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ATMOSALERT: A WEATHER-HEALTH PLATFORM USING WEB AND ML TECHNOLOGIES

Real-Time Alerts and Health Risk Prediction Through Smart Integration

1Shweta Shimpi, 2Ninad Walke, 3Sakshi Nikum
1UG Student, 2UG Student, 3UG Student
1Computer Engineering Department
K.C. College of Engineering, Management Studies and Research. Kopri, Thane (E), Maharashtra, India

Abstract: AtmosAlert is a full-stack web platform that bridges real-time weather data with personalized health risk predictions using integrated Machine Learning models. Built with React.js, Node.js, Express.js, and Flask, the system offers location-based alerts and forecasts alongside AI-driven insights on heatstroke, sunburn, and hydration risks. With features like user authentication, blogging, and responsive design, AtmosAlert not only informs users about changing weather conditions but also empowers them to make health-conscious decisions. The platform aims to create a smarter, safer, and more connected experience for users navigating extreme environmental conditions.

Index Terms - weather monitoring, machine learning, web application, heatstroke prediction, sunburn risk, Flask, React.js

1. INTRODUCTION

In recent years, the intersection of climate change and public health has become increasingly critical. With rising global temperatures, unpredictable weather patterns, and more frequent extreme weather events, the need for real-time, accessible weather-health information has never been greater. Traditional weather applications focus primarily on forecasts and alerts, often overlooking the direct impact of environmental conditions on individual health. This gap in functionality highlights a growing need for integrated solutions that go beyond weather prediction to provide actionable, personalized health insights.

AtmosAlert is a comprehensive web platform designed to meet this need by offering a unified system for weather awareness and health risk assessment. It combines real-time weather data with intelligent Machine Learning models to provide users with predictive analysis of health risks such as heatstroke, sunburn, and dehydration. Unlike existing solutions, AtmosAlert tailors recommendations based on individual user profiles and environmental inputs, ensuring a highly personalized and practical experience.

The platform is built using a robust full-stack architecture that includes React.js for the frontend, Node.js and Express.js for backend API handling, and a Flask-based Python service for ML model integration. It also features secure authentication, user profiling, a blogging community, and a fully responsive design to enhance accessibility and engagement across devices. External APIs such as WeatherAPI and browser-based geolocation are utilized to fetch real-time data and location context for accurate predictions.

Through its AI-powered, health-centric approach, AtmosAlert aims to not only inform users about weather conditions but also guide them in making proactive health decisions. By bridging the gap between meteorology and healthcare, the platform promotes awareness, preparedness, and community engagement—empowering users to navigate seasonal extremes safely and smartly.

1.2 MOTIVATION

With the increasing frequency and intensity of extreme weather events, there is an urgent need for innovative, technology-driven solutions that bridge the gap between meteorological data and personal health awareness. Traditional weather apps may offer forecasts and alerts, but they often fail to directly address the impact of environmental changes on individual health. This gap in functionality is what AtmosAlert seeks to address.

The key motivations for developing AtmosAlert include:

- **Connecting Weather to Health Risks:** Unlike generic weather apps that simply provide forecasts, AtmosAlert integrates personalized health risk predictions for conditions like heatstroke, sunburn, and dehydration, all based on real-time weather data and user-specific information. This enables users to receive tailored advice on how specific weather conditions may impact their well-being.

- **Ensuring Accessible Health Awareness:** AtmosAlert is a web-based platform, ensuring users can access weather-health guidance anytime, anywhere. Whether on a mobile device or desktop, users can continuously monitor weather conditions and health risks, empowering them to make proactive, informed decisions on their health and well-being.

- **Prioritizing User-Centric Personalization:** The platform leverages detailed user profiles to offer personalized health predictions based on individual factors like skin type, age, outdoor exposure time, and location. This level of customization ensures that advice is more relevant, accurate, and actionable, improving the user's ability to respond to weather-induced health risks.

- **Fostering Community Engagement and Education:** AtmosAlert goes beyond just providing weather forecasts by creating a space for users to engage with educational content such as blogs and forums. This interactive ecosystem enables users to share experiences, learn from experts, and support one another in navigating climate-related health challenges, fostering a sense of community and resilience.

- **Enabling Scalable AI Integration:** AtmosAlert utilizes machine learning models hosted on a Flask backend to deliver real-time, data-driven health insights. The platform's AI capabilities are designed to scale as it accumulates more data and user feedback, evolving over time to provide even more accurate predictions and personalized health guidance.

Through these motivations, AtmosAlert strives to do more than just predict the weather — it aims to protect users' health by providing critical information to help them adapt and thrive in an ever-changing climate. By offering a combination of data-driven predictions, personalized advice, and community-based support, the platform encourages an informed, proactive, and resilient response to environmental stressors.

1.3 PROBLEM STATEMENT & OBJECTIVES:

- **Problem Statement:**

The increasing frequency of extreme weather events and their impact on public health necessitate a solution that bridges the gap between meteorological data and personal health awareness. Traditional weather apps often fail to provide actionable health insights, leaving individuals unaware of the specific risks that environmental changes pose to their health. AtmosAlert was developed to address this issue, delivering timely, personalized health advice based on real-time weather data.

- **Objectives:**
  1. Provide Personalized Health Risk Predictions: Help users understand how real-time weather conditions impact their health, such as heatstroke, sunburn, dehydration, and other environmental health risks.
  2. Promote Health Awareness and Prevention: Offer features like health tips, alerts, and risk assessments to encourage proactive health management in extreme weather conditions.
  3. Foster Community Engagement: Enable users to share experiences, tips, and advice on how to handle climate-related health challenges, creating a supportive ecosystem.
  4. Utilize AI for Scalable and Accurate Health Insights: Use machine learning models to provide accurate, real-time health predictions and advice based on user-specific data, ensuring personalized guidance.

RESEARCH METHODOLGY

To assess the effectiveness and user satisfaction of **AtmosAlert**, a comprehensive research methodology was employed, combining both quantitative and qualitative approaches. The study population consisted of individuals from diverse geographic locations, health conditions, and demographics to ensure comprehensive data collection.

