PROJECT REPORT

ON

WEATHER MASTERS

Submitted in partial fulfillment of the requirements for the award of the degree of

DIPLOMA

IN

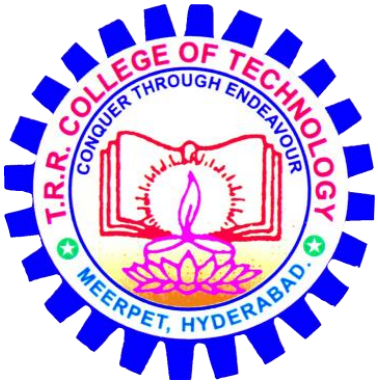
COMPUTER SCIENCE ENGINEERING

BY

D.SRI SIMHA CHARAN 21124-CS-063

Under the Guidance of

ASMA MASROOR MCA



T.R.R COLLEGE OF TECHNOLOGY

(POLYTECHNIC)

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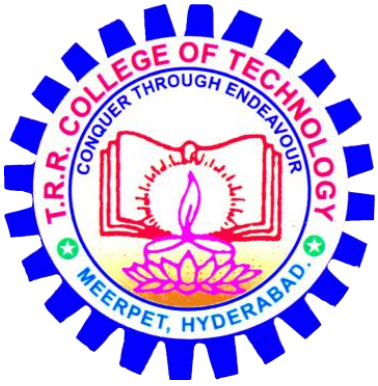

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ACKNOWLEDGEMENT

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ABSTRACT

ABSTRACT

The presented Flask-based web application, named "Weather Masters," offers users functionalities related to weather forecasting, account management, and data visualization. Users can sign up for accounts, log in securely, and retrieve forgotten passwords through email verification. The application utilizes SQLite for database management and incorporates SMTP for email functionalities.

Upon registration, users receive a one-time password (OTP) via email for verification. Password reset functionality is also provided, where users can request a password reset link sent to their registered email addresses. Additionally, the application includes various weather options such as weather data visualization through interactive charts, news updates, and air quality index (AQI) monitoring.

Users can gain insights into weather patterns through visual representations like pie charts and bar charts, stay informed about the latest weather-related news and alerts, and monitor air quality levels in their area. These features enhance the user experience by providing comprehensive weather-related services within a single platform.

INTRODUCTION

INTRODUCTION

In an era where weather plays a crucial role in daily activities, having access to accurate and timely weather information is paramount. "Weather Masters" is a Flask-based web application designed to fulfil this need by providing users with a comprehensive platform for accessing weather forecasts, managing accounts securely, and visualizing weather data effectively. With functionalities ranging from user authentication to data visualization and news updates, "Weather Masters" aims to offer a seamless and informative experience to its users.

This innovative application not only allows users to register and log in securely but also provides features such as password recovery through email verification and one-time password (OTP) authentication. Additionally, "Weather Masters" offers various weather options, including interactive charts for visualizing weather data trends, real-time news updates on weather-related events, and monitoring of air quality through the air quality index (AQI) information. These features empower users to make informed decisions, plan their activities, and stay updated on weather conditions in their area.

With a user-friendly interface and robust functionalities, "Weather Masters" strives to become the go-to platform for individuals seeking reliable weather forecasts, comprehensive data visualization, and timely news updates. This introduction sets the stage for exploring the various features and capabilities of "Weather Masters" in detail.

MODULE DESCRIPTION

MODULE DESCRIPTION

AUTHENTICATION MODULE: This module handles user authentication processes, including user registration, login, and password recovery. It ensures secure access to the application by implementing encryption techniques and email verification for account creation and password reset.

DATABASEMANAGEMENTMODULE: Responsible for managing the application's database using SQLite, this module facilitates storing and retrieving user information such as usernames, passwords, and email addresses. It ensures data integrity and provides seamless integration with other modules.

WEATHERDATAFETCHINGMODULE: This module is responsible for retrieving weather data from external APIs or sources. It interacts with weather data providers to fetch real-time weather forecasts, historical weather data, and other relevant information. The fetched data is then processed and stored in the application's database for access by other modules.

GEOLOCATONMODULE: Facilitates geolocation functionality within the application, allowing users to specify their location or retrieve weather information for specific geographical areas. This module may utilize geocoding APIs to convert user-provided addresses or coordinates into geographical data that can be used to fetch weather data accurately.

EMAIL FUNCTIONALITY MODULE: Integrates SMTP (Simple Mail Transfer Protocol) for sending verification emails and password reset links to users.

Weather DATA VISUALIZATION MODULE: Utilizes interactive chart libraries visualize weather data trends, including temperature variations, precipitation levels, wind speeds, and more. Users can access graphical representations such as pie charts and bar charts to gain insights into weather patterns.

NEWS UPDATES MODULE: This module aggregates and presents real-time weather-related news and alerts from trusted sources. It keeps users informed about significant weather events, forecasts, and advisories, enhancing their awareness and preparedness.

AIR QUALITY INDEX (AQI) MONITORING MODULE: Integrates AQI data from reliable sources to provide users with information on air quality levels in their area. This module offers real-time monitoring of pollutant concentrations and helps users make informed decisions regarding outdoor activities and health precautions.

DASHBOARD INTEGRATION MODULE: Enables users to customize their dashboard with personalized weather preferences, saved locations, and notifications. This module enhances user engagement by providing a centralized hub for accessing weather-related features and functionalities.

WEB ROUTING AND RENDERING MODULE: Handles routing requests from users' web browsers to the appropriate endpoints within the application. It renders HTML templates dynamically, incorporating data from the database and other modules to generate dynamic webpage.

FEASIBILITY STUDY

FEASIBILITY STUDY

A FEASIBILITY STUDY is an analysis used in measuring the ability and likelihood to complete a project successfully including all relevant factors. It must account for factors that affect it such as economic, technological, legal and scheduling factors. Project managers use feasibility studies to determine potential positive and negative outcomes of a project before investing a considerable amount of time and money into it. Feasibility studies allow companies to determine and organize all the details to make a business work. A feasibility study helps in identify logistical problems, and nearly all business-related problems and their solutions. Feasibility studies can also lead to the development of marketing strategies that convince investors or a bank that investing in business is a wise choice.

Feasibility studies should be undertaken any time that a completely new project, process is being used, or business is being built. The document provides feasibility of the project that is being designed and lists various areas that were considered very carefully during the feasibility study of this project such as Technical, Economical and Operational feasibilities.

TYPES OF FEASIBILITY:

1. TECHNICAL FEASIBILITY:

To undertake the project. The essential questions that help in testing the technical feasibility assesses the current resources (such as software and hardware) and technology, which are required to accomplish user requirements in the software within the allocated time and budget .For this, the project team ascertains whether the current resources and technology can be upgraded or added in the project to accomplish specified user required. Determines whether the relevant technology is stable and established. Determines does the company have the technological resources.

Feasibility of a system includes the following:

- Does the technology exist at all?
- Is it available within given resource constraints?
- Is it a practical proposition?
- Manpower- programmers, testers & debuggers
- Software and hardware
- Are the current technical resources sufficient for the new system?
- Can they be upgraded to provide to provide the level of technology necessary for the new system?
- Can the technology be easily applied to current problems?
- Does the technology have the capacity to handle the solution?
- Do we currently possess the necessary technology?

2. ECONOMICALFEASIBILITY:

The economic feasibility study is more commonly called as cost/benefit analysis. Economic feasibility determines whether the project is capable of generating financial gains. It involves the cost incurred on the project, cost of performing feasibility study, and so on. In addition, it is necessary to consider the benefits that can be achieved by developing the project. It is used to determine the financial resources of the project. It measures all costs incurred in development of new system. It determines total cost for development of new system and benefits derived from new system possible questions raised in economic feasibility are following:

- Is the system cost effective?
- Do benefits outweigh costs?
- The cost of doing full system study
- The cost of business employee time
- Estimated cost of software/software development

- Is the project possible, given the resource constraints?
- What are the savings that will result from the system?

