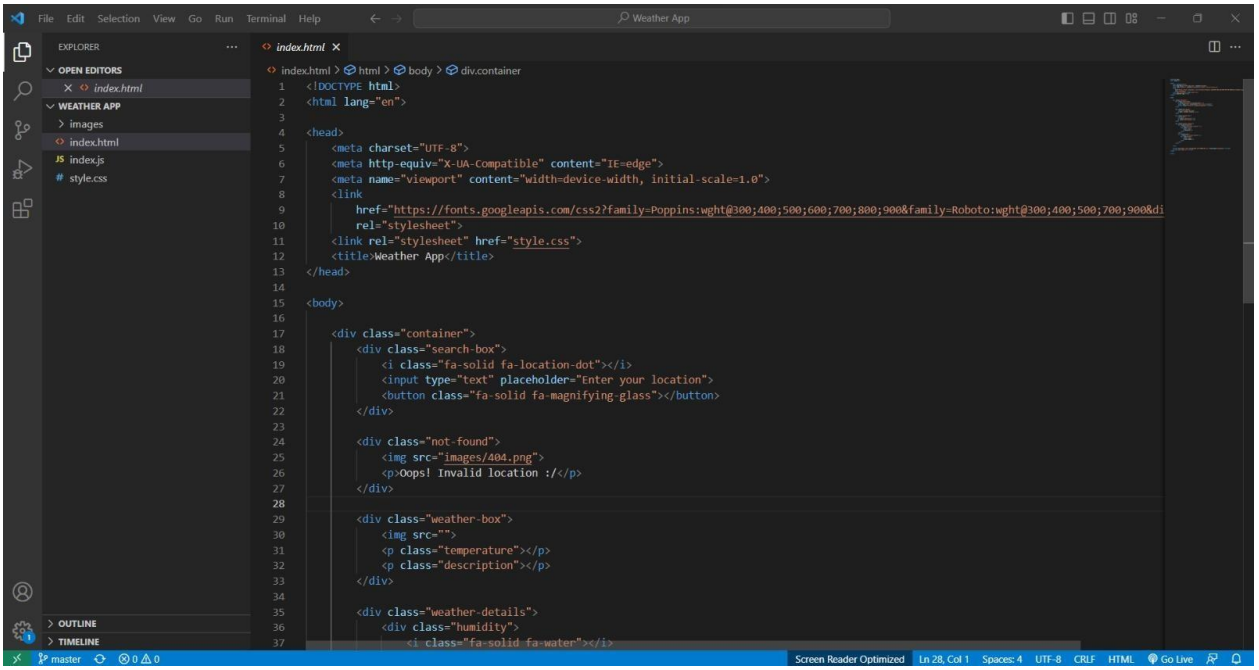
Fig 4.2 Naive Bayes Algorithm

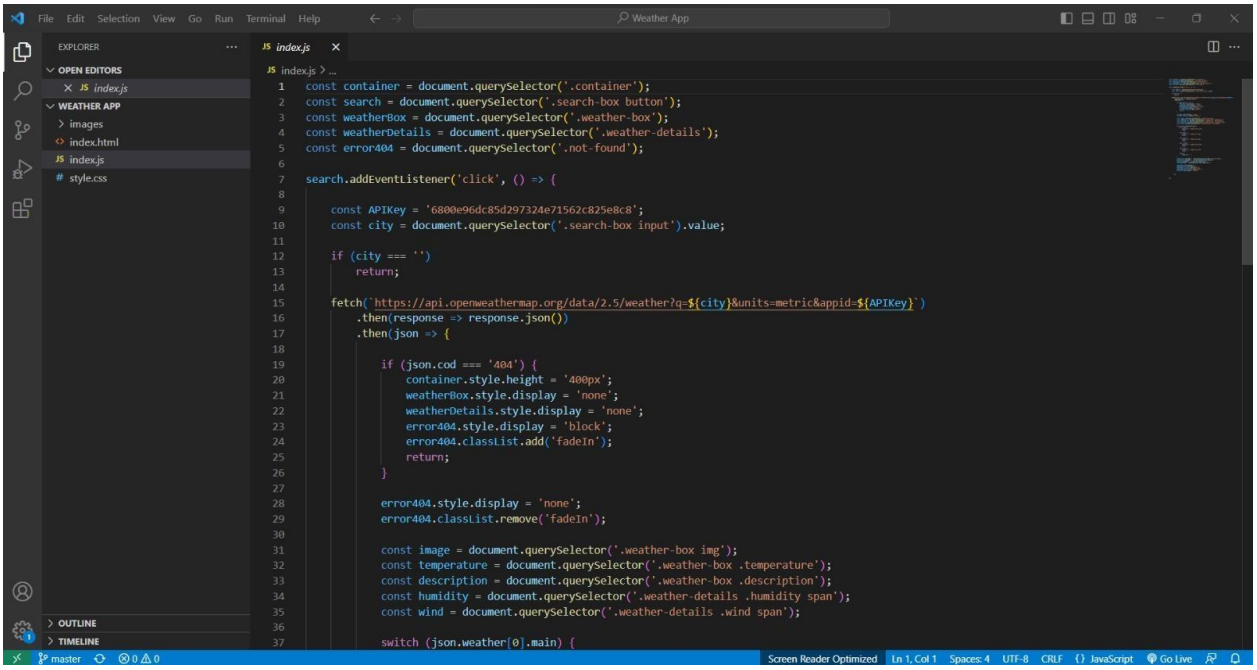
CHAPTER 5

CODING AND TESTING

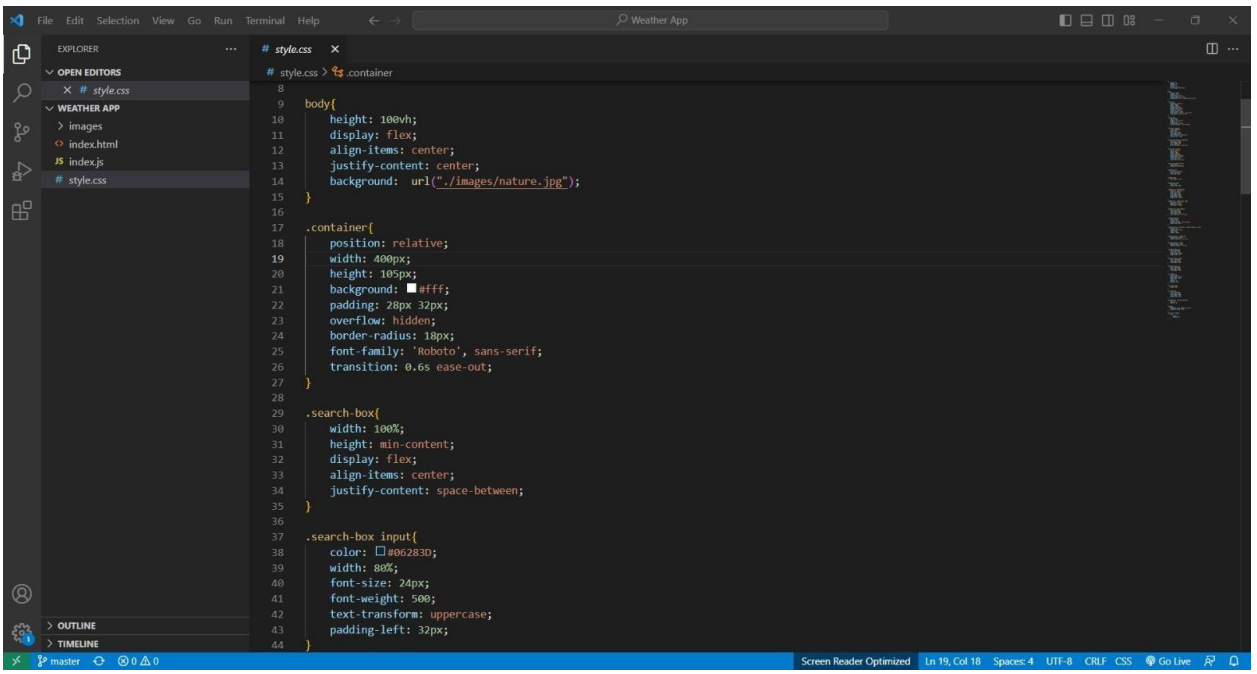
The user enters location as an input in the client side of the application and that input is then fetched by the application and data is sent to the backend. The API then uses this information to extract the related details about the location entered by the user. The details such as the temperature, humidity and wind speed in the particular region are then extracted and displayed on the interface for the user to access.

Code:





```
const container = document.querySelector('.container');
const search = document.querySelector('.search-box button');
const weatherBox = document.querySelector('.weather-box');
const weatherDetails = document.querySelector('.weather-details');
const error404 = document.querySelector('.not-found');

search.addEventListener('click', () => {

    const APIKey = '6800e96dc85d297324e71562c825e8c8';
    const city = document.querySelector('.search-box input').value;

    if (city === '')
        return;

    fetch(`https://api.openweathermap.org/data/2.5/weather?q=${city}&units=metric&appid=${APIKey}`)
        .then(response => response.json())
        .then(json => {

            if (json.cod === '404') {
                container.style.height = '400px';
                weatherBox.style.display = 'none';
                weatherDetails.style.display = 'none';
                error404.style.display = 'block';
                error404.classList.add('fadeIn');
                return;
            }

            error404.style.display = 'none';
            error404.classList.remove('fadeIn');

            const image = document.querySelector('.weather-box img');
            const temperature = document.querySelector('.weather-box .temperature');
            const description = document.querySelector('.weather-box .description');
            const humidity = document.querySelector('.weather-details .humidity span');
            const wind = document.querySelector('.weather-details .wind span');

            switch (json.weather[0].main) {
```

