WEATHER FORECASTING

DESIGN PROJECT REPORT

Submitted by

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RASIPURAM

BONAFIDE CERTIFICATE

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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ABSTRACT

Weather forecasting is the prediction of the state of the atmosphere for a given location using the Application of science and technology. This includes temperature, rain, cloudiness, wind speed, and Humidity. Weather forecasts are often made by collecting scientific quantitative data about the current state of the atmosphere and using scientific understanding of atmospheric processes to project how the atmosphere will evolve in future. Forecasting could be applied in air traffic, severe weather alerts, marine, agriculture, utility companies, private sector and military application. Weather forecasting is a complex and challenging science that depends on the efficient interplay of weather observation, data analysis by meteorologist and computers, and rapid and rapid communication system.

In addition to predictions of atmospheric phenomena themselves, weather forecasting includes predictions of changes on the Earth's surface climate. These changes are caused by atmospheric conditions like snow and ice cover, storm tides, and floods. The weather forecasting has now become a science and it is performed by adopting the following procedures (steps)Recording of weather data (temperature, pressure, wind speed and direction, cloud forms, humidity and precipitation, visibility, storms etc.).

Collection of weather data from weather recording (observations center) stations scattered world over including both land and ocean surfaces. Transmission of weather data collected form major weather stations to sub center. Analysis of weather charts and maps with the help of electronic computers etc. Final forecasting of weather and numerical modelling.

I .INTRODUCTION

Weather forecasting is a software application that provides weather information to users. It can be used to check the current weather conditions, as well as to get forecasts for the upcoming days . The app uses a variety of data sources, including satellite imagery, radar data, and weather station reports, to provide accurate and up-to-date information . Some weather apps also use machine learning algorithms to collect and analyze data on current and past weather conditions, providing real-time updates and personalized forecasts based on a user's location, preferences, and historical data . The development of weather forecasting apps has made it easier for people to stay informed about the weather and plan their activities accordingly.

1.1 Background

Weather forecasting is the prediction of the weather through application of the principles of physics, supplemented by a variety of statistical and empirical techniques . It includes predictions of both atmospheric phenomena and changes on Earth's surface caused by atmospheric conditions . People have attempted to predict the weather informally for millennia and formally since the 19th century . The Babylonians used cloud formations and astrology to forecast conditions in 650 BCE . Aristotle's Meteorologics, written about 350 BCE, identified weather patterns . Theophrastus also compiled the Book of Signs, a book on weather forecasts . The study of meteorology dates back millennia, though significant progress in meteorology did not begin until the 18th century . The 19th century saw modest progress in the field after weather observation networks were formed across broad regions . Prior attempts at prediction of weather depended on historical data .

1.2 Aim of the Project

People can get accurate weather information is the main aim of this application. the important issue faced in our country is climatic changes and that can be resolved by our application **"WEATHER FORECASTING ".** The goal of weather prediction is to provide information. People and organizations can use to reduce weather related loses and enhanced societal benefits, including protection of life and property, public health and support of economic prosperity and quality of life.

1.3 Scope of the Project

Weather forecasts are made by collecting as much data as possible about the current state of the atmosphere (particularly the temperature, humidity and wind) and using understanding of atmospheric processes (through meteorology) to determine how the atmosphere evolves in the future.

However, the chaotic nature of the atmosphere and incomplete understanding of the processes mean that forecasts become less accurate as the range of the forecast increases.

To develop software for forecasting the weather involving wind speed, cloud cover, rain or snow in order to nurture the needs of people all around the globe.

To develop a weather forecasting application on which people can completely rely for their weather updates. The scope for weather forecasting system will keep on increasing as the technology progresses.

1.4 Purpose of Weather Forecasting :

Weather forecasts are used for a variety of purposes. They are important for protecting lives and property by issuing weather warnings .

Forecasts based on temperature and precipitation are important to agriculture, and therefore to traders within commodity markets .

Weather forecasts are also used in aviation, shipping, and other transportation industries to ensure safe travel .

Additionally, weather forecasts are used by energy companies to predict demand for heating and cooling.

II. LITERATURE REVIEW

Mark Holmstrom, Dylan Liu, Christopher Vo (2016) concluded that both linear and functional regression di not perform as well as professional weather forecasting methods but in the longer run differences in their performances decreased, suggesting that over a longer period of time, Machine learning can indeed outperform professional and traditional methods. Linear regression is a low bias and high variance algorithm and hence its accuracy can be improved by collecting further data.

Sanyam Gupta, Indumathy, Govind Singhal (2016) suggested and proposed an efficient and accurate weather prediction and forecasting model using linear regression concepts and normal equation model. All these concepts area a part of machine learning. The normal equation is a very efficient weather prediction model and using the entities temperature, humidity and dew-point, it can be used to make reliable weather predictions. This model also facilitates decision making in day to day life. It can yield better results when applied **to cleaner and larger datasets.**

2.1 Overview of Weather Forecasting

Prediction is the application of technology to predict the action of the atmosphere for a given location. Weather It is becoming increasingly vital for business, agriculturists, farmers, disaster management and relatedorganizations to understand the natural phenomena. The art of weather prediction began with using the reoccurring astronomical and meteorological events to help them to monitor the seasonal changes in the weather. Throughout these centuries, this attempt is made to produce forecasts based on weather changes and personal

observations. Weather prediction has been one of the most interesting domains.

Weather forecasts are issued to protect life and property, save life and tell us what changes to except in the atmosphere. They provide vital information to a wide range of categories: agriculture, aviation, commerce, marine, advisories, etc. Forecasting can also significantly influence decision and policymaking, construction planning, productivity and environmental risk management. People can also know and be aware of atmospheric changes through variables such as temperature, wind speed and direction, cloudiness and precipitation.

2.2 Applications of Weather Forecasting

Agriculture : Weather forecasting apps can help farmers make informed decisions about planting, harvesting, and irrigation. They can provide information about temperature, precipitation, and soil moisture, which are important factors for crop growth

Aviation : Weather forecasting apps are used in aviation to ensure safe travel. Pilots use weather forecasts to plan their routes and avoid turbulence and other hazardous weather conditions .