3. OPERATIONALFEASIBILITY:

Operational feasibility is measure of, how well the solution will work in organization. It is also the measure of, what people feel about the project/system. It is used for identify the importance of certain problem in the project and how it is to be solved. The essential questions that help in testing the operational feasibility of a system include the following:

- If the system is developed, will it Does management support the project?
- Does current mode provide end users and managers with timely, pertinent, accurate and useful formatted information?
- Does current mode of operation provide cost-effective information services to the business?
- Could there be a reduction in cost and or an increase in benefits?
- Does current mode of operation make maximum use of available resources, including people, time, and flow of forms?
- Does current mode of operation provide reliable services?
- Will it reduce the time (operation) considerably?
- Have the users been involved in the planning and development of the project?
- Will the proposed system really benefit the organization?
- Does the overall response increase?

SOFTWARE DEVELOPMENT LIFE CYCLE

SDLC


Requirement Analysis
Design
Implementation
Testing
Evolution
SDLC
Software / System Development Life Cycle - SDLC

SDLC

System Development Life Cycle Model (SDLC Model)

This is also called as classic lifecycle model (or) linear sequential model (or) waterfall method. This model has the following activities.

- System Information Engineering and Modeling
- Software Requirements Analysis
- System Analysis And Design
- Code Generation
- Testing
- Maintenance

1) System Information Engineering and Modeling

As software development is large process so work begins by establishing requirements for all system elements and then allocating some subset of their requirements to software. The view of this system is necessary when software must information interface with other elements such as hardware, people and other resources. System is the very essential requirement for the existence of software in any entity. In some cases for maximum output, the system should be requirement the development team studies the software requirement for the system.

2) Software Requirement Analysis

Software requirement analysis is also known as feasibility study. In this requirement analysis those development team visits the customers and studies their system requirement. They examine the need for possible software automation in the given software need for possible software automation in the

given software system. After feasibility study, the development team After feasibility study, the development team provides a document that holds the different specific recommendations for the candidate system. It also consists of personnel assignment, costs of the system, project schedule and target dates. The requirements analysis and information gathering process and forced specially on software. To understand what type of the program to be built, the system analyst must study the information domain for the software as well as understand.

3) System Analysis and Design

In system analysis and design phase the whole software development process the software structure and its outlay are defined client services processing technology .In case of the architecture, the database design, the data structure design etc. Are all defined in this phase. After designing part a software development model is created analysis and design are very important in the whole development cycle process. Any fault in the design phase could be very expensive to solve in the software development process. In this phase the logical system of the product is developed.

4) Code Generation

In code generation phase, the design must be decoded into a machine-readable form .If the design of software product is done in a detailed manner, code generation can be achieved without much complication for generation of code, programming tools like complier and interpreter are used for coding purpose different high level programming languages like c, c++, Pascal and java are used the right programming languages is chosen according to the type of application.

5) Testing

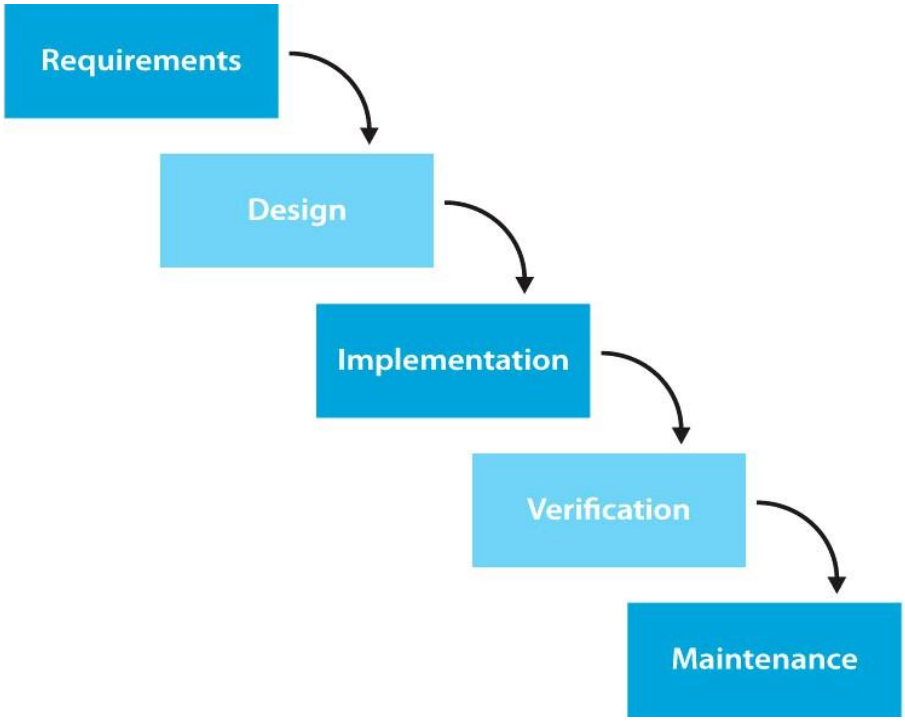
After code generation phase the software program testing begins different testing methods are available to detect the error but which were committed during the previous phases. A number of testing tools and methods are already for testing

purpose.

6) Maintenance

Software is definitely going throughout the changes once when it is delivered to the customer. There are large members of reasons for the change. It could happen due to some unpredicted input values into the system. In addition to this the changes in the system have effect on the software operation.

WATERFALL MODEL


Requirements
Design
Implementation
Verification
Maintenance

SYSTEM REQUIREMENTS

SYSTEM REQUIREMENTS

HARDWARE REQUIREMENTS:

OPERARTING SYSTEM : Windows 10 Ultimate

PROCESSOR : Intel core 13 DUO CPU

RAM : 8GB

SYSTEM TYPE : 64-bit operating system

SOFTWARE REQUIREMENTS:

FRONT-END:

- JAVA SCRIPT
- HTML
- CSS

BACK-END:

- FLASK
- SQLITE-3

FRONT END

HTML

HTML, or Hypertext Markup Language, is the standard markup language used to create and structure content on the World Wide Web. It provides the basic building blocks for web pages, allowing developers to define the structure, layout, and semantic meaning of content. HTML is essential for creating static web pages as well as dynamic web applications. It allows for the inclusion of various media types such as text, images, videos, and audio, and enables the creation of hyperlinks, forms, tables, and other interactive elements. In essence, HTML serves as the foundation for web development, providing the structure upon which CSS (Cascading Style Sheets) and JavaScript can be applied to enhance presentation and interactivity.

CSS

CSS, or Cascading Style Sheets, is a style sheet language used to describe the presentation of HTML (or XML) documents. While HTML defines the structure and content of web pages, CSS controls how that content is displayed, providing a means to style and layout the elements of a webpage. CSS allows developers to specify various visual properties such as colors, fonts, spacing, alignment, and more, thereby enabling the creation of visually appealing and consistent designs across different web pages and devices.

JAVA SCRIPT

JavaScript is a versatile programming language primarily used to create dynamic, interactive, and engaging web experiences. Unlike HTML and CSS, which primarily handle the structure and presentation of web content, JavaScript enables developers to add functionality and behavior to web pages.

JavaScript runs on the client side, meaning it executes in the web browser of the user's device rather than on a remote server. This allows for dynamic updates and interactions without needing to reload the entire web page. JavaScript can manipulate HTML and CSS elements, respond to user actions such as clicks and keystrokes, handle form validation, create animations, and communicate with web servers to fetch or send data asynchronously, among many other tasks.

When fetching data from an API using JavaScript, utilizing modern asynchronous programming techniques like async/await alongside the Fetch API streamlines the process. By marking the function as async, you can await the Fetch API call, simplifying asynchronous code structure. This allows for a more readable and synchronous-looking code style while maintaining asynchronous behavior.

