Real Time Weather Forecast

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***Abstract*— In today's dynamic environment, access to accurate and timely weather information is crucial for various sectors, including agriculture, transportation, emergency management, and outdoor activities. The abstract proposes the development of a real-time weather forecast system aimed at providing users with up-to-the-minute weather updates and predictions. Leveraging advanced meteorological data, predictive modelling techniques, and integration with weather APIs, the system aims to deliver reliable weather forecasts through a user-friendly web interface. Key components include data acquisition and integration from multiple sources, predictive modelling utilizing machine learning algorithms, user interface design for intuitive interaction, and integration with external systems for enhanced data interoperability. The project's scope encompasses the development of scalable and performance-optimized solutions, ensuring accuracy, reliability, and responsiveness in delivering weather information to users. Through seamless integration with climate APIs and robust implementation of software and hardware requirements, the actual-time weather forecast device objectives to empower individuals and corporations with actionable insights for climate-based selection-making.**

Keywords— Weather API, Web Interface, Real time weather forecast, Meteorological data

1. INTRODUCTION

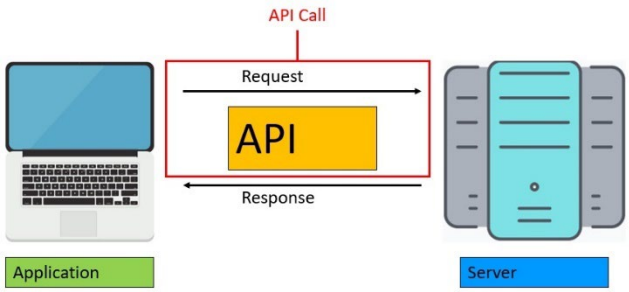
In order to produce precise and timely forecasts, researchers and meteorologists constantly work to overcome a number of obstacles in real-time weather forecasting. Among these difficulties are:

Complexity of Atmospheric Processes:[1] Weather patterns are influenced by a multitude of interacting factors within the atmosphere, which is a dynamic and complex system. Accurately predicting the interaction of these variables can be difficult, particularly when dealing with phenomena like tornadoes, hurricanes, and thunderstorms.

Designing user interface:[2] Designing a user interface that user can check the temperature, moisture, humidity, cloud and wind speed of current location and the desired location thar user want. This is a vital step because it shall we customers interact with the software and get the records they require. This section will have a look at the stairs involved in growing the Open Weather API net application's person interface and cross over each one in element.

In this web application we are using three Application Programming Interface (API). The first API is open weather API which tell the current temperature, moisture, humidity, wind speed, cloud. The second API is flag API of the country which display the flag of the searched location lie in which country. The third API is open weather API which tell about the climate by showing different type of cloud for example if there is rainy outside then it will display the rainy cloud and if there is lightning then it will show the thunderstorm picture.

Making an API request: [3] API request means connecting to the server which has vast amount of current data which tell the real time information about the request. When user enter the location of the city the API fetch the information of that city for example when we enter the location of city Chandigarh it will tell the current temperature, humidity, cloud, wind speed of the city.



Parsing JSON reaction: [4] Parsing JSON (Java Script Object Notation) mean converting JSON data into data structure manner. When the data come from the API it is in JSON format which is hard to understand by the user so parsing help to convert that complex structure in user friendly manner so that user can understand easily. In this web application we are fetching the API request through java script language. Java script handle the API request in efficient manner so chances error is very less and it is less likely to fail to fetch data.

In this we application we are using the HTML (Hyper Text Markup Language) and CSS (Cascading Style Sheet) and CSS framework like tailwind to design the website. Which

help in making user friendly interface.

Location Access: [5] In this web application the user has the preference to see their current location weather through GPS or user can manually enter the any city name across the globe and it also tell the which country the city belong to by showing the flag of the country.

When user click on grant access the location permission will be asked by the browser when user give the permission it will tell display the current data of that location.