Marine : Weather forecasting apps are used in marine transportation to ensure safe navigation. They provide information about wind speed, wave height, and sea surface temperature, which are important factors for marine safety .

Energy : Weather forecasting apps are used by energy companies to predict demand for heating and cooling. They provide information about temperature and humidity, which are important factors for energy consumption .

Emergency management : Weather forecasting apps are used by emergency management agencies to issue weather warnings and alerts. They provide information about severe weather conditions such as thunderstorms, tornadoes.

Tourism : Weather forecasting apps are used by tourists to plan their trips. They provide information about temperature, precipitation, and other weather conditions, which are important factors for outdoor activities .

Research : Weather forecasting apps are used by researchers to study weather patterns and climate change. They provide access to historical weather data and allow researchers to analyze weather patterns over time .

2.3 Problem Statement

To develop a weather forecasting app that provides accurate and up-to-date weather information to users. The app should include features such as current weather conditions, hourly and daily forecasts, radar and satellite maps, weather alerts, air quality information, UV index, sunrise and sunset times, and weather news.

The app should be user-friendly and customizable, allowing users to set their preferences for temperature units, notifications, and other features. The app should also be reliable and fast, providing users with real-time weather information.

The main challenge in developing such an app is obtaining accurate and up-to-date data, which requires a robust data collection and processing system.

Additionally, the app should be able to handle large amounts of data and provide accurate forecasts in real-time. Finally, the app should be designed to engage users and provide them with a positive user experience.

2.4 Challenges and Solutions in Weather Forecasting

Weather forecasting apps can face several challenges, including limited data availability, limited accuracy, limited computing power, limited user engagement, limited features, and limited resources .

To overcome these challenges, weather forecasting apps can incorporate features such as current weather conditions, hourly and daily forecasts, radar and satellite maps, weather alerts, air quality information, UV index, sunrise and sunset times, and weather news .

Additionally, weather forecasting apps can allow users to customize the app according to their preferences, such as choosing between Celsius and Fahrenheit or setting up notifications for severe weather alerts .

Weather forecasting faces several challenges, including limited data availability, limited accuracy, and limited computing power . To overcome these challenges, weather forecasting can incorporate technological advances such as automated weather stations and high-performance computing .

Additionally, weather forecasting can improve the data observation network, especially in developing countries .

III. SYSTEM REQUIREMENTS

3.1 Functional Requirements:

Functional requirements of weather forecasting are the requirements that describe the functionalities of the system elements.

These requirements may involve functional user requirements or functional system requirements.

For instance, the system should be able to produce minimum, maximum, and average data of a particular weather parameter when it is requested by an operator.

The system should provide the following weather parameters: temperature, pressure, wind speed & direction, rainfall, and humidity . The operator should be able to input the weather periods to the system to view the desired weather parameters within the periods .

Human input is still required to pick the best possible model to base the forecast upon, which involves pattern recognition skills, teleconnections, knowledge of model performance, and knowledge of model biases .

The system should also have non-functional requirements such as reliability, availability, security, and maintainability .

3.2 Non Functional Requirements:

Non-functional requirements of weather forecasting are the requirements that describe the system properties and constraints. These requirements are not directly related to the functionalities of the system but rather describe the standard of the objectives that the system should achieve.

The following are some of the non-functional requirements of weather forecasting :

Reliability: The system should be able to provide accurate

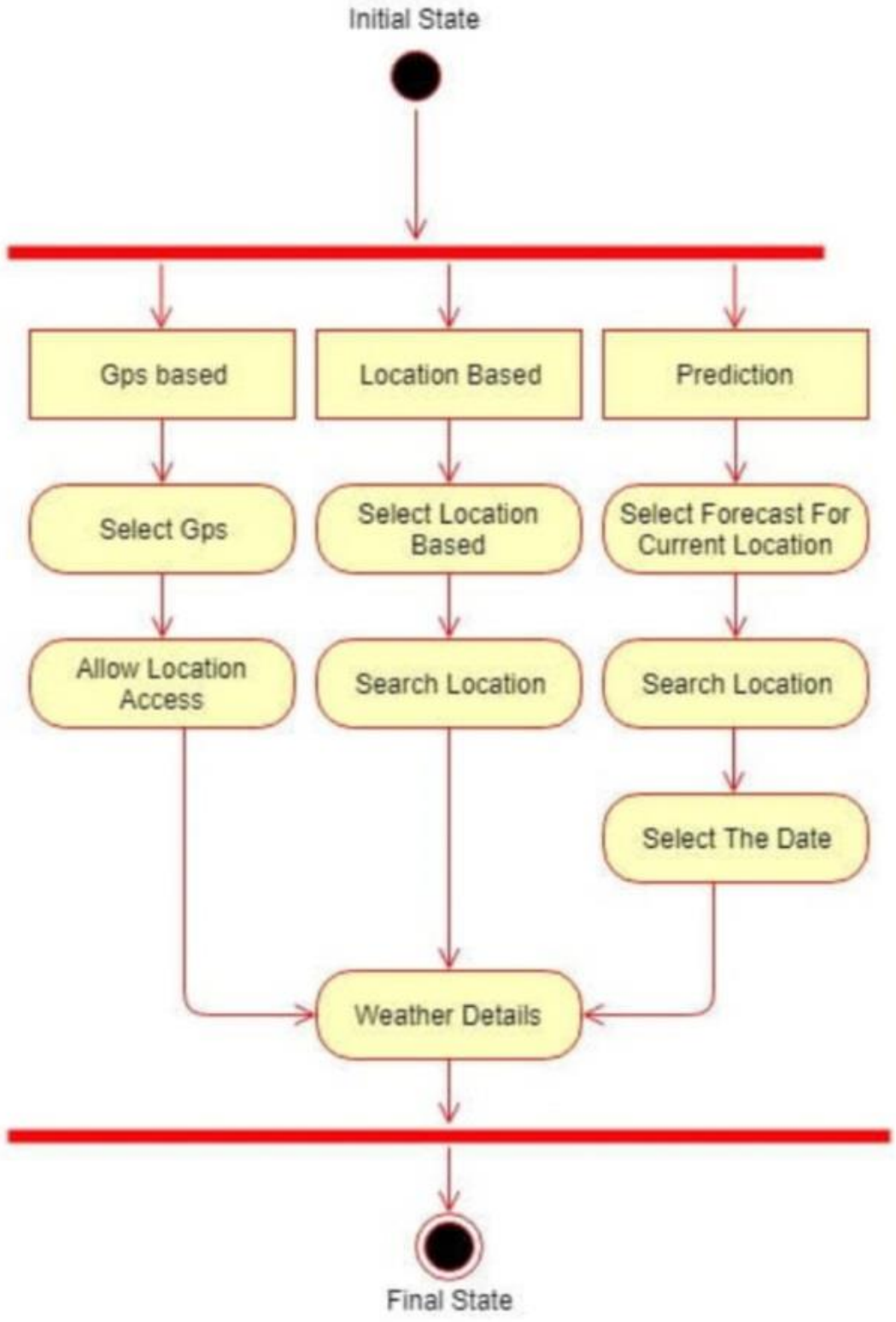
Weather forecasts with a high degree of reliability.