1. Quantitative Data Collection:

Quantitative data was gathered through an online survey distributed to a sample of AtmosAlert users. The survey focused on evaluating various aspects of the platform, such as:

- **User Experience:** Ease of use, navigation, and accessibility of the platform.
- **Effectiveness of Health Alerts:** Accuracy and timeliness of weather-health alerts.
- **Satisfaction with AI-based Predictions:** User satisfaction with personalized health predictions (e.g., dehydration or heatstroke risks).
- **Overall Utility:** General usefulness of the platform for managing health risks.

Participants rated their experiences on a Likert scale, allowing for a detailed, quantifiable understanding of user perceptions.

2. Qualitative Data Collection:

Qualitative insights were gathered through in-depth interviews and focus group discussions with a subset of AtmosAlert users. This qualitative data helped uncover:

- **User Motivations:** Why users chose to use AtmosAlert and how they benefited from personalized health predictions.
- **Challenges and Pain Points:** Issues or areas of improvement that users encountered while using the platform.
- **Recommendations for Enhancement:** Suggestions for new features or improvements to make the platform even more effective.

The combination of these quantitative and qualitative data provided a comprehensive evaluation of AtmosAlert's effectiveness and user satisfaction, guiding future development decisions.

Methodology Breakdown:

1. Research and Requirements Gathering:

- Conduct Surveys and Interviews: Collect feedback from potential users regarding their health concerns, weather awareness, and technological needs.
- Gather Platform Requirements: Identify the specific data (weather, health) that needs to be integrated and assess what features are necessary for users.
- Analyze Existing Solutions: Study current weather and health apps to identify gaps and areas where AtmosAlert can provide additional value.

2. Design Phase:

- Create Wireframes and Prototypes: Develop early-stage designs focusing on user-friendly interfaces, including dashboards for health alerts and weather predictions.
- Database Design: Design a schema to store weather data, health risks, user profiles, and historical health alerts.
- Technology Stack Definition: Select appropriate technologies for both the front-end (React.js, for dynamic and responsive UIs) and back-end (Flask, for scalable AI and ML models).

3. Development Phase:

- Frontend Development: Build the UI using React.js to ensure that the platform is responsive and offers a smooth user experience across all devices.
- AI Integration: Implement machine learning models using Python and Flask to provide personalized health predictions based on real-time weather data.
- Backend Development: Set up APIs to integrate weather data (from weather APIs) and user health profiles, ensuring seamless real-time updates.

4. Content Creation:

- Health Risk Algorithms: Develop the underlying logic to predict heatstroke, dehydration, sunburn, and other climate-related health risks based on user-specific data.
- Educational Content: Create articles, blogs, and tips to educate users about managing environmental health risks.
- Community Interaction: Establish discussion forums where users can share their experiences and seek advice.

5. Testing and Quality Assurance:

- Feature Testing: Test each feature for functionality, including weather-health alerts, AI predictions, and community engagement tools.
- User Acceptance Testing (UAT): Conduct testing with a sample of users to gather real-world feedback on the platform's usability and effectiveness.
- Cross-Browser and Device Compatibility Testing: Ensure the platform functions seamlessly across various devices and browsers.

6. Deployment:

- Launch Platform: Deploy the platform to a reliable hosting environment, ensuring it can scale to accommodate a growing number of users.
- Cloud Integration: Use cloud infrastructure to handle large volumes of weather data and AI computations, ensuring scalability.

7. Maintenance and Updates:

- Monitor Performance: Regularly monitor the platform’s performance, identify any bugs, and address issues promptly.
- Content Updates: Periodically update health risk algorithms, add new educational content, and refine AI models based on user feedback.
- Feature Enhancements: Continuously add new features based on user needs, such as incorporating additional health conditions or enhancing geolocation-based alerts.

LITERATURE SURVEY

1.1 Survey of Existing System:

In the current landscape of weather apps and health platforms, information regarding weather-related health risks is often scattered, with no centralized solution to bridge the gap between meteorological data and personalized health advice. Below are some existing systems and platforms:

- Traditional Weather Apps (e.g., AccuWeather, The Weather Channel): These apps provide weather forecasts and alerts, but they lack a focus on health risks directly related to weather conditions. While they notify users of extreme weather events like heatwaves or storms, they do not offer tailored health advice (e.g., heatstroke risk, dehydration) based on real-time weather data and user-specific variables.

- Health Monitoring Apps (e.g., MyFitnessPal, Sweatcoin): Some apps focus on overall health tracking, such as exercise or hydration, but they do not integrate weather data to offer proactive health advice. There is a gap in providing specific, actionable advice about how weather conditions affect health in real time.

- Climate-Related Health Research Websites (e.g., CDC, WHO): These organizations provide general information on climate change and health risks, but they do not offer a platform that connects real-time weather data to individual health predictions, leaving users to rely on static resources or manually search for information.

Despite the availability of these systems, none of them integrate weather forecasts with personalized health predictions in an easy-to-access, real-time platform like AtmosAlert. Existing solutions fail to provide users with immediate and actionable advice about how changing weather conditions (such as high UV index or extreme heat) directly impact their health.

1.2 Limitation in the Existing System:

While traditional weather apps and health platforms offer basic information, they present several key limitations:

- Lack of Personalized Health Risk Alerts: Existing weather apps provide weather forecasts, but they do not offer personalized health alerts. AtmosAlert aims to bridge this gap by using real-time weather data to generate personalized health risk predictions based on individual factors such as skin tone, outdoor exposure, and hydration needs.

- Scattered Information Across Platforms: Users have to rely on multiple sources—weather apps, health apps, and climate-focused websites—to gather the necessary data about weather conditions and health risks. AtmosAlert consolidates weather and health information in one platform, allowing users to access tailored alerts, health tips, and educational content in a single place.

- Static, Non-Interactive Data: Many current systems provide static data without interactive elements. For example, quizzes or personalized tips to engage users in actively managing their health during extreme weather events are generally absent. AtmosAlert aims to enhance user engagement by integrating interactive features like quizzes and personalized weather-health reports.

- Limited Focus on Real-Time Predictions and Scalability: Existing apps do not scale well to include real-time predictions or use machine learning models to dynamically assess health risks as weather conditions evolve. AtmosAlert leverages scalable AI models to provide real-time, evolving health predictions based on user-specific data and environmental factors.