2. LITERATURE SURVEY

The field of net development has shown a extraordinary deal of interest in the development of real-time climate forecasting. Ten research papers that advance our understanding of real-time weather forecasting and its connection to internet development are highlighted on this review of the literature:

Jaseena and B.C. Kumar (2022) [5]. Their research on the application of intelligent predictors to improve weather forecast accuracy was published in the King Saud University - Computer and Information Sciences Journal.

Abhishek and M. S. Kumar (2012) [6] proposed an artificial neural network-based weather forecasting model. Their study, which was published in Procedia Technology, investigates how artificial neural networks might be used to predict the weather with the goal of increasing forecast accuracy.

Choudhary, V., & Taruna, S. (2021) [7] At the International Conference on Computing, Communication, and Intelligent Systems (ICCCIS), the paper about frequency analysis ends up offered. Their artwork focused on developing a frequency evaluation-primarily based intrusion detection method for WSNs.

Fathi and M.H. (2021) [8] conducted a Comprehensive Analysis of Big Data Analytics for Weather Prediction. Their study, focuses on using big data analytics to improve the precision and effectiveness of weather forecasts.

Choudhary and S. (2018) [9] The International Conference on Advanced Informatics for Computing Research featured the Key Management Protocol for Wireless Sensor Networks. They mainly work on the sensors with the help of IOT.

Singh and S. A. (2019) [10] They have used the machine learning model to predict the future weather of the city they used the data set of the previous 30 year to train the model which has the accuracy of 88 percent to predict the future weather of the city. In this model they have used the linear regression, decision tree and random forest model to predict the weather.

Vishal, S. (2020) [9] In this paper they have used the various sensor and IOT devices to know the pressure and humidity of that location which help them to predict the weather of that location.

In 2020 [11], Vishal Choudhary and S. T. They have used the various mathematic and statistic techniques to predict the weather through cryptography and latest technology and their goal is to use the polynomial.

Vishal Choudhary and S. T. (2016) [11] In this paper they have used the wireless sensor and various IOT devices to know the weather of the current location. Wireless sensor has the high security and data is more secure then other sensors.

Together, these nine research papers expand our understanding of real-time weather forecasting and how it relates to web development. They also offer important insights into how to enhance the security, dependability, and accuracy of weather information delivered via online platforms.

3. METHODS & MATERIALS

Project Planning and Scope definition:
The endeavor began with an escalated making arrangements segment to characterize the degree, goals, and expectations. This concerned directing partner meetings to gain necessities, select key capacities, and set up mission timetables. The extension became depicted to envelop the improvement of a café saving site using HTML, CSS, and JavaScript, that have practical experience in buyer driven format ideas and solid backend usefulness.

Frontend Development:
Use HTML, CSS, and JavaScript to design and create the user interface. Users will be able to see the current weather forecast through this interface. Build the backend infrastructure to manage API requests, handle data processing, and provide predictions to the front end. This is known as backend development. Database Setup: Create a database to hold user preferences and historical weather information.

Integration of Control Systems:
Weather APIs can be integrated into the system to retrieve current weather information in real time. This could entail making asynchronous API calls from the frontend or backend using JavaScript. Error Handling: Put error handling procedures in place to address problems like inconsistent data or outages in the API.

Configuring Connectivity:
Online Hosting: Set up the website on a web server or hosting platform. Users will be able to access the application through the internet as a result. Domain Setup: Make sure the deployed application is pointed to in the domain settings.

Examining and Assessing:
Unit testing: Examine each system component separately to make sure it operates as intended. Testing the integration of front-end and back-end components with external APIs is known as integration testing. User testing: Get input from

users to find problems with usability and potential areas for development. Performance testing: Assess the system's functionality under various loads and circumstances.

Record-keeping:
Technical documentation: For future reference, record the data flows, APIs, and system architecture. User documentation: Write user manuals or guides to assist users in navigating and comprehending the features of the application.

Frameworks:
In this website we have used the various framework like tailwind CSS and jquery in java script.

Third party services:
Third-birthday celebration offerings including geolocation APIs, fee gateways, and electronic mail notification systems had been included into the website to enhance its capability and streamline the reservation procedure. This concerned configuring API endpoints, handling authentication, and implementing errors dealing with mechanisms to make sure seamless communication among the website and outside services.