Availability: The system should be available to users at all times, with minimal downtime.

Security: The system should be secure and protect user data from unauthorized access.

Maintainability: The system should be easy to maintain and update, with minimal disruption to users

3.3 Workflow of Weather Forecasting:



IV. METHODOLOGY

4.1 Existing System:

Weather forecasting is the application of science and technology to predict the state of the atmosphere for a given location. Weather forecasts are made by collecting quantitative data about the current state of the atmosphere and using scientific understanding of atmospheric processes to project how the atmosphere will evolve. There are a variety of end users to weather forecasts. Weather warnings are important forecasts because they are used to protect life and property.

In ancient times, forecasting was mostly based on weather pattern observation. Over the years, the study of weather patterns has resulted in various techniques for rainfall forecasting. Present rainfall forecasting embodies a combination of computer models, interpretation, and an acquaintance of weather patterns. So, we created a web application to predict the weather in accuracy format to help user can get the weather detail.

4.2 Proposed System:

Weather report application is a web based application through which you will able to get all the reports related to weather forecasting of any locations. Its geographical locator which will be received through your browser setting and server configuration will automatically identify the location and able to present its weather details such as Temperature, Direction of Wind, Humidity etc.

To develop software for forecasting the weather involving Wind Speed, Cloud Cover, Rain or Snow in order to nurture the needs of any person around the world.

4.3 Module Description

4.3.1 Module 1: Interactive Web Application

An interactive website is essentially an internet page that uses different kinds of software to create a rich, interactive experience for the user. The Django framework and bootstrap present themes gives the web application a pleasant look to interact with, it provides a simple and yet sophisticated look to the user every time they into the web application.

4.3.2 Module 2: Location Based Prediction

Where the user will be naming the location for which he wants to know theweather updates. After entering the city name, this model gives the weather forecast for the city entered by the user by providing details like Date, Time Maximum Temperature, Minimum Temperature and picture describing rainfall or sunshine. It also predicts the future of weather in maximum and minimum temperature with accuracy.

The user can also view the same result in graphical representation module which the amount of rainfall in centimeters and the amount of sunshine in degrees.

4.3.3 Module 3: Graphical Representation

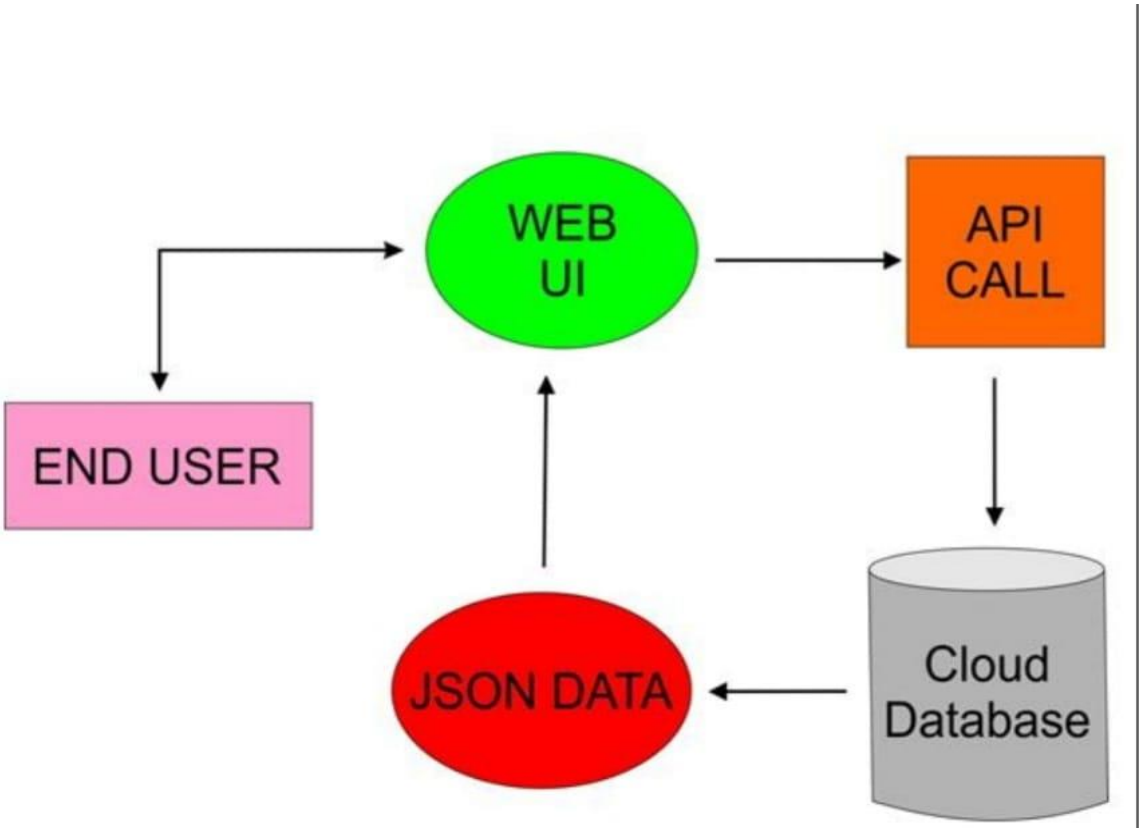
The application with a better user interface which is elegant and simple for better user experience. The application features color fulltheme like orange, gray etc. allocated for the title, topics and user greeting on the home page.