- Paid Platforms and Accessibility Issues: Many of the most comprehensive health-monitoring and weather apps are paid, limiting access for students and others with fewer resources. AtmosAlert is a web-based, user-friendly platform designed to offer critical health-related alerts and advice for free, making it more accessible to a wide range of users.

With AtmosAlert, we aim to solve these limitations by providing a centralized, free, and scalable platform that connects weather data with health insights, empowering users to take proactive steps to safeguard their well-being in the face of extreme weather events.

Literature Survey in Tabular Format

Website / Platform	Purpose	Availability	Accessibility
Weather Apps (e.g., AccuWeather, The Weather Channel)	Provide weather forecasts and severe weather alerts	Mobile & Web Apps	Free (Limited Personalization)
Health Apps (e.g., MyFitnessPal, Fitbit)	Track fitness, hydration, and general health stats	Mobile Apps	Mostly Paid / Subscription-based
CDC / WHO Websites	Share general information on climate-related health risks	Official Websites	Free (Static Content)
UV Index & AQI Trackers	Provide real-time UV exposure or air quality data	Various Platforms	Free (Data-Only, No Health Integration)
Mobile Wellness Apps	Offer wellness tips, hydration reminders, or step tracking	App Stores	Paid (Some versions Free)

Fig. 1. Literature Survey in Tabular Format

PROPOSED SYSTEM

1.3 Introduction:

This project, AtmosAlert, was developed to address the rising need for weather-aware health guidance in the face of increasing climate extremes. It empowers users by offering real-time, personalized predictions related to heatstroke, sunburn, and dehydration—based on their location, weather data, and user-specific health profiles. We've also integrated interactive features such as health-based quizzes, educational blogs, and a community engagement section to help users understand and manage weather-related health challenges better.
To achieve this, we used the following technologies:

- **React.js (Frontend Framework):**
  React was used to create a highly interactive and responsive user interface. It helps us build reusable components, manage real-time UI updates, and ensure smooth navigation across pages like health reports, user profiles, and blogs.

- **Tailwind CSS (Styling):**
  Tailwind CSS allows rapid styling of UI elements using utility-first classes. It gives us the power to build a clean, modern interface with responsive design and smooth user experience across all screen sizes.

- **Node.js & Express.js (Backend Server):**
  Node.js and Express.js are used for handling all frontend-backend communication. They manage user authentication, API routing, data retrieval, and communication between the client and the Flask ML backend.

- **Flask (ML Integration Backend):**
  Flask serves as the backbone for integrating our Machine Learning models. It handles risk prediction based on real-time weather data, user attributes (like skin tone, exposure time), and other personalized inputs.

- **MongoDB (Database):**
  MongoDB stores all the dynamic user-related data such as profiles, blog posts, quiz results, and feedback. Its NoSQL structure supports scalability and fast data retrieval for our platform.

- **OpenWeatherMap API (External Data Source):**
  This API provides live weather updates (temperature, humidity, UV index, etc.), which are essential for generating accurate health risk predictions.

Development Tools:

- **VS Code (Visual Studio Code):**
  All code for the AtmosAlert platform—frontend, backend, and ML models—was written and debugged using VS Code due to its extensive ecosystem, extensions, and developer-friendly interface.

- **Git & GitHub:**
  For version control and collaborative development, we used GitHub to manage our repositories, track changes, and ensure seamless teamwork.

3.2 Architecture / Framework:

Website Architecture – AtmosAlert
We have defined the architecture of the **AtmosAlert** platform as follows:

• Landing Page:
This is the first page a user sees upon visiting the website. It introduces the core features of the platform such as:

- Personalized weather-health risk predictions (e.g., sunburn, dehydration, heatstroke)
- Blog and discussion sections for community learning
- Access to quizzes, safety tips, and recent climate-health updates

The page dynamically adjusts based on the user's **location (geolocation)** and **login state**, providing an engaging preview of personalized data.

• Login / Sign Up Page:
This page allows users to create an account or sign in to access personalized health data. Authentication is handled using **JWT-based secure login** via **Node.js & MongoDB**. Once logged in, users' data such as **skin tone, exposure habits, age, and medical considerations** are stored securely for personalized risk analysis.

• Health Risk Dashboard:
This is the core of AtmosAlert. After login, users are taken to a dashboard that shows:

- Real-time weather updates (fetched using **OpenWeatherMap API**)
- Risk levels for **heatstroke**, **sunburn**, and **dehydration**
- Personalized recommendations (hydration reminders, SPF tips, etc.)

The dashboard pulls prediction results from the **Flask ML backend** and adjusts content dynamically based on the user profile.

•

• Blogs & Discussions Page:
This section promotes community engagement. Users can:

- Read and post blogs about their experiences dealing with weather-health challenges
- Share local tips and tricks to cope with extreme weather
- Comment and support each other through a moderated discussion system

Data is stored and retrieved from **MongoDB**, enabling persistent and searchable content.