Deployment and hosting:
This website has been pushed on GitHub and deployed through third party site Vercel where it has it own link which can access able to anyone through link.

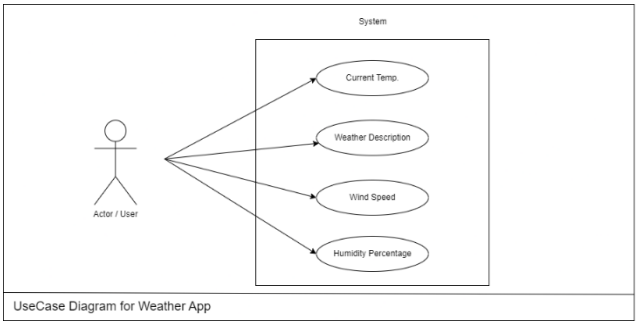


Fig1. User interaction

Flowchart: -

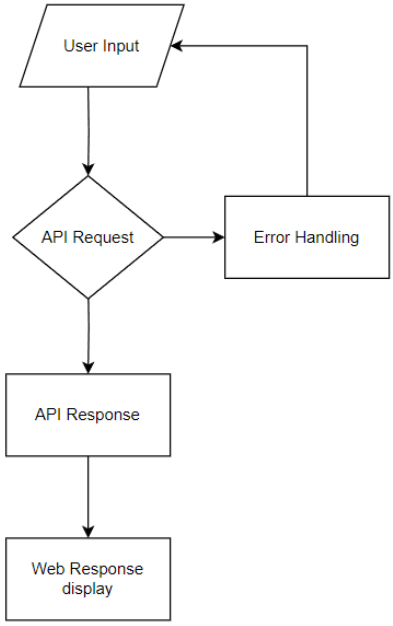


Fig2. flowchart

4.WORKFLOW

a) Literature Search and Review: We have used the many literatures and reviewed them on every filed through which weather prediction made such as through website, Apps, Machine learning and API calls.

b) Navigation and UI Design: Made user friendly UI so that user can easily interact with the website. author used framework such as tailwind which provide best design to the website. The format and float of the software are designed to offer an intuitive and person-pleasant interface. The design must facilitate brief and efficient get entry to the desired statistics.

c) Implementation: This degree is pivotal for ensuring a excessive first-class patron experience. The layout and go with the flow of the software are designed to provide an intuitive and man or woman-nice interface. The design should be user friendly that is understandable by the user.

d) Testing and Debugging: Comprehensive trying out is carried out in this very last level to make sure the software features efficaciously and gives accurate climate data. Any issues or errors are recognized and resolved for the duration of checking out, making sure the utility meets excellent requirements.