V. SYSTEM IMPLEMENTATION

5.1 Explanation of Data Flow

When the end user request the weather forecasting information from the web application and it will directly go the API call. API call is the process of a user application submitting a request to an API and that API retrieving the requested data from the external server or program and delivering it back to the client. After API call it will go to the cloud database in which all the weather data information are saved in a database.

From database it will go into JSON data. JSON data is an open standard file format and data interchange format that uses human-readable text to store and transmit data objects consisting of attribute value pairs and arrays. It is a common data format with diverse uses in electronic data interchange.



5.2 Programming Languages

5.2.1 HTML

The Hyper Text Markup Language or HTML is the standard markup language for documents designed to be displayed in a web browser. It can be assisted by technologies such as Cascading Style Sheets (CSS) and scripting languages such as JavaScript

HTML elements are the building blocks of HTML pages. With HTML constructs, images and other objects such as interactive forms may be embedded into the rendered page.

HTML provides a means to create structureddocuments by denoting structural semantics for text such as heading, paragraphs, lists, links, quotes and other items. HTML elements are delineatedby tags written using angle brackets.

Tags such as <img/> and <input/> directlyintroduce content into the page. Other tags such as <p> surround and provide information about document text and may include other tags as sub-elements.

Web browser receives HTML documents from a web server or from local storage and render the documents into multimedia web pages. HTML describesthe structure of a web page semantically and original included cues for the appearance of the documents.

HTML can embed programs written in a scripting language such as JavaScript, which affects the behavior and content of web pages. Inclusion of CSS defines the look and layout of content. The World wide Web consortium (W3C), former maintainer of the HTML and current maintainer of the CSS standards, has encouraged the use of CSS over explicit presentational HTML since 1997.

A form of HTML, known as HTML5, is used to displayed video andaudio, primarily using the <canvas> element, in collaboration with Java

5.2.2 CSS

Cascading **S**tyle **S**heets, fondly referred to as **CSS**, is a simply designed language intended to simplify the process of making web pages presentable. CSS allows you to apply styles to web pages.

More importantly, CSS enables you to do this independently of the HTML that makes up each web page. It describes how a webpage should look: it prescribes colours, fonts, spacing, and much more. In short, you can make your website look however you want. CSS lets developers and designers define how it behaves, including how elements are positioned in the browser.

While HTML uses tags, CSS uses rulesets. CSS is easy to learn and understand, but it provides powerful control over the presentation of an HTML document.

- **CSS saves time:** You can write CSS once and reuse the same sheet in multiple HTML pages.
- **Easy Maintenance:** To make a global change simply change the style, and all elements in all the webpages will be updated automatically.
- **Search Engines:** CSS is considered a clean coding technique, which means search engines won't have to struggle to "read" its content.
- **Superior styles to HTML:** CSS has a much wider array of attributes than HTML, so you can give a far better look to your HTML page in comparison to HTML attributes.
- **Offline Browsing:** CSS can store web applications locally with the help of an offline cache. Using this we can view offline websites.

5.2.3 Javascript

JavaScript is a light-weight object-oriented programming language which is used for several website for scripting the webpages. It is an interpreted full- fledged programming language that enables dynamic interactivity on website when applied to an HTML document.

It was introduced in the year 1995 for adding programs to the webpage in the Netscape Navigator browser. Since then, it has been adopted by all other graphical web browsers. With JavaScript,users can build modern web applications to interact directly without reloading the page every time. The traditional website uses js to provide serval forms of interactivity and simplicity.

Although, JavaScript has no connectivity with Java programming language. the name was suggested and provided in the times when Java was gaining popularity in the market. In addition to web browsers, databases such as

CouchDB and MongoDB uses JavaScript as their scripting and querylanguage.

SOURCE CODE:

HTML:

```
      <!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8">
    <title>Weather forecast</title>
    <link rel="stylesheet" href="style.css">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <script src="script.js" defer></script>
  </head>
  <body>
    <h1>Weather Dashboard</h1>
    <div class="container">
       <div class="current-info">

          <div class="date-container">
             <div class="time" id="time">
                12:30 <span id="am-pm">PM</span>
             </div>
             <div class="date" id="date">
                Monday, 25 May
             </div>
```

```
        </div>
    <div class="container">
      <div class="weather-input">
        <h3>Enter a City Name</h3>
        <input class="city-input" type="text" placeholder="E.g., New York,
London, Tokyo">
        <button class="search-btn">Search</button>
        <div class="separator"></div>
        <button class="location-btn">Use Current Location</button>

      </div>
      <div class="weather-data">
        <div class="current-weather">
          <div class="details">
            <h2>___ ( __ )</h2>
            <h6>Temperature: __°C</h6>
            <h6>Wind: __ M/S</h6>
            <h6>Humidity: __%</h6>
            <h6>Pressure:__hPa</h6>
          </div>
        </div>
        <div class="days-forecast">
          <h2>5-Day Forecast</h2>
          <ul class="weather-cards">
            <li class="card">
              <h3>( __ )</h3>
              <h6>Temp: __C</h6>
              <h6>Wind: __ M/S</h6>
```

```
  <h6>Humidity: __%</h6>
  <h6>Pressure:__hPa</h6>
  <h6>Description:__</h6>
</li>
<li class="card">
  <h3>( __ )</h3>
  <h6>Temp: __C</h6>
  <h6>Wind: __ M/S</h6>
  <h6>Humidity: __%</h6>
  <h6>Pressure:__hPa</h6>
  <h6>Description:__</h6>
</li>
<li class="card">
  <h3>( __ )</h3>
  <h6>Temp: __C</h6>
  <h6>Wind: __ M/S</h6>
  <h6>Humidity: __%</h6>
  <h6>Pressure:__hPa</h6>
  <h6>Description:__</h6>
</li>
<li class="card">
  <h3>( __ )</h3>
  <h6>Temp: __C</h6>
  <h6>Wind: __ M/S</h6>
  <h6>Humidity: __%</h6>
  <h6>Pressure:__hPa</h6>
  <h6>Description:__</h6>
</li>
```

```
          <li class="card">
            <h3>( __ )</h3>
            <h6>Temp: __C</h6>
            <h6>Wind: __ M/S</h6>
            <h6>Humidity: __%</h6>
            <h6>Pressure:__hPa</h6>
            <h6>Description:__</h6>
          </li>
        </ul>
      </div>
    </div>
  </div>

 </body>
</html>
```