3.3 Flowchart

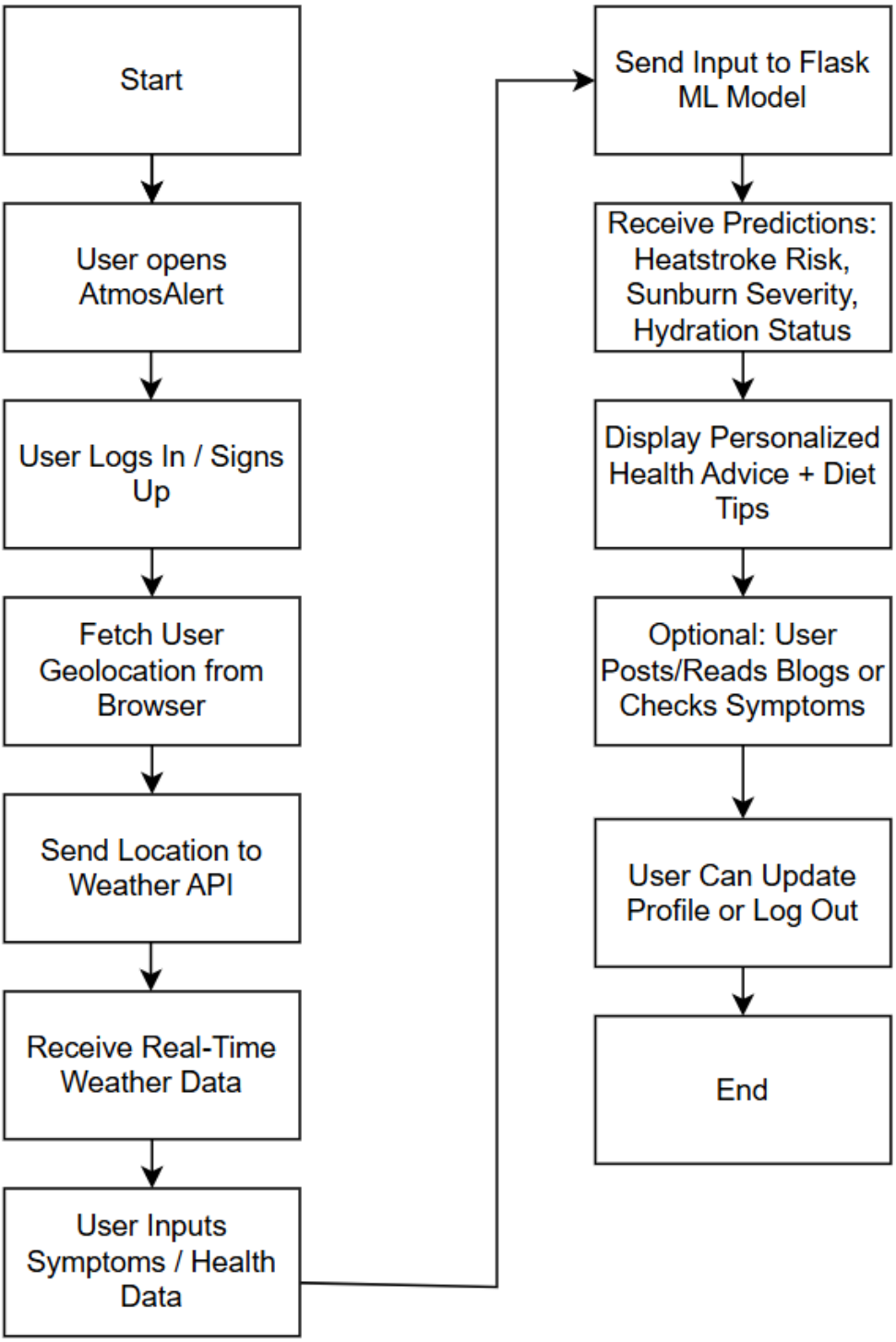


Fig. 2. Data Flow Diagram

3.4 Working and Results

The application was tested on various personal computers as well as laptops and primarily the OS used was Windows Operating System (10/11).
The following listed-out figures explain the structure of our proposed system graphically and allow us to enrich our research capabilities.

Figure 3: Depicts the home page for our website. This page contains navigations, various paths to access sub-sections of our website. Login and Sign-Up features are available in the nav bar above.
Before accessing any features, the user must Login or Sign Up in order to continue.

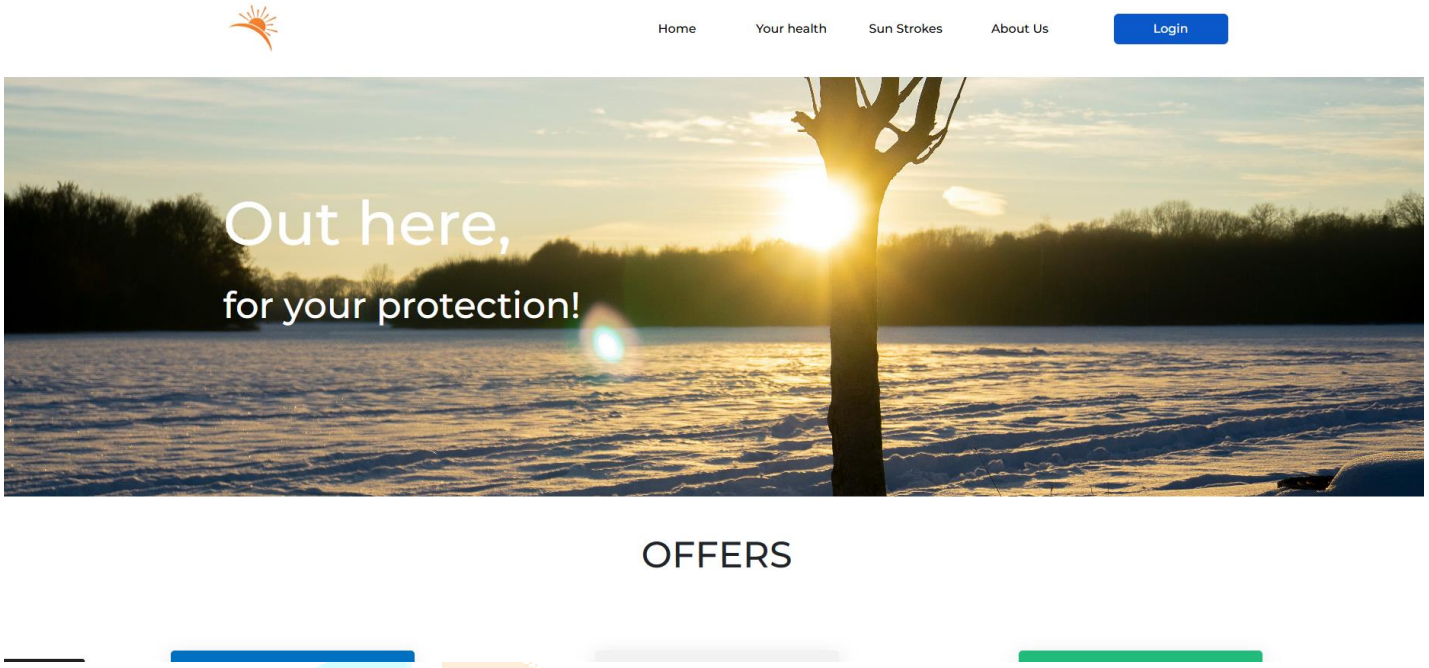


Fig. 3.1. Home page displaying the options to access sub-sections of the website

Initially, the home page redirects to the login page as the login constraint is of utmost importance when accessing resources.