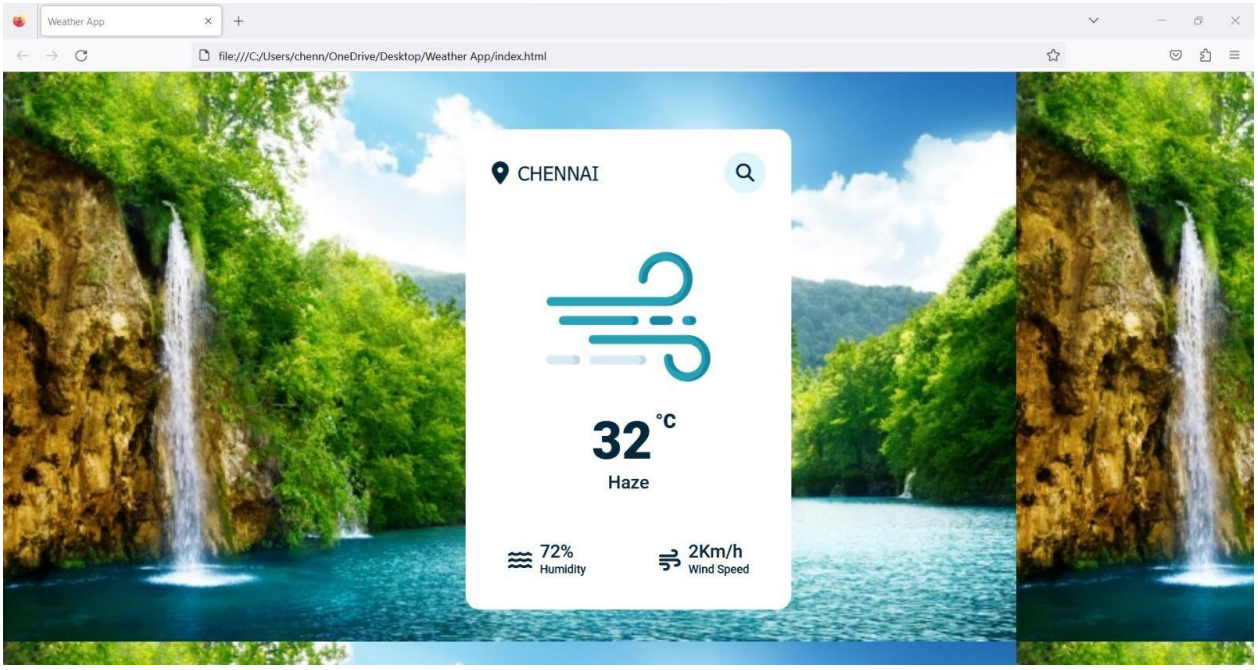


```
body{
    height: 100vh;
    display: flex;
    align-items: center;
    justify-content: center;
    background:  url("./images/nature.jpg");
}

.container{
    position: relative;
    width: 400px;
    height: 105px;
    background: #fff;
    padding: 28px 32px;
    overflow: hidden;
    border-radius: 18px;
    font-family: 'Roboto', sans-serif;
    transition: 0.6s ease-out;
}

.search-box{
    width: 100%;
    height: min-content;
    display: flex;
    align-items: center;
    justify-content: space-between;
}

.search-box input{
    color: #06283D;
    width: 80%;
    font-size: 24px;
    font-weight: 500;
    text-transform: uppercase;
    padding-left: 32px;
}
```

CHAPTER 6

SCREENSHOTS AND RESULTS

Output Screenshot:



Result:

Thus, the Weather Prediction application was built and implemented using Artificial Intelligence algorithms and the data was shown accordingly.

CHAPTER 7

CONCLUSION AND FUTURE ENHANCEMENTS

In conclusion, the weather prediction AI project has significant potential to improve the accuracy and reliability of weather forecasts. The use of AI and machine learning techniques can help identify complex patterns and relationships between different weather variables, providing more accurate and reliable weather forecasts for individuals and organizations. Linear regression is one of the commonly used techniques in weather prediction, but more advanced techniques such as Naive Bayes algorithm has also shown promising results.

Future Enhancements:

There is still a lot of room for improvement in AI-based weather prediction systems. Some potential future enhancements include:

1. Incorporating more data sources: AI-based weather prediction systems can benefit from incorporating more data sources such as social media, satellite imagery, and drone-based data.
2. Improving data quality: Accurate and reliable weather prediction requires high-quality data, so future enhancements could focus on improving data quality through better data collection methods and improved data processing techniques.
3. Integrating real-time data: Real-time data can be critical in predicting severe weather events, so future enhancements could focus on integrating real-time data into AI-based weather prediction systems.
4. Improving interpretability: One of the challenges of AI-based weather prediction systems is interpretability, as it can be difficult to understand how the system arrives at its predictions. Future enhancements could focus on developing more interpretable models.
5. Regionalization: Future enhancements can be focusing on creating regionalized models to provide more accurate predictions of weather patterns in specific areas.

REFERENCES

‘The Weather Forecast Using Data Mining Research Based on Cloud Computing’

‘Analysis on The Weather Forecasting and Techniques’

‘Issues with weather prediction’

‘Current weather prediction’

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https://cloud.google.com/blog/topics/sustainability/weather-prediction-with-ai