CSS :

```
 /* Import Google font – Open Sans */
@import
url('https://fonts.googleapis.com/css2?family=Open+Sans:wght@400;500;600;
700&display=swap');
{
 Margin: 0;
 Padding: 0;
 Box-sizing: border-box;
 Font-family: 'Open Sans', sans-serif;
```

```
}
Body {
  Background: #e6eaee;
}
H1 {
  Background: #2d4adc;
  Font-size: 1.75rem;
  Text-align: center;
  Padding: 18px 0;
  Color: #f6f6f6;
}
.date-container{
  Font-size: 1.35rem;
  Font-weight: 600;
  Text-align: center;
  Border-radius: 4px;
  Margin: 10px 0 20px 0;
  Padding: 0 18px;
  Background: #2c52ed;
  Color: white;
}
.container {
  Display: flex;
  Gap: 35px;
  Padding: 30px;
}
.weather-input {
  Width: 550px;
```

```
}
.weather-input input {
  Height: 46px;
  Width: 100%;
  Outline: none;
  Font-size: 1.07rem;
  Padding: 0 17px;
  Margin: 10px 0 20px 0;
  Border-radius: 4px;
  Border: 1px solid #ccc;
}
.weather-input input:focus {
  Padding: 0 16px;
  Border: 2px solid #5372F0;
}
.weather-input .separator {
  Height: 1px;
  Width: 100%;
  Margin: 25px 0;
  Background: #BBBBBB;
  Display: flex;
  Align-items: center;
  Justify-content: center;
}
.weather-input .separator::before{
  Content: “or”;
  Color: #6C757D;
  Font-size: 1.18rem;
```

```
  Padding: 0 15px;
  Margin-top: -4px;
  Background: #E3F2FD;
}
.weather-input button {
  Width: 100%;
  Padding: 10px 0;
  Cursor: pointer;
  Outline: none;
  Border: none;
  Border-radius: 4px;
  Font-size: 1rem;
  Color: #fff;
  Background: #5372F0;
  Transition: 0.2s ease;
}
.weather-input .search-btn:hover {
  Background: #2c52ed;
}
.weather-input .location-btn {
  Background: #6C757D;
}
.weather-input .location-btn:hover {
  Background: #5c636a;
}
.weather-data {
  Width: 100%;
}
```

```
.weather-data .current-weather {
  Color: #fff;
  Background: #2d48c1;
  Border-radius: 5px;
  Padding: 20px 70px 20px 20px;
  Display: flex;
  Justify-content: space-between;
}
.current-weather h2 {
  Font-weight: 700;
  Font-size: 1.7rem;
}
.weather-data h6 {
  Margin-top: 12px;
  Font-size: 1rem;
  Font-weight: 500;
}
.current-weather .icon {
  Text-align: center;
}
.current-weather .icon img {
  Max-width: 120px;
  Margin-top: -15px;
}
.current-weather .icon h6 {
  Margin-top: -10px;
  Text-transform: capitalize;
```

```
}
.days-forecast h2 {
  Margin: 20px 0;
  Font-size: 1.5rem;
}
.days-forecast .weather-cards {
  Display: flex;
  Gap: 20px;
}
.weather-cards .card {
  Color: #fff;
  Padding: 18px 16px;
  List-style: none;
  Width: calc(100% / 5);
  Background: #6C757D;
  Border-radius: 5px;
}
.weather-cards .card h3 {
  Font-size: 1.3rem;
  Font-weight: 600;
}
.weather-cards .card img {
  Max-width: 70px;
  Margin: 5px 0 -12px 0;
}

@media (max-width: 1400px) {
  .weather-data .current-weather {
```

```
    Padding: 20px;
  }
  .weather-cards {
    Flex-wrap: wrap;
  }
  .weather-cards .card {
    Width: calc(100% / 4 – 15px);
  }
}
@media (max-width: 1200px) {
  .weather-cards .card {
    Width: calc(100% / 3 – 15px);
  }
}
@media (max-width: 950px) {
  .weather-input {
    Width: 450px;
  }
  .weather-cards .card {
    Width: calc(100% / 2 – 10px);
  }
}
@media (max-width: 750px) {
  H1 {
    Font-size: 1.45rem;
    Padding: 16px 0;
  }
```

```
  .container {
    Flex-wrap: wrap;
    Padding: 15px;
  }
  .weather-input {
    Width: 100%;
  }
  .weather-data h2 {
    Font-size: 1.35rem;
  }
}
```