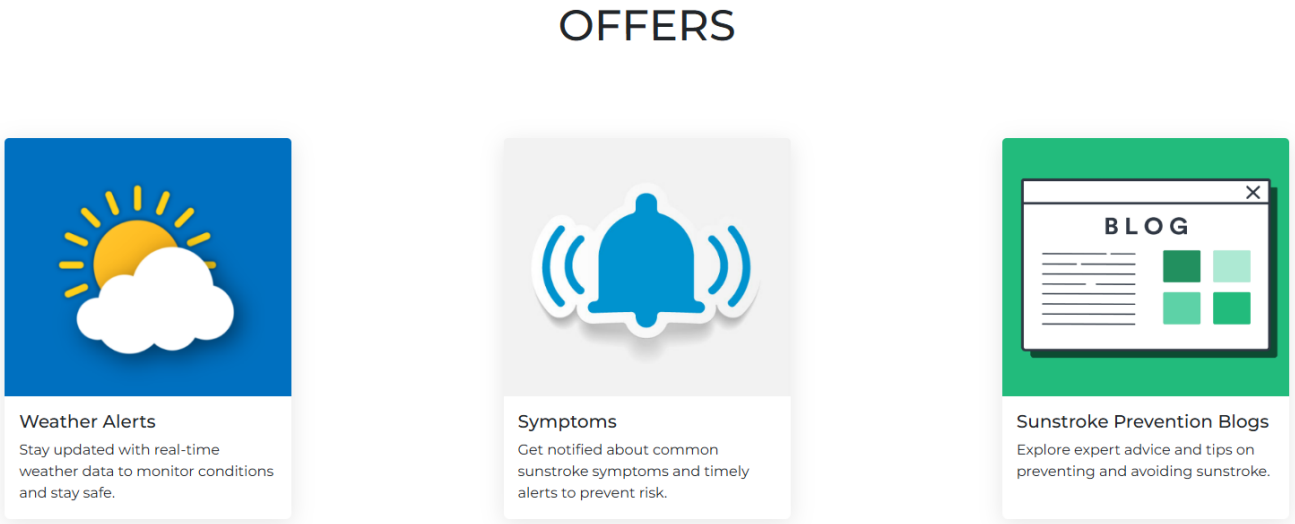


Fig. 3.2. Various cards on the home page leading to another sections.

Figure 4: This is the Login / Sign Up page for our website. The user must fill-up the required fields and Sign Up to access our website. Already Signed Up users can insert their credentials and login to the application. The Login / Sign Up pages are connected to a MongoDB Database.