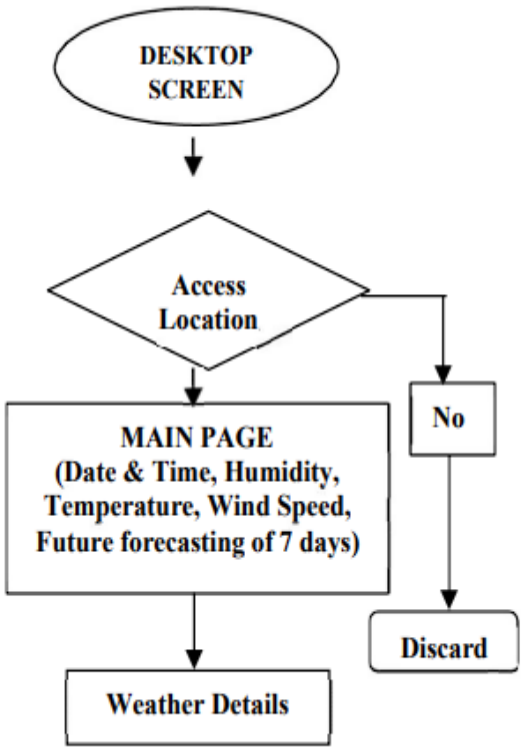


Fig.3 Web page flowchart

```
index.js > fetchUserWeatherInfo
const userTab = document.querySelector("[data-userWeather]");
const searchTab = document.querySelector("[data-searchWeather]");
const userContainer = document.querySelector(".weather-container");

const grantAccessContainer = document.querySelector(".grant-location-container");
const searchForm = document.querySelector("[data-searchForm]");
const loadingScreen = document.querySelector(".loading-container");
const userInfoContainer = document.querySelector(".user-info-container");


let oldTab = userTab;
const API_KEY = "d1845658f92b31c64bd94f06f7188c9c";
oldTab.classList.add("current-tab");
getfromSessionStorage();

function switchTab(newTab) {
    if(newTab != oldTab) {
        oldTab.classList.remove("current-tab");
        oldTab = newTab;
        oldTab.classList.add("current-tab");

        if(!searchForm.classList.contains("active")) {
            userInfoContainer.classList.remove("active");
            grantAccessContainer.classList.remove("active");
            searchForm.classList.add("active");
        }
        else {
            searchForm.classList.remove("active");
            userInfoContainer.classList.remove("active");
            getfromSessionStorage();
        }
    }
}
```

Fig4. Java script code (a)

```
async function fetchUserWeatherInfo(coordinates) {
    const {lat, lon} = coordinates;
    grantAccessContainer.classList.remove("active");
    loadingScreen.classList.add("active");

    try {
        const response = await fetch(
            `https://api.openweathermap.org/data/2.5/weather?lat=${lat}&lon=${lon}&appid=${API_KEY}&units=metric`
        );
        const  data = await response.json();

        loadingScreen.classList.remove("active");
        userInfoContainer.classList.add("active");
        renderWeatherInfo(data);
    }
    catch(err) {
        loadingScreen.classList.remove("active");
    }
}
```

Fig5. Java script code (b)

```
    console.log(weatherInfo);
    cityName.innerText = weatherInfo?.name;
    countryIcon.src = `https://flagcdn.com/144x108/${weatherInfo?.sys?.country.toLowerCase()}.png`;
    desc.innerText = weatherInfo?.weather?.[0]?.description;
    weatherIcon.src = `http://openweathermap.org/img/w/${weatherInfo?.weather?.[0]?.icon}.png`;
    temp.innerText = `${weatherInfo?.main?.temp} °C`;
    windspeed.innerText = `${weatherInfo?.wind?.speed} m/s`;
    humidity.innerText = `${weatherInfo?.main?.humidity}%`;
    cloudiness.innerText = `${weatherInfo?.clouds?.all}%`;
}

function getlocation() {
    if(navigator.geolocation) {
        navigator.geolocation.getCurrentPosition(showPosition);
    }
}
```

Fig6. Java script code (c)

```
async function fetchSearchWeatherInfo(city) {
    loadingScreen.classList.add("active");
    userInfoContainer.classList.remove("active");
    grantAccessContainer.classList.remove("active");

    try {
        const response = await fetch(
            `https://api.openweathermap.org/data/2.5/weather?q=${city}&appid=${API_KEY}&units=metric`
        );
        const data = await response.json();
        loadingScreen.classList.remove("active");
        userInfoContainer.classList.add("active");
        renderWeatherInfo(data);
    }
    catch(err) {
        loadingScreen.classList.remove("active");
    }
}
```

Fig7. Java script code (d)

5. RESULTS AND OUTPUT

Accurate Weather Information: Users have got proper of access to trendy-day, unique climate records for any given place in the international, which incorporates their private. The tool retrieves cutting-edge meteorological records, which encompass temperature, humidity, wind tempo, and precipitation, from the Open Weather API.

User friendly interface: The weather forecast can be easily accessed and interacted with by users thanks to the web application's user-friendly interface. It might have simple controls for looking up locations, switching between different temperature units (like Celsius and Fahrenheit), and seeing more information about the weather.

Responsive design: The system is made to be as responsive as possible, guaranteeing top functionality and usability on a range of screens and devices. Users don't experience any loss of functionality when accessing the weather forecast on a desktop computer, tablet, or smartphone.

Dynamic Updates: As weather conditions change, the forecast is updated continuously in real-time to reflect those changes. The system offers up-to-date information, so users can make well-informed decisions regarding outdoor activities, travel arrangements, and daily routines.