Javascript :

```
 const cityInput = document.querySelector(".city-input");
const searchButton = document.querySelector(".search-btn");
const locationButton = document.querySelector(".location-btn");
const currentWeatherDiv = document.querySelector(".current-weather");
const weatherCardsDiv = document.querySelector(".weather-cards");
const timeEl = document.getElementById('time');
const dateEl = document.getElementById('date');
const timezone = document.getElementById('time-zone');
const countryEl = document.getElementById('country');

const API_KEY = "5f1a9773b38a2103c5e606577d124abc"; // API key for
OpenWeatherMap API
```

```
const days = ['Sunday', 'Monday', 'Tuesday', 'Wednesday', 'Thursday', 'Friday', 'Saturday']
const months = ['Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun', 'Jul', 'Aug', 'Sep', 'Oct', 'Nov', 'Dec'];

setInterval(() => {
    const time = new Date();
    const month = time.getMonth();
    const date = time.getDate();
    const day = time.getDay();
    const hour = time.getHours();
    const hoursIn12HrFormat = hour >= 13 ? hour %12: hour
    const minutes = time.getMinutes();
    const ampm = hour >=12 ? 'PM' : 'AM'

    timeEl.innerHTML = (hoursIn12HrFormat < 10? '0'+hoursIn12HrFormat : hoursIn12HrFormat) + ':' + (minutes < 10? '0'+minutes: minutes)+ ' ' + `<span id="am-pm">${ampm}</span>`

    dateEl.innerHTML = days[day] + ', ' + date+ ' ' + months[month]

}, 1000);

const createWeatherCard = (cityName, weatherItem, index) => {
    if(index === 0) { // HTML for the main weather card
        return `<div class="details">
                    <h2>${cityName} (${weatherItem.dt_txt.split(" ")[0]})</h2>
                    <h6>Temperature: ${(weatherItem.main.temp -
```

```
273.15).toFixed(2)}°C</h6>
                <h6>Wind: ${weatherItem.wind.speed} M/S</h6>
                <h6>Humidity: ${weatherItem.main.humidity}%</h6>
                <h6>Pressure: ${weatherItem.main.pressure} hPa</h6>
            </div>
            <div class="icon">
                <img
src="https://openweathermap.org/img/wn/${weatherItem.weather[0].icon}@4x
.png" alt="weather-icon">
                <h6>${weatherItem.weather[0].description}</h6>
            </div>`;
    } else { // HTML for the other five day forecast card
        return `<li class="card">
                <h3>(${weatherItem.dt_txt.split(" ")[0]})</h3>
                <img
src="https://openweathermap.org/img/wn/${weatherItem.weather[0].icon}@4x
.png" alt="weather-icon">
                <h6>Temp: ${(weatherItem.main.temp -
273.15).toFixed(2)}°C</h6>
                <h6>Wind: ${weatherItem.wind.speed} M/S</h6>
                <h6>Humidity: ${weatherItem.main.humidity}%</h6>
                <h6>Pressure: ${weatherItem.main.pressure}hPa</h6>
                <h6>Description: ${weatherItem.weather[0].description}</h6>
            </li>`;
    }
}
```

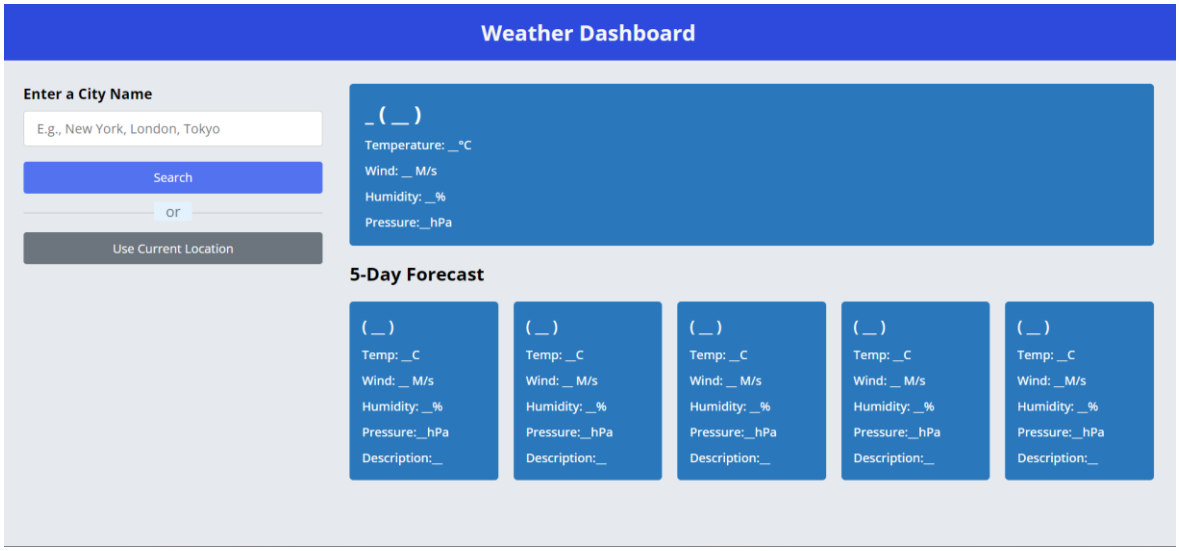
```
const getWeatherDetails = (cityName, latitude, longitude) => {
    const WEATHER_API_URL =
`https://api.openweathermap.org/data/2.5/forecast?lat=${latitude}&lon=${long
itude}&appid=${API_KEY}`;

    fetch(WEATHER_API_URL).then(response => response.json()).then(data
=> {
        // Filter the forecasts to get only one forecast per day
        const uniqueForecastDays = [];
        const fiveDaysForecast = data.list.filter(forecast => {
            const forecastDate = new Date(forecast.dt_txt).getDate();
            if (!uniqueForecastDays.includes(forecastDate)) {
                return uniqueForecastDays.push(forecastDate);
            }
        });


        // Clearing previous weather data
        cityInput.value = "";
        currentWeatherDiv.innerHTML = "";
        weatherCardsDiv.innerHTML = "";

        // Creating weather cards and adding them to the DOM
        FiveDaysForecast.forEach((weatherItem, index) => {
            const html = createWeatherCard(cityName, weatherItem, index);
            if (index === 0) {
                currentWeatherDiv.insertAdjacentHTML("beforeend", html);
            } else {
```

```
            weatherCardsDiv.insertAdjacentHTML("beforeend", html);
          }
        });
    }).catch(() => {
        alert("An error occurred while fetching the weather forecast!");
    });
}


const getCityCoordinates = () => {
    const cityName = cityInput.value.trim();
    if (cityName === "") return;
    const API_URL =
`https://api.openweathermap.org/geo/1.0/direct?q=${cityName}&limit=1&appi
d=${API_KEY}`;


    // Get entered city coordinates (latitude, longitude, and name) from the API
response
    fetch(API_URL).then(response => response.json()).then(data => {
        if (!data.length) return alert(`No coordinates found for ${cityName}`);
        const { lat, lon, name } = data[0];
        getWeatherDetails(name, lat, lon);
    }).catch(() => {
        alert("An error occurred while fetching the coordinates!");
    });
}
const getUserCoordinates = () => {
```

```
    navigator.geolocation.getCurrentPosition(
        position => {
            const { latitude, longitude } = position.coords; // Get coordinates of
user location
            // Get city name from coordinates using reverse geocoding API
            const API_URL =
`https://api.openweathermap.org/geo/1.0/reverse?lat=${latitude}&lon=${longit
ude}&limit=1&appid=${API_KEY}`;
            fetch(API_URL).then(response => response.json()).then(data => {
                const { name } = data[0];
                getWeatherDetails(name, latitude, longitude);
            }).catch(() => {
                alert("An error occurred while fetching the city name!");
            });
        },
        error => { // Show alert if user denied the location permission
            if (error.code === error.PERMISSION_DENIED) {
                alert("Geolocatio
n request denied. Please reset location permission to grant access again.");
            } else {
                alert("Geolocation request error. Please reset location permission.");
            }
        });
}
locationButton.addEventListener("click", getUserCoordinates);
searchButton.addEventListener("click", getCityCoordinates);
cityInput.addEventListener("keyup", e => e.key === "Enter" &&
getCityCoordinates());
```