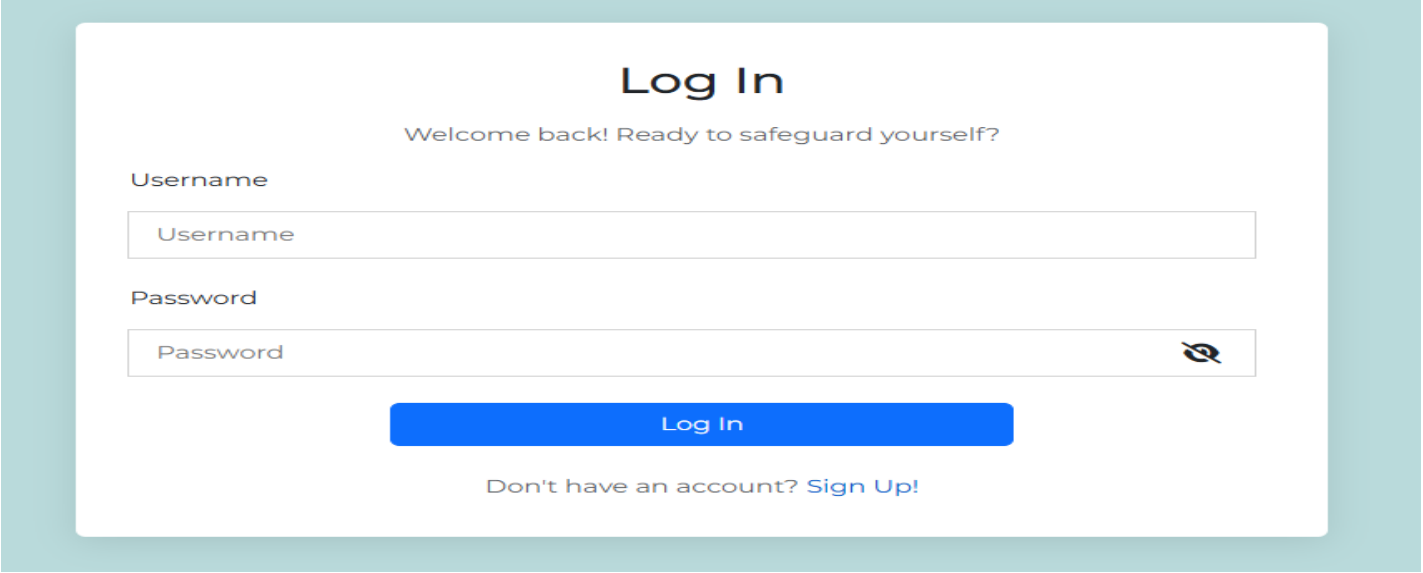


Fig. 4.1. Login Page

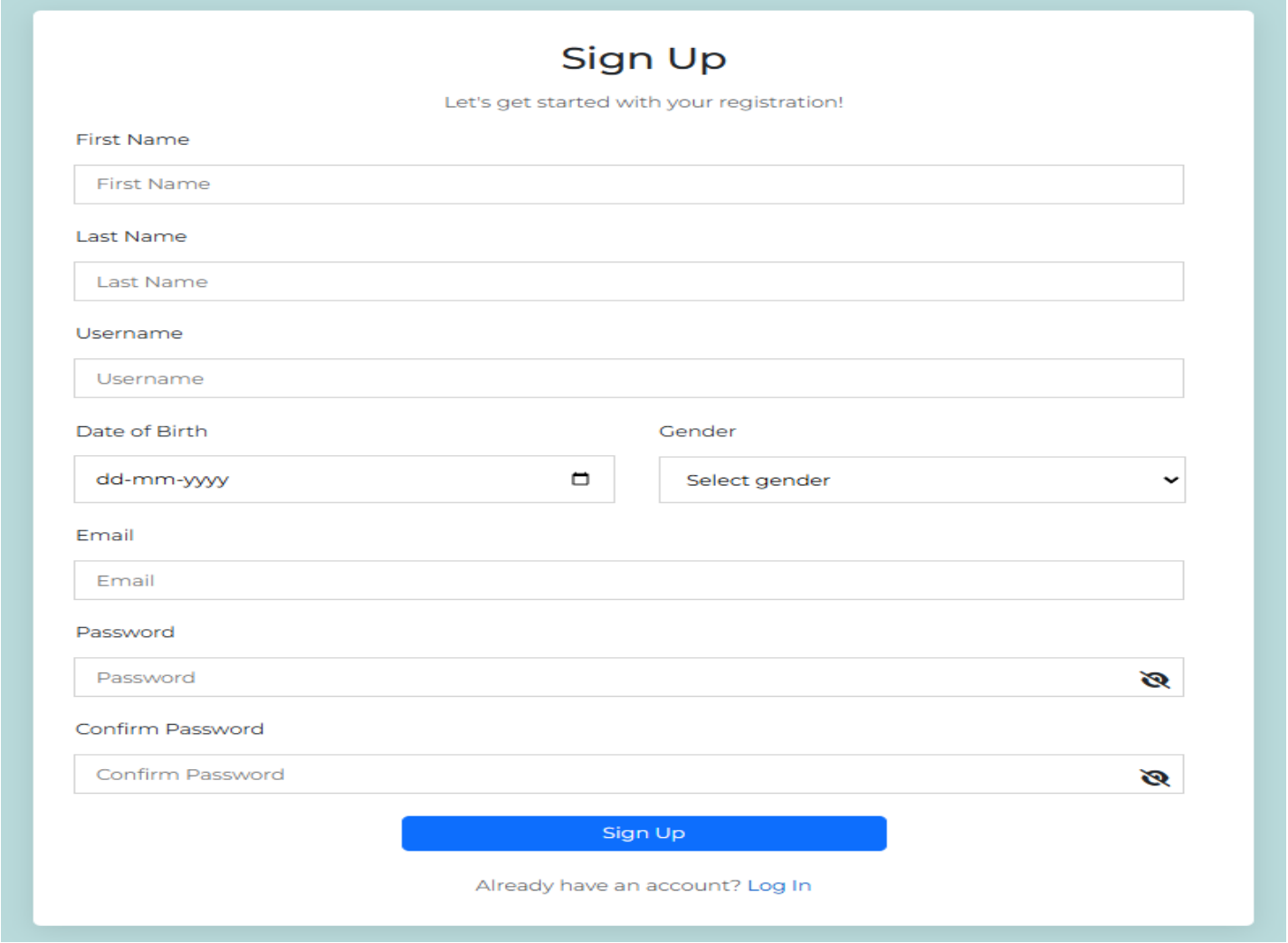


Fig. 4.2. Sign Up Page

Figure 5: Depicts the Knowledge section about our website, free to use. This will lead on to let the user know about various points regarding their health and how they can safeguard their wellbeing.

YOUR FIRST LINE OF DEFENSE

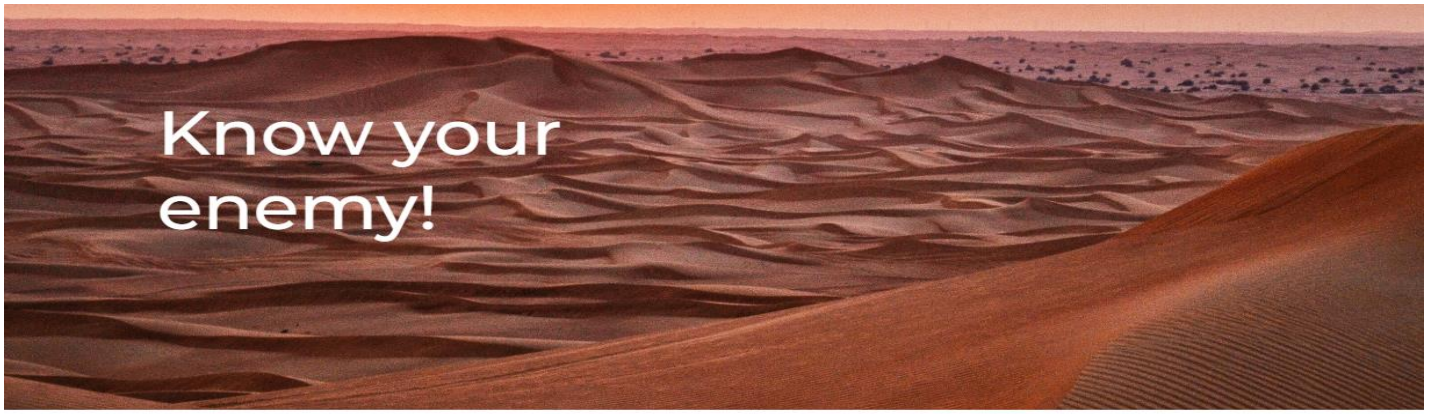
How does one defend themselves from Sun Strokes?

StrokeDefenseImage

Sunstroke, also known as heat stroke, is a serious condition that occurs when the body becomes overheated due to prolonged exposure to high temperatures, particularly in hot and humid environments. It can lead to life-threatening complications if not addressed promptly. To prevent sunstroke, it is essential to take proactive measures such as staying hydrated, wearing appropriate clothing, and limiting exposure to direct sunlight during peak hours. Using sunscreen, avoiding strenuous activities in extreme heat, and being mindful of early symptoms like dizziness or nausea can further reduce the risk. By adopting these practices, individuals can effectively protect themselves from the harmful effects of sunstroke.