Customization Options: To accommodate individual preferences, the system might provide options for customizing the weather forecast experience. Users might be able to customize the interface's look, set favorite locations, and receive weather alerts for particular conditions.

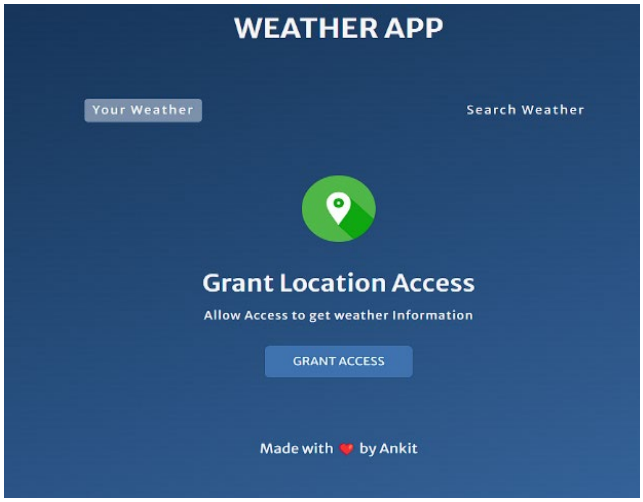


Fig8. Landing page website

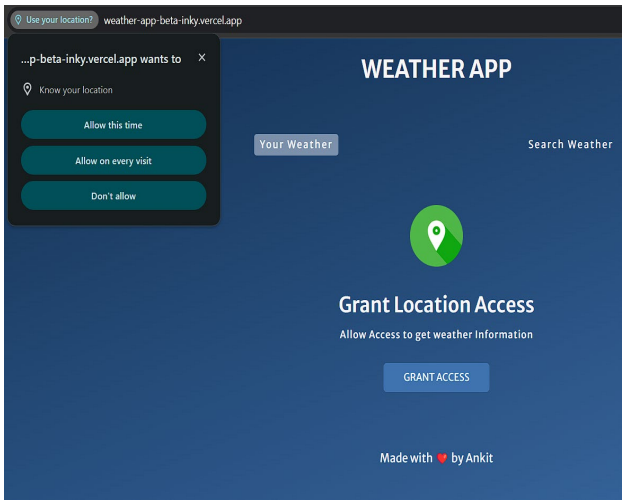


Fig9. Getting location of user

Fig8. Current location data

Fig9. Weather of manually enter city

6. CONCLUSION & FUTURE WORK

In conclusion, the author has used the web application that is made through HTML, CSS, JavaScript and also used various framework such as tailwind CSS and jquery.

In this project author has used three API through JSON parsing in JavaScript. The API are open weather API and country flag API. The open weather API talk about the temperature, humidity, cloud and wind speed of the current location. The second API is about the flag of the country in which that city belongs. The third API is about the cloud image which give the image of the cloud like rainy and thunder etc.

Improved User Experience: Adding new features and improving the user interface further could improve the user experience as a whole. Interactive maps, analyses of historical weather data, tailored suggestions, and social sharing features are a few examples of this.

Localization and Multilingual Support: Expanding the user base and enhancing accessibility would be possible by incorporating localization features that support various languages and regional preferences.

Advanced Forecasting Algorithms: Research into machine learning and other advanced forecasting techniques could increase the precision and dependability of weather forecasts, particularly for long-range and extreme weather events.

Ensuring adherence to accessibility guidelines (such as WCAG) in order to provide an inclusive experience for all users and accommodate those with disabilities is known as accessibility compliance

Performance optimization is the process of continuously

enhancing system performance, particularly for users with older or less bandwidth-capable devices, in order to minimize loading times, maximize resource utilization, and improve overall system efficiency.

In future the author will integrate the machine learning model for the future prediction of the weather so next few month result can be predicted. Various machine learning model are used like decision tree and random forest etc.

7. ACKNOWLEDGMENT

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This research has been a collective effort, and we are grateful to all those who have played a role, however large or small, in making this project a reality.

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