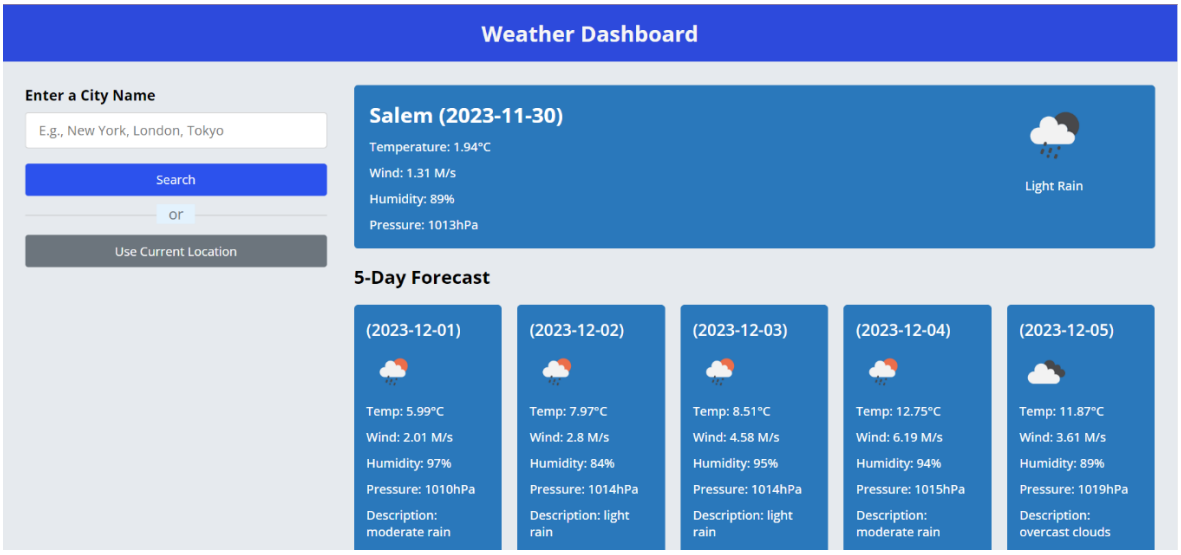
VI. RESULT AND PERFORMANCE ANALYSIS

Home page:



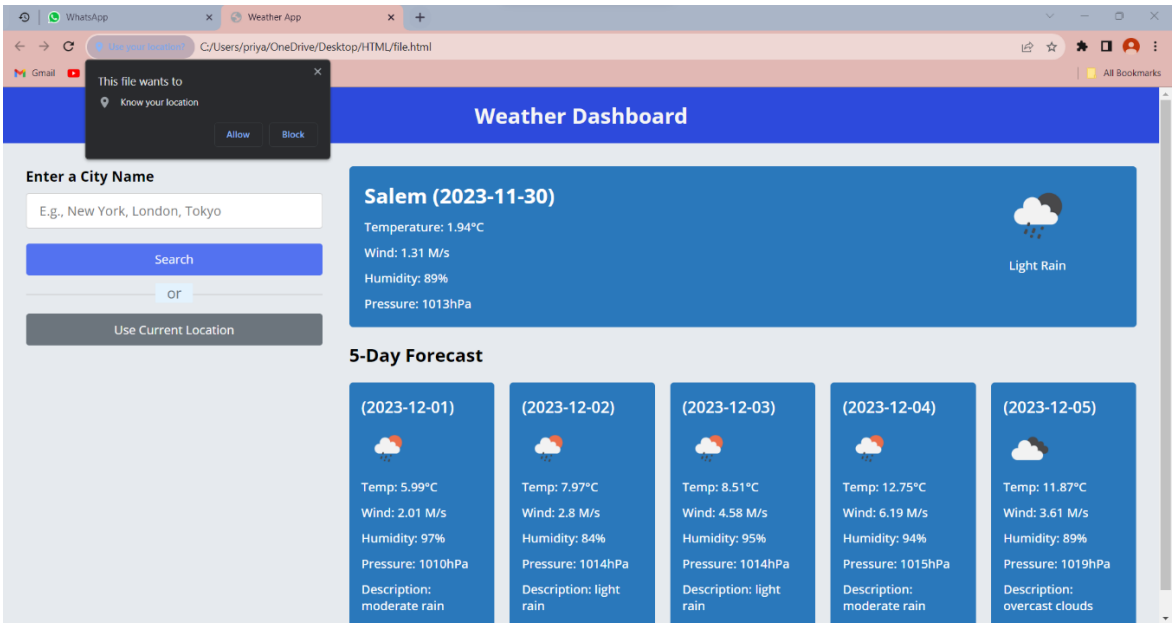
This is the homepage of weather forecasting. This page contains no Information as shown in the figure.