Methods to defend yourself

Fig. 5.1. Your Health section



SUN STROKES

Sunstroke, also known as heat stroke, is a severe and potentially life-threatening condition that occurs when the body is exposed to extreme heat for an extended period, causing the body's temperature regulation system to fail. Normally, the body cools itself by sweating, but when exposed to high temperatures, especially combined with dehydration, the body can no longer maintain a safe core temperature. When body temperatures rise above 104°F (40°C), the heat overwhelms the body's ability to cool down, leading to serious health risks.

SunStrokeImage

Unlike heat exhaustion, which is a milder form of heat-related illness, sunstroke can lead to significant damage to the brain, heart, kidneys, and muscles. The longer it takes to lower the body temperature, the greater the risk of complications. The condition can come on suddenly, often without warning, and requires immediate medical attention. If untreated, sunstroke can result in long-term organ damage or even death.

SunStrokeImage SunStrokeImage

Sunstroke is most commonly seen during periods of extreme heat, such as heatwaves, and affects people who spend long hours outdoors or engage in strenuous

Fig. 5.2. Sunstrokes Section

Figure 6: Depicts the dashboard page of the website. This is the main section of the website and the user can choose our services from here on.
The page is interactive and various CSS elements have been utilized to respond on user actions.

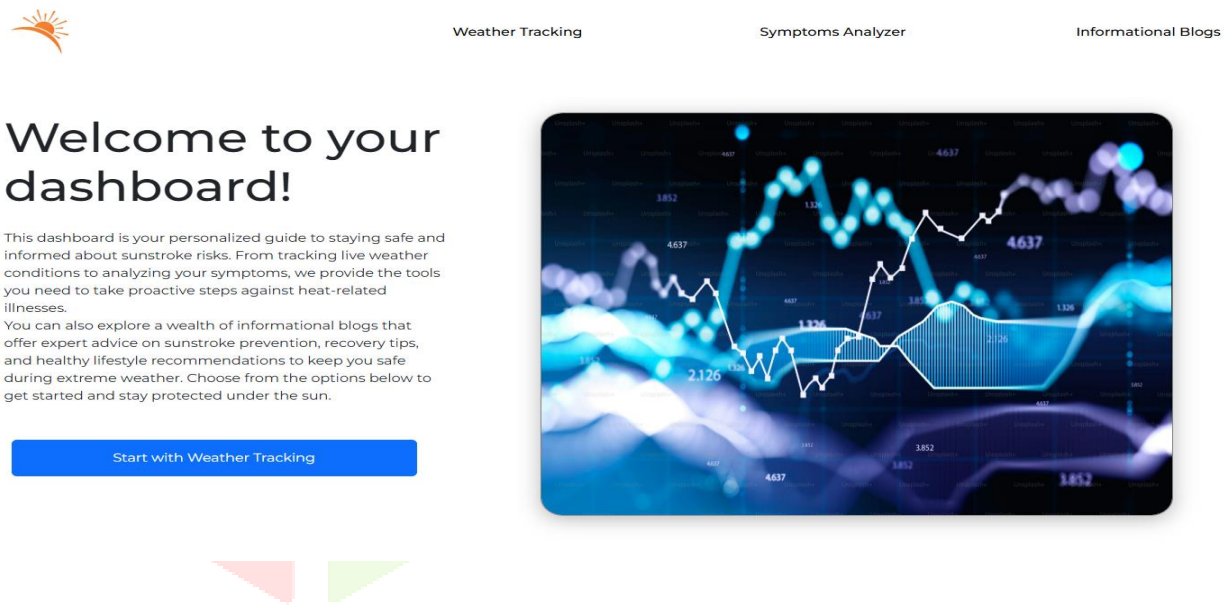


Figure 6.1: Depicts the Weather Tracking section of our website, where the user can track the weather at their current location using GeoCoding.

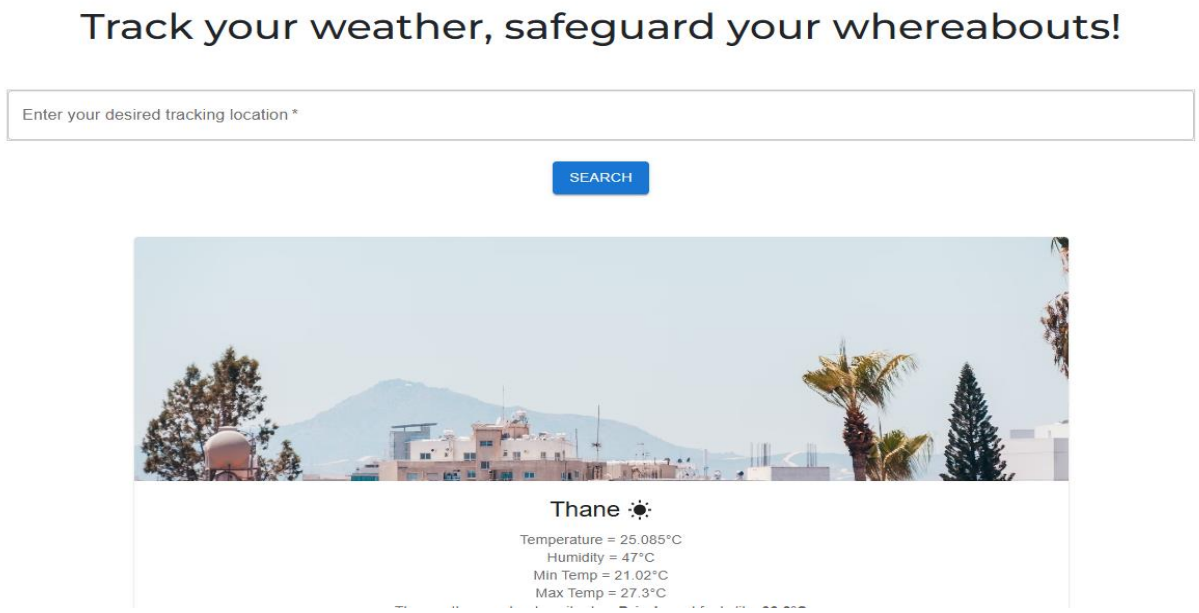


Fig. 6.1. Weather Tracking

Figure 6.2: Depicts the Symptom Analyzer section of our website, where the user can input their symptoms and act accordingly.