BACKEND

Python

Python is a versatile and widely-used programming language known for its simplicity, readability, and flexibility. Created by Guido van Rossum and first released in 1991, Python has since grown into one of the most popular languages in the world, with a vast ecosystem of libraries, frameworks, and tools that support a wide range of applications.

Modules Used In Python:

Flask: Flask is a lightweight web framework for Python designed to make it easy to build web applications. It provides features such as URL routing, template rendering, request handling, and more, while keeping the core of the framework simple and extensible. Flask follows the WSGI (Web Server Gateway Interface) specification, allowing it to work with various web servers. Its simplicity and flexibility make it a popular choice for developing web applications, APIs, and micro services in Python.

SQLite3: SQLite3 is a built-in module in Python that provides a lightweight and self-contained SQL database engine. It allows developers to interact with SQLite databases using SQL queries, without requiring a separate server process. SQLite databases are stored as single files, making them easy to manage and transfer. SQLite3 is well-suited for small to medium-sized applications, prototyping, and development scenarios where a full-fledged database server is not necessary.

smtplib: The smtplib module in Python provides a simple client interface for sending emails using the Simple Mail Transfer Protocol (SMTP). It allows developers to connect to an SMTP server, authenticate with credentials, and send email messages programmatically. With smtplib, you can specify the sender, recipient(s), subject, body, and attachments of the

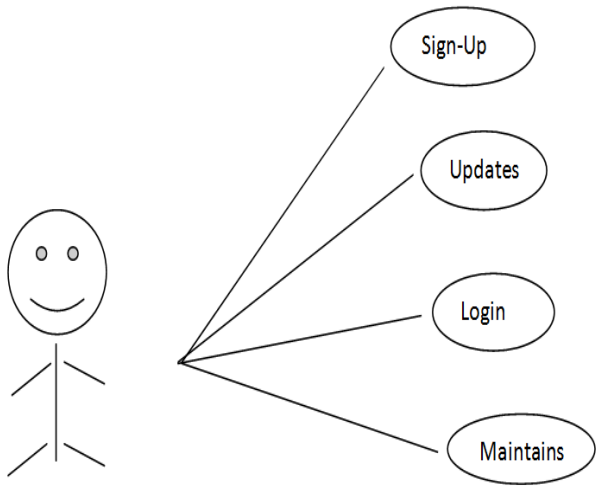
email. This module is commonly used in applications that require automated email notifications, alerts, or messaging functionality.

random: The random module in Python provides functions for generating pseudo-random numbers. It includes functions for generating random integers, selecting random elements from a sequence, shuffling sequences randomly, and more. The random module is useful for various tasks, including simulations, games, cryptography, and statistical sampling. While the numbers generated by the random module are not truly random (they are deterministic and based on an initial seed), they are generally suitable for most applications requiring randomness**.**

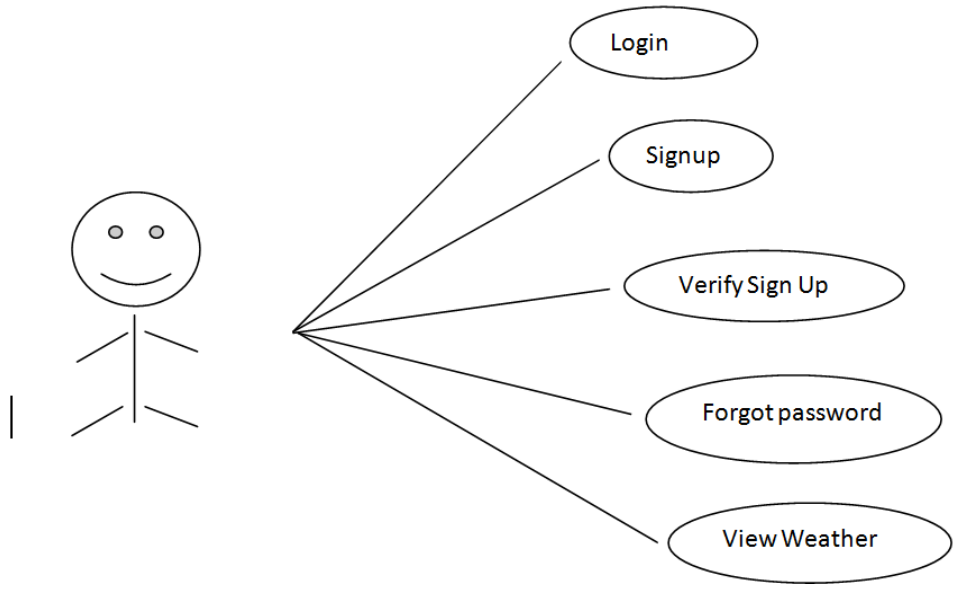
SYSTEM DESIGN

USE CASE DIAGRAM

ADMIN ROLES:

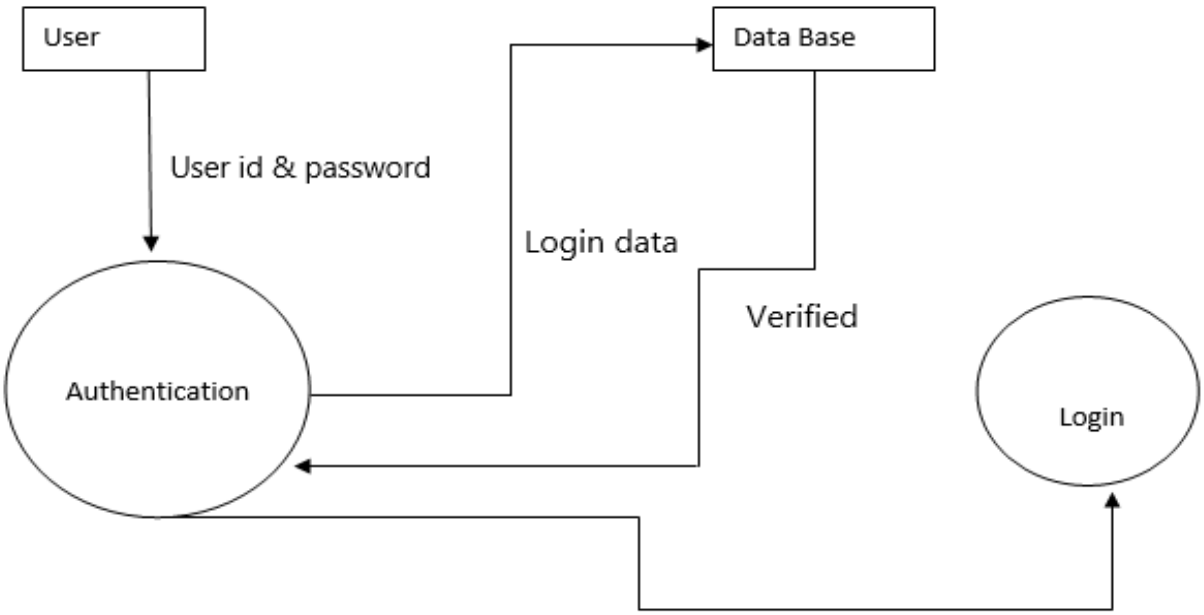


USER ROLES:

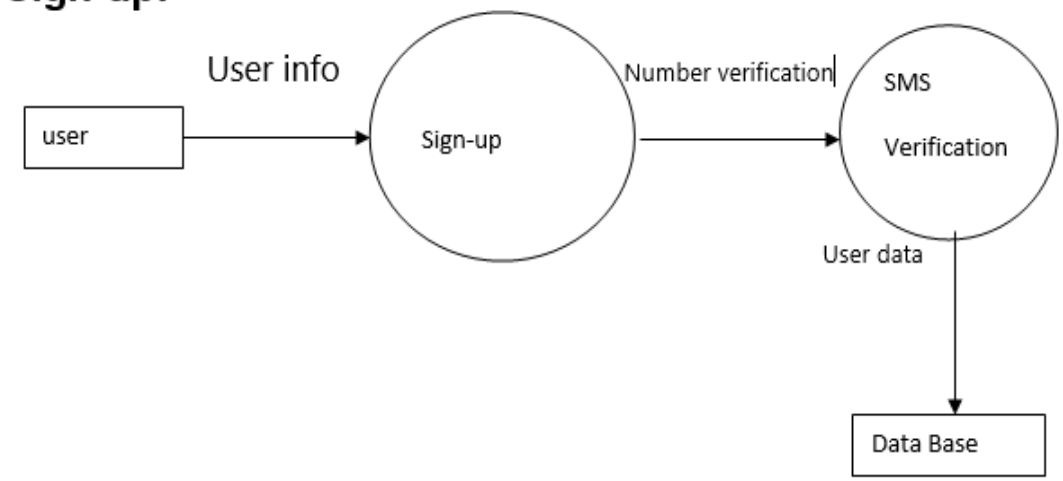


DATA FLOW DIAGRAM

LOGIN:



Sign-up:


User info
user
Sign-up
Number verification
SMS
Verification
User data
Data Base

DATABASE DIAGRAM

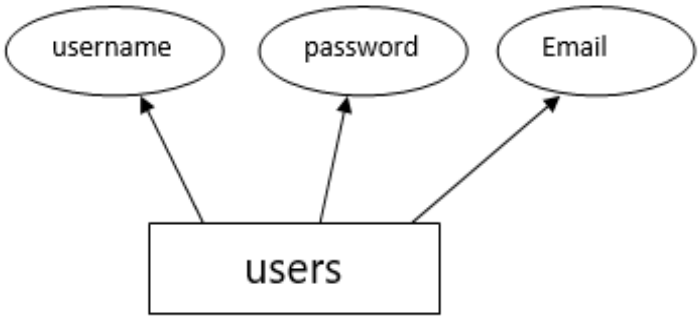
Database Table Design:

USER:

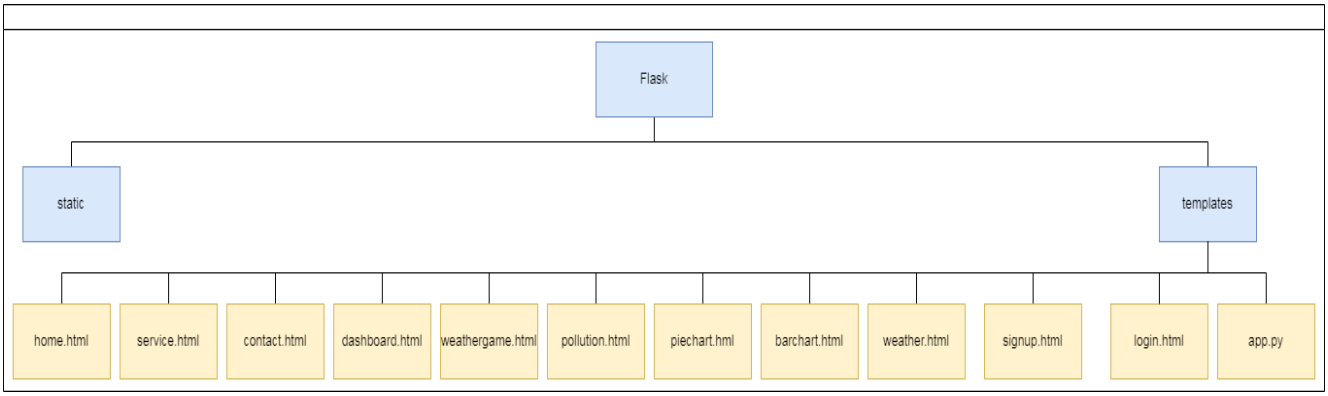
FIELD	DATATYPE
NAME	VARCHAR[30]
EMAIL	VARCHAR[500]
PASSWORD	VARCHAR[50]

ER-DIAGRAM

ER Diagram:



PROJECT STRUCTURE



DESCRIPTION:

- **home.html**: This file represents the home page of the WeatherMasters website. It includes a navigation bar with links to different sections like home, about, service, contact, and view weather. The main content area contains information about the services provided by WeatherMasters, listed in bullet points.

- **service.html**: This file corresponds to the service page of the WeatherMasters website. Similar to the home page, it contains a navigation bar with links and a content section titled "Our Services" which lists the services provided by WeatherMasters in bullet points.

- **contact.html:** This file represents the contact page of the WeatherMasters website. It includes a navigation bar and a content section titled "Contact WeatherMasters" which provides contact information such as email and phone number for reaching out to WeatherMasters.

- **dashboard.html**: This file depicts the dashboard of the WeatherMasters website. It includes a sidebar menu with links to different sections like dashboard, weather game, pie representation, bar chart representation, weather news, air quality checker, and view weather. The main content area contains sections for displaying information about earthquake alerts, rain alerts, and volcano eruption alerts. It also includes JavaScript functions for handling sidebar navigation and fetching/displaying alert data.

- **weathergame.html** :The **weathergame.html** file outlines the structure and content of a weather-themed game interface, featuring elements for displaying words, hints, and a timer. It also incorporates JavaScript code for game logic, including word generation, user input validation, and timer management. Meanwhile, the style.css file complements the HTML layout with aesthetic enhancements, defining styles for the sidebar navigation, dashboard layout, and various game elements, ensuring a visually appealing and cohesive user experience.

- **Pollution.html:** The pollution.html file is part of a weather dashboard application and is responsible for displaying pollution-related data. It utilizes Bootstrap CSS for styling and includes Font Awesome Icons for visual elements. Additionally, it incorporates Chart.js to generate bar charts displaying temperature, humidity, and wind speed forecasts for the next five days. The interface features a sidebar navigation menu, allowing users to access different sections of the dashboard. A form is provided for users to input a city name, triggering the retrieval and display of corresponding weather data upon submission. The page dynamically updates with the fetched weather information, presenting it in visually appealing bar charts and hiding previous data upon a new search.

- **Piechart.html:** The **piechart.html** file is another component of the weather dashboard application. Similar to the previous file, it utilizes Bootstrap CSS and Font Awesome Icons for styling and visual elements. It also incorporates Chart.js to display pie charts representing weather-related data such as temperature, humidity, and wind speed. The interface features a sidebar navigation menu, allowing users to navigate between different sections of the dashboard. A form is provided for users to input a city name, triggering the retrieval and display of corresponding weather data upon submission. The page dynamically updates with the fetched weather information, presenting it in visually appealing pie charts and hiding previous data upon a new search.

- **Barchart.html:** The **barchart.html** file is another component of the weather dashboard application, similar to the previous files. It includes Bootstrap CSS, Font Awesome Icons, and Chart.js for styling and data visualization.This file contains a sidebar for navigation, allowing users to switch between different sections of the dashboard. It also features a form where users can input a city name to fetch weather data. Upon submission, the page dynamically updates with weather forecasts for temperature, humidity, and wind speed displayed as bar charts.

- **Weather.html:** The content of the webpage consists of a search bar for entering a location, followed by a display section showing the current weather information such as temperature, climate condition, humidity, wind speed, and air pressure. Additionally, there's a unit conversion section for toggling between Celsius and Fahrenheit, and an option to detect the user's location. The page also features a forecast section for displaying weather predictions for the upcoming days.

- **Signup.html:** The `signup.html` file contains the HTML and CSS code for a sign-up form. It includes fields for username, password, and email, along with icons for each input field. The form is styled with a background image and has a transparent overlay for readability. JavaScript functions are used for form validation and toggling password visibility.

Additionally, the page displays a Weather Masters logo and a message span for displaying information to the user.

- **Login.html:** The `login.html` file contains HTML and CSS code for a login page. It features a navigation bar with links to different sections of the website, a search bar, and a section showcasing the advantages of signing up. The login form is styled with transparent background and bordered input fields. JavaScript is used to toggle password visibility and hide information messages when the user interacts with input fields. Additionally, the page provides options for signing up and recovering forgotten passwords.