Result page 1:

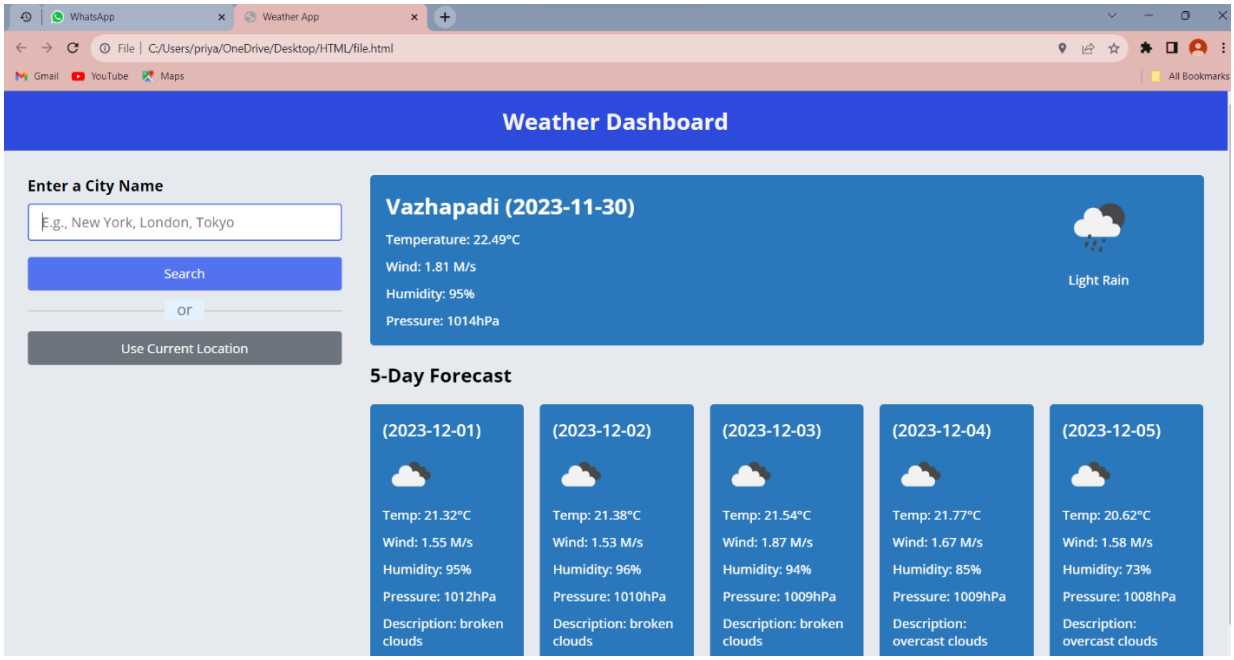


When you enter the city name and find weather forecast it will show the accurate weather forecasting information of your city. It will also show you temperature, description, cloud precipitation, wind speed, humidity and sunshine. It will give you accurate weather predicitons for five days

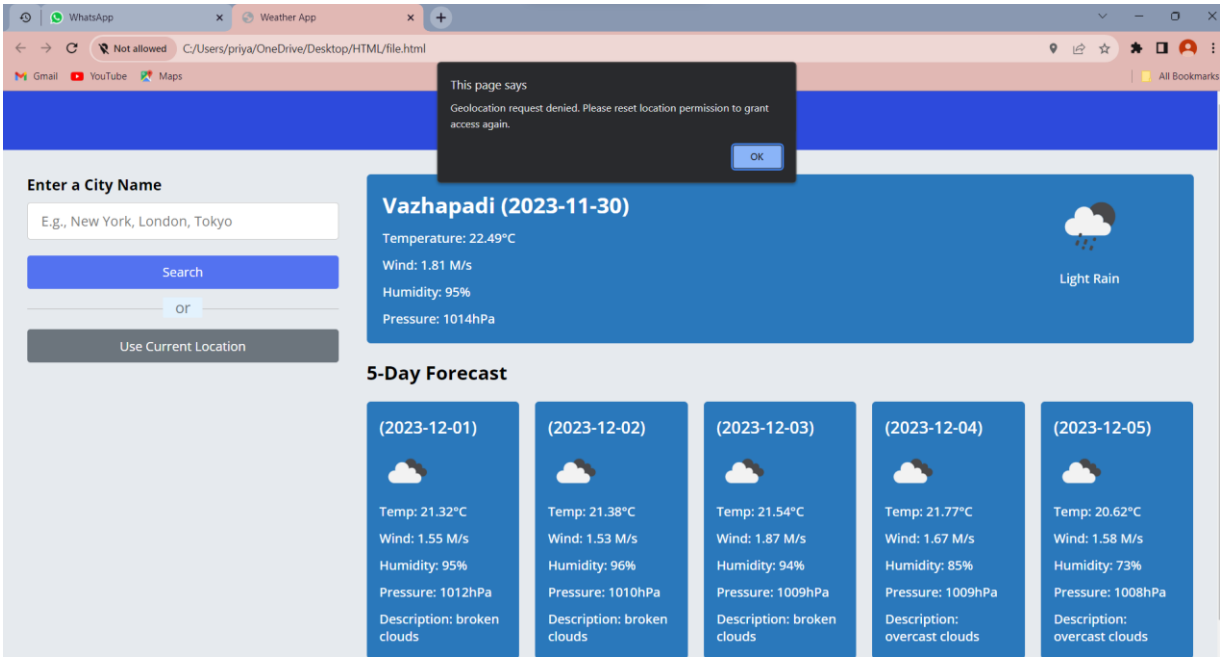
Result page 2:



You can able to use the location also. When the user allows to access the location permission the result is given below



If the user denies to access the location permission the result is given below.



VII. CONCLUSION

In the era of the global warming, research in weather measurement, monitoring and forecasting are become more and more relevant.

This research demonstrates the design and implementation of an affordable mini weather monitoring system that ensures flexibility, portability, scability and user friendly operations which can provide data of some weather variables including temperature, humidity and pressure.

With the advacement of technology weather forecasting has developed to its level best, but there is yet to develop, as far as a nature is so unpredictable.

Weather forecasts are increasingly accurate and useful, and their benefits extend widely across the economy.

While much has been accomplished in improving weather forecasts, there remains much room for improvement.

Simultaneously, they are developing new technologies and observational netwoeks that can enchance forecaster skill and the value of their services to their use

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IX. FUTURE ENHANCEMENTS

- The website we created in this project can be futher developed into a mobile
- application so that it can give timely weather updates.
- These updates will be received in the form of notification in the user's mobile based on the location they are present in.
- So the users don't even have to get into that particular application to know the weather and it saves their valuable time.