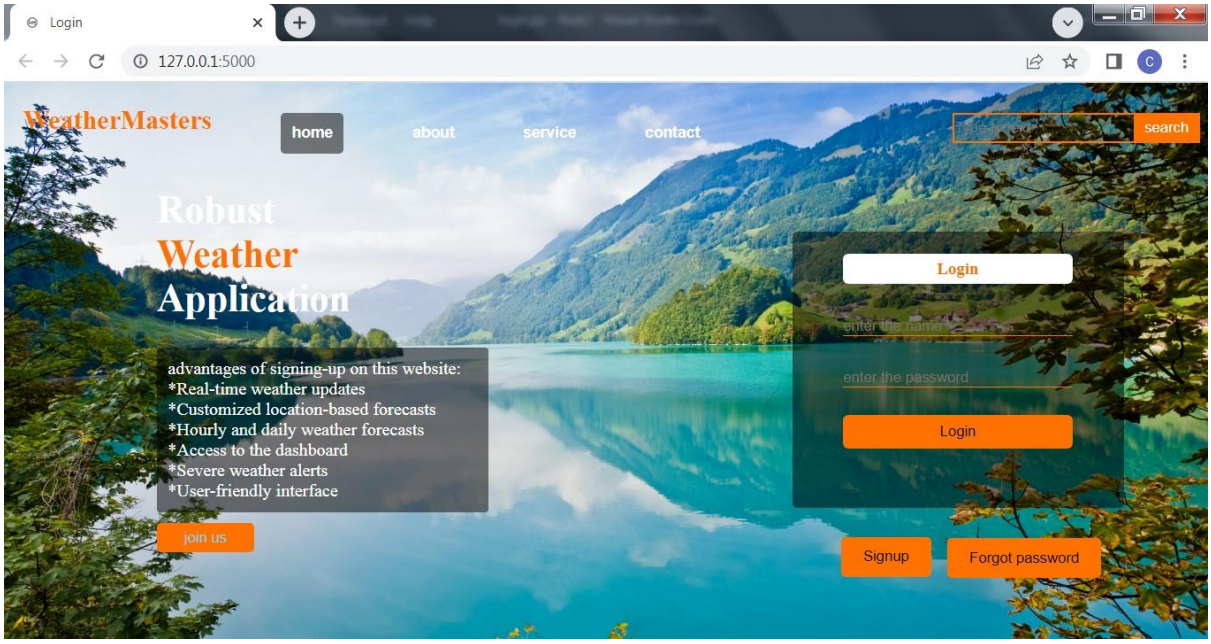
- **App.py:** The `app.py` file contains Python code for a Flask web application. It initializes a SQLite database for user management and defines various routes for rendering different pages like login, signup, weather information, and more. It includes functionalities for user authentication, email verification, and password resetting. Additionally, it provides routes for displaying weather-related data, charts, and news. The application runs in debug mode, facilitating development and debugging processes.

- **Static(Folder):** In Flask, the static folder serves as a centralized location to store static files such as CSS, JavaScript, images, and other assets required by your web application. These files are served directly to clients without being processed by the server, improving performance. By organizing static files within the static folder, Flask automatically maps URLs to these files, simplifying the process of linking them in your HTML templates. This separation of dynamic content (handled by Flask routes) and static assets helps maintain a clean and organized project structure, enhancing readability and maintainability.

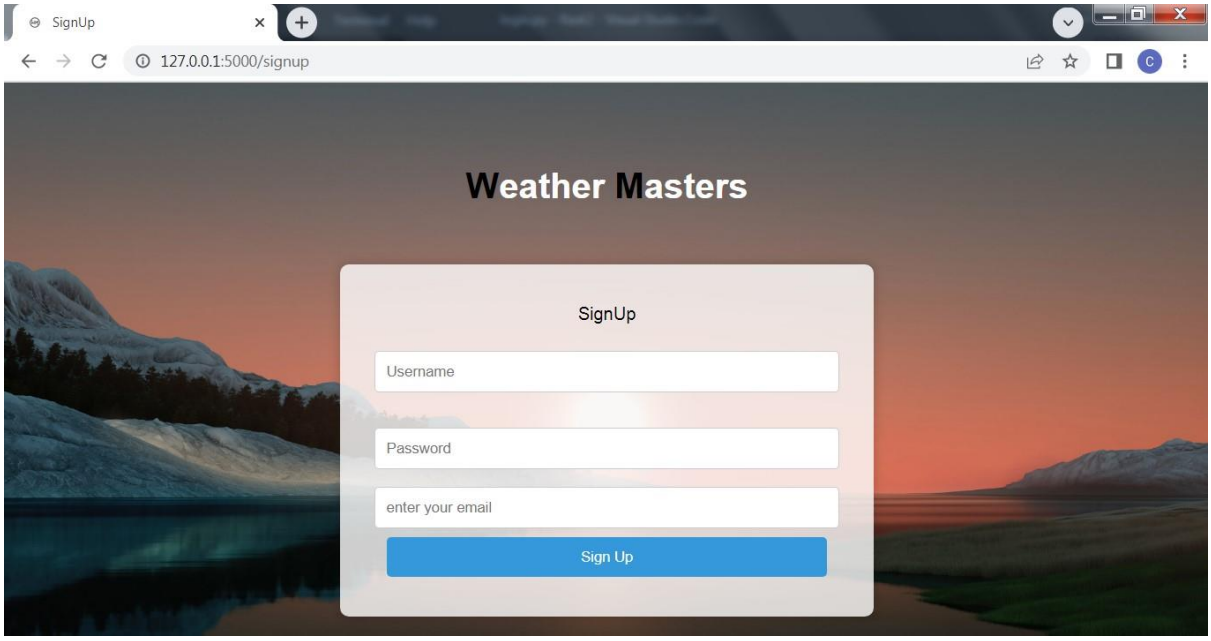
SCREEN SHOTS

Screen Shots

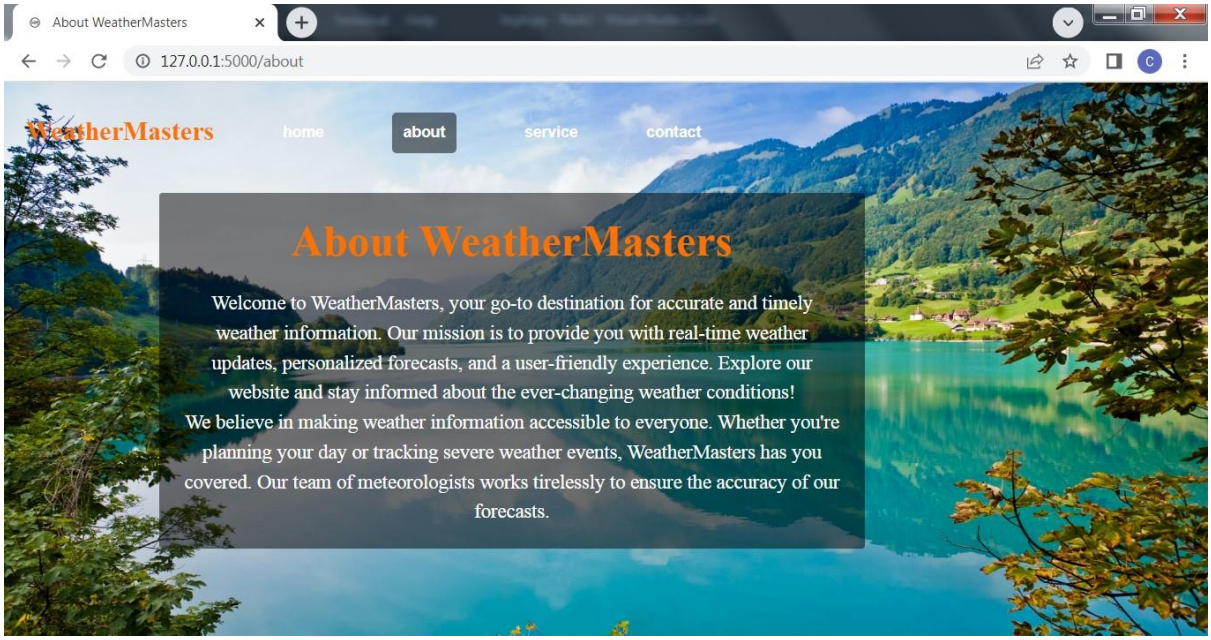
Login page:



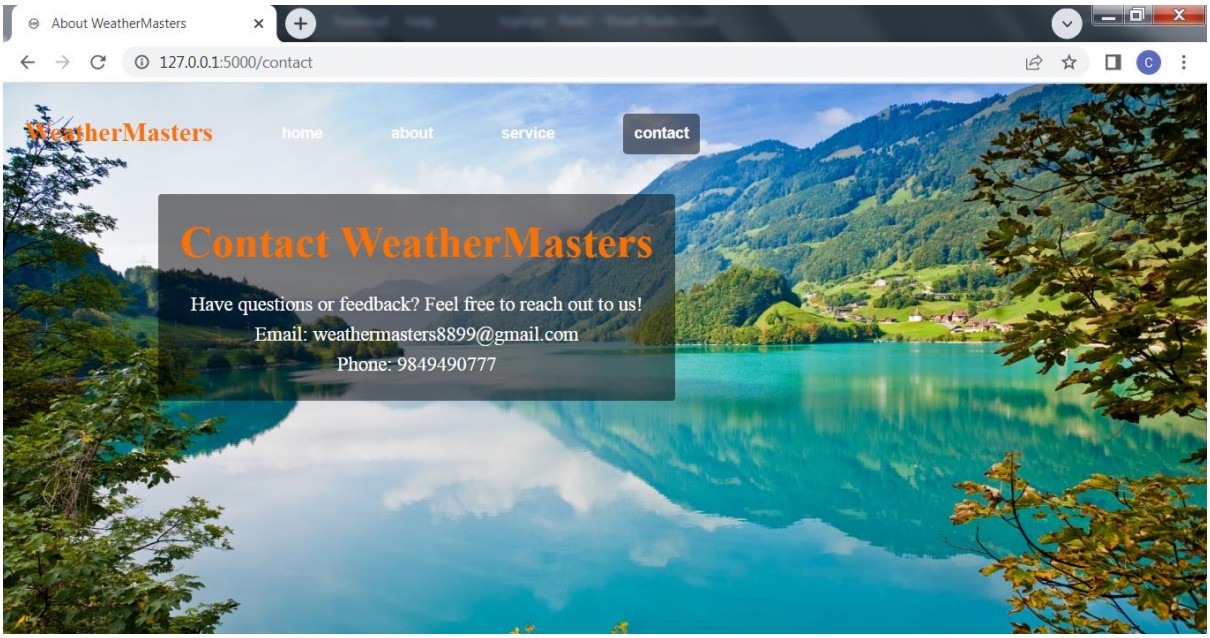
Sign in page:



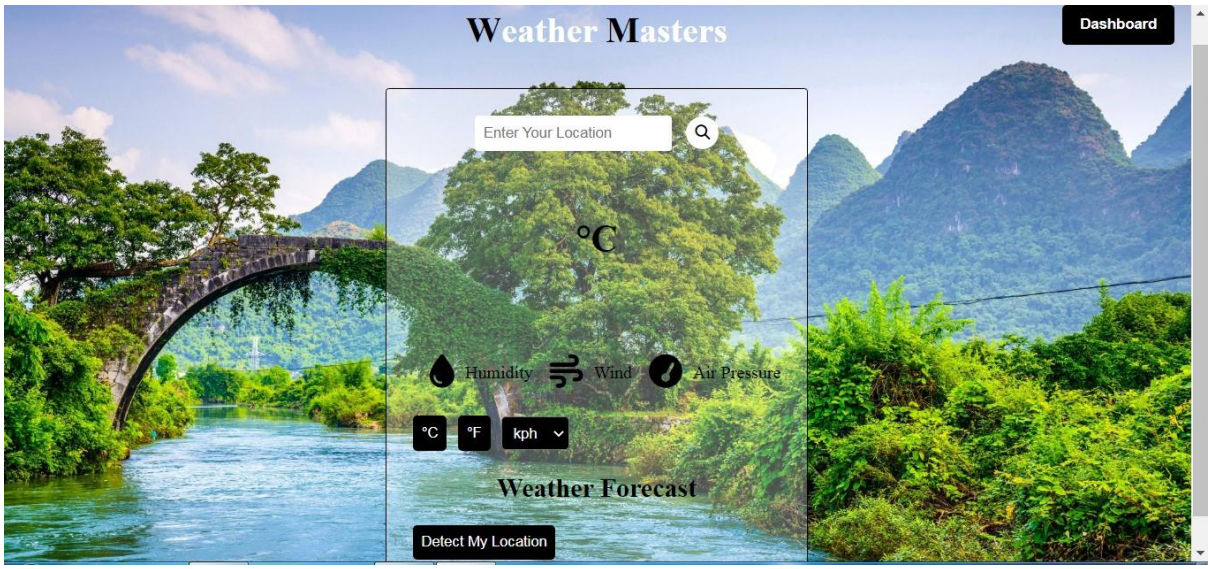
About us:



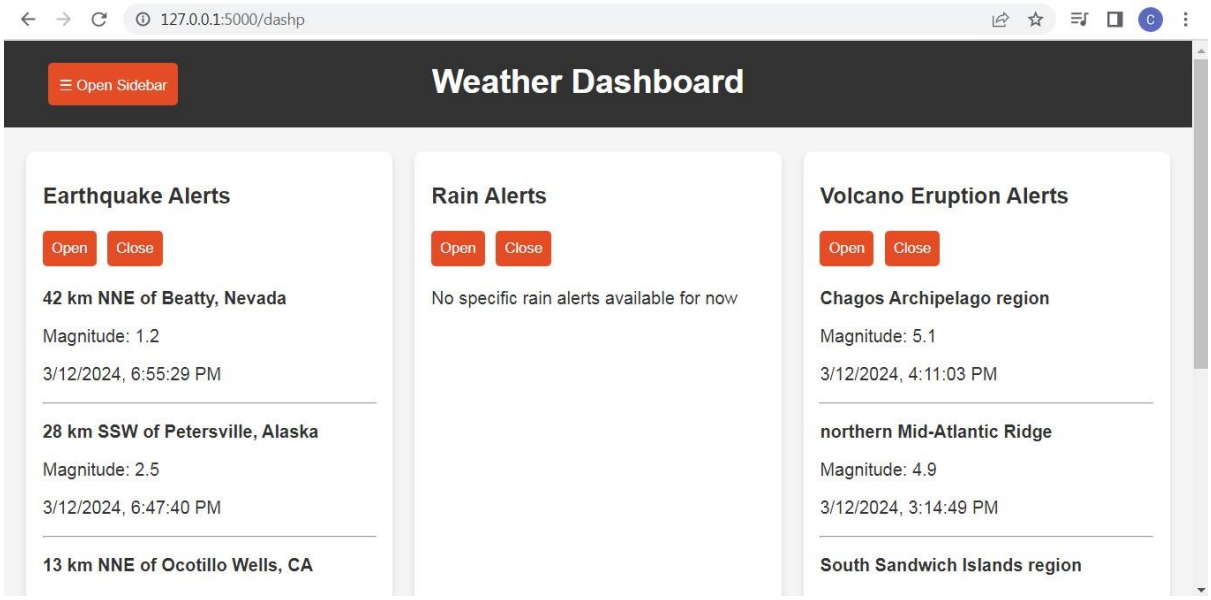
Contact Us:



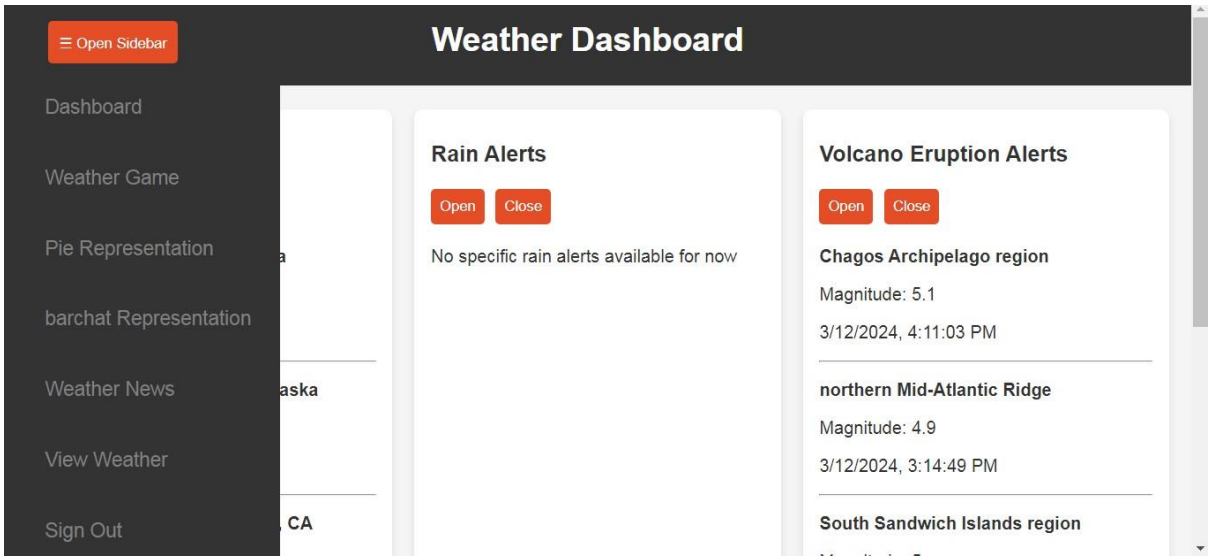
Weather Displaying Page:



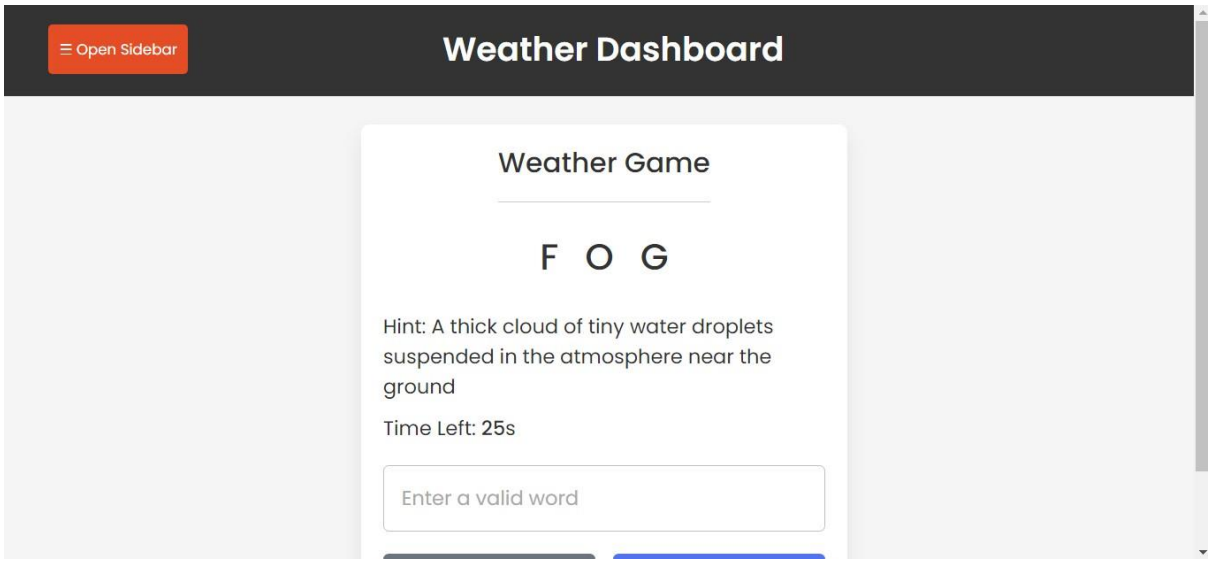
Natural Disasters Information Dashboard:



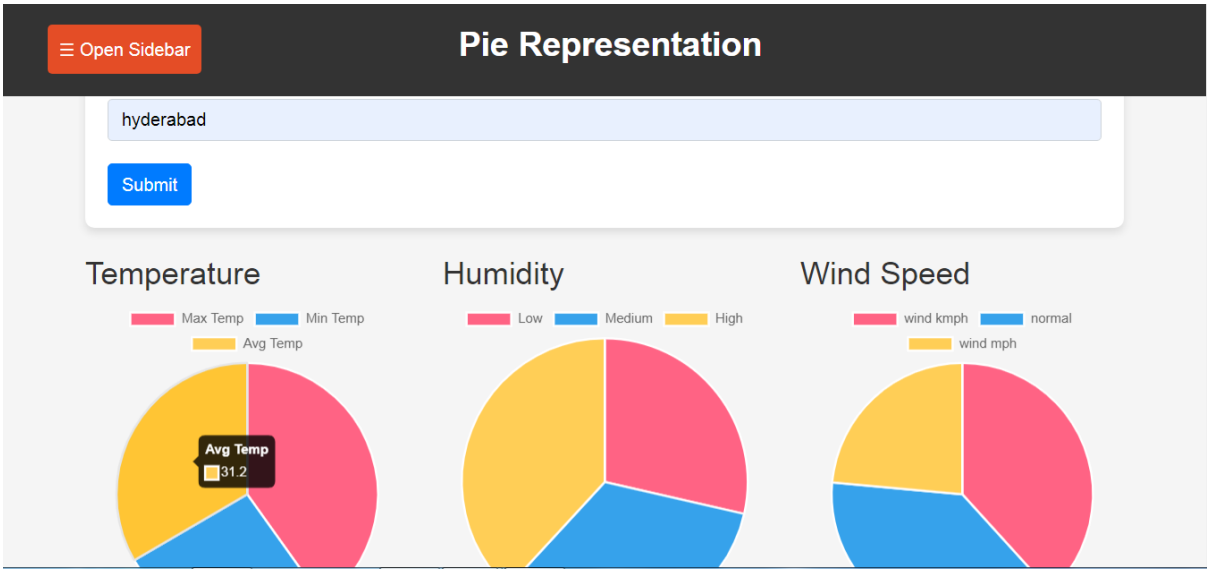
Dashboard:



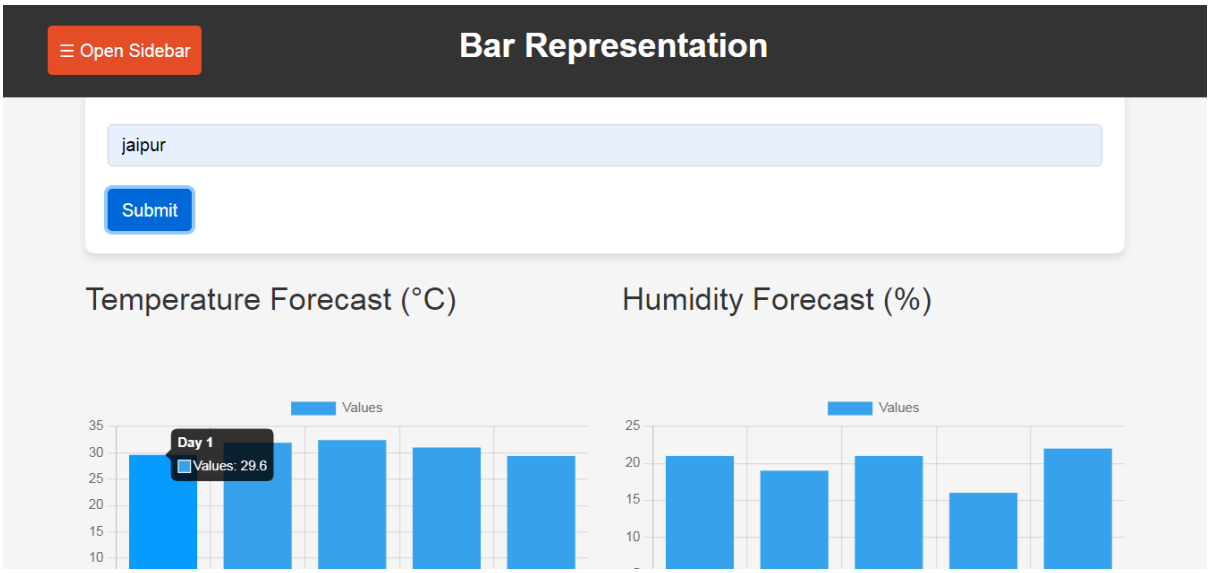
Weather Game:



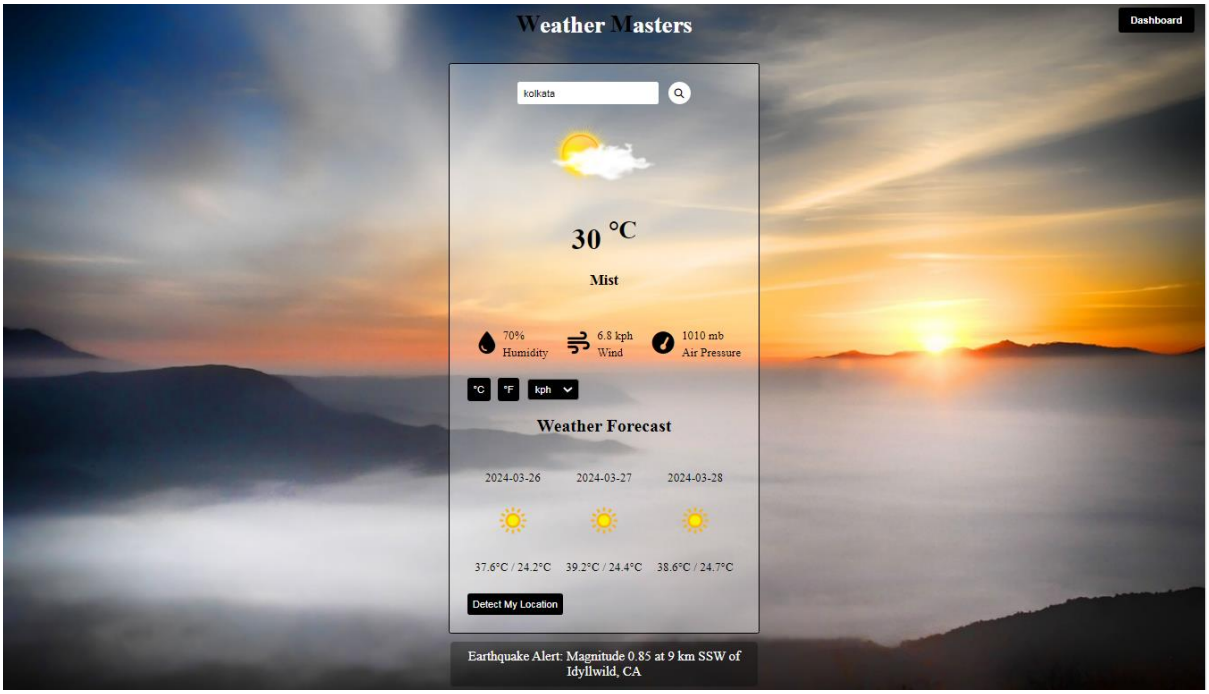
Pie Representation:



Bar Chart Represent:

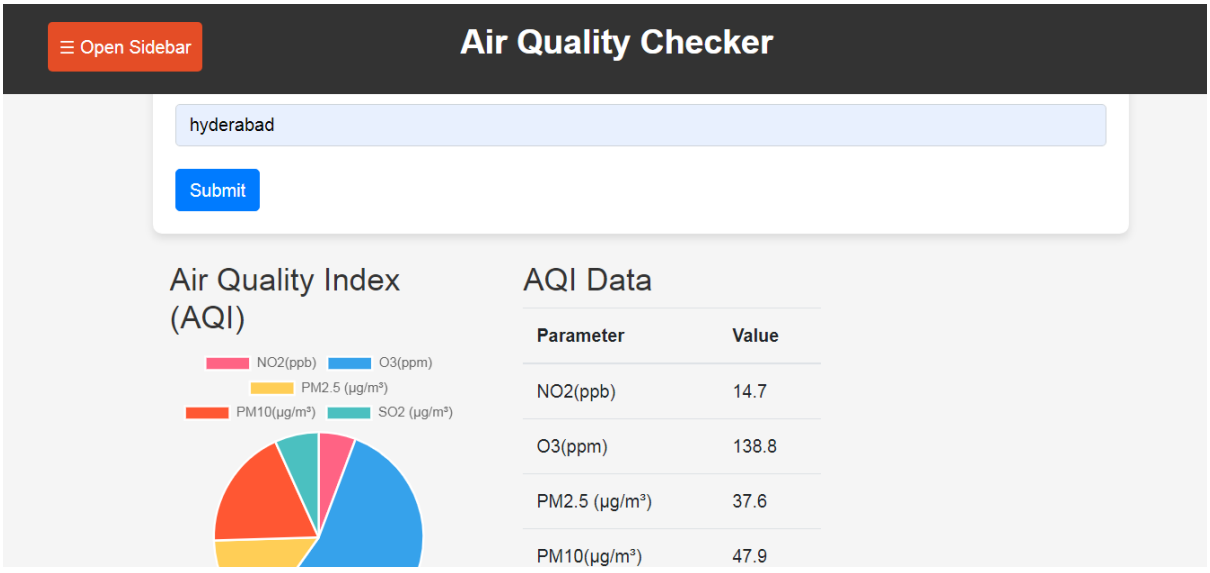


Weather Page Example:



Note : The Background will be changed according to the weather Condition.

Air Quality Checker:



TESTING

TESTING

Software testing is a critical element of software quality assurance and represents the ultimate reviews of specifications, design and coding. Testing represents interesting anomaly for the software. During earlier definition and development phases, it was attempted to build software from an abstract concept to tangible implementation.

The testing phase involves the testing of the developed system using various test data. Preparation of the test data plays a vital role in the system testing. After preparing of the test data the system under study was tested using those test data .while testing the system, errors were found and corrected by using the following testing steps and corrections are also noted for future use. Thus, a series of testing is performed for the proposed system, before the system was ready for the implementation.

Unit Testing

Unit testing focuses verification effort on the similar unit of software design the form this is known as testing, the is done individually on each form. Using the unit test plans, prepared in design phase of the system development as a guide, important control paths are tested to uncover error within the boundary of the module. In this testing step, each module is found to be working satisfactorily, as regard to expected output from the module.

Integrated Testing

Data can be lost across an interface, one module can have an adverse effect on other sub functions, when combined, may not produce the desired major function. Integration testing a systematic technique for constructing the program structure while at the same time conducting tests to uncover errors associated with the interface .all modules are combined in the testing step.

Then the entire program is tested as a whole.

Output Testing

After performing validation testing, the next steps are output testing of the proposed system, since no system could be useful if it does not produce the desired output in the specified format. The output generated is display by the system under in the specified format. The outputs generated are displayed by the system under consideration or tested by asking the user about the format requiredby them.

CONCLUSION

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Weather Masters is a comprehensive weather application featuring user authentication, account management, password recovery, and data visualization capabilities. Offering weather forecasts, news updates, and pollution tracking, it ensures seamless user experience and data accuracy for weather enthusiast.