Fig. 6.2 Symptom Analyzer

Figure 6.3: The **Blogs section** is designed to showcase informative and engaging articles across a range of topics. Once users navigate to the blogs page, they are presented with a collection of posts, each offering insights, updates, or thought pieces. A structured layout displays blog summaries with a designated 'Read More' button for full article access. This section enhances user engagement and serves as a dedicated space for content exploration within the website.

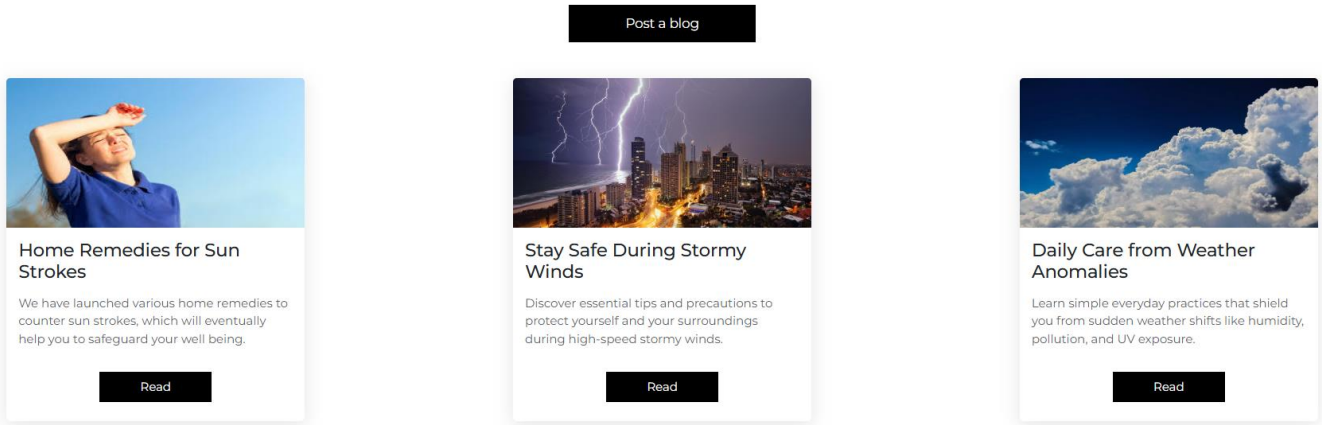


Fig. 6.3. Blogs

3.5 Database Requirements

The database used is **MongoDB** with the **Mongoose ODM (Object Data Modelling)** library for Node.js. The database is relatively lightweight, consisting of a few collections for Login / Sign-Up and Former users.

We have initialized and operated on the MongoDB database through Mongoose in a Node.js environment. The database stores all user credentials from the Login and Sign-Up pages, which are essential to the program's flow.

Figure 8: Displays the database structure and statistics along with currently registered user statistics. Below listed are the schema attributes.

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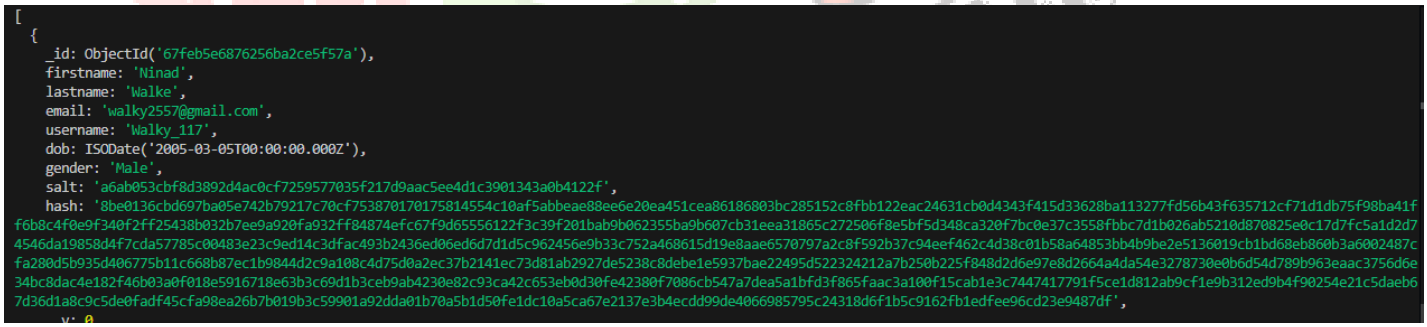

Fig. 8.1. Database details and structure

These fields are directly connected to the website through a PHP server set up on the Login / Sign Up page.

CONCLUSION

In conclusion, our project AtmosAlert addresses the growing intersection between climate change and public health by offering a centralized, intelligent, and accessible web platform that empowers users to make proactive health decisions based on real-time environmental data.
By aligning with the core objectives outlined in our project vision, we have successfully created a system that goes beyond conventional weather apps. AtmosAlert not only forecasts the weather but also interprets it in a personalized health context, helping users understand and mitigate risks such as heatstroke, dehydration, and sunburn.

Key accomplishments include:

- Real-Time Risk Prediction: Leveraging machine learning models hosted on a Flask backend, AtmosAlert delivers dynamic health risk analysis based on user profile data and live weather conditions.

- User-Centric Design: The platform incorporates personalized insights by considering individual attributes such as skin tone, age, location, and outdoor exposure, making health guidance more relevant and effective.

- Interactive Learning and Awareness: Through quizzes and educational content, users are empowered with knowledge about environmental health risks, building climate resilience from the ground up.

- Community Engagement: The integrated blog and discussion platform creates space for user stories, peer learning, and climate-health awareness—transforming users into a supportive, informed community.

- Free and Accessible: As a fully web-based platform, AtmosAlert is designed to be available to anyone with an internet connection—promoting equity in access to environmental health resources.

With climate conditions becoming increasingly unpredictable and extreme, AtmosAlert serves as a vital digital ally in promoting safety, preparedness, and awareness. It simplifies complex meteorological data into actionable health insights, encouraging users to make smarter, safer daily choices—whether they're planning a hike, commuting to work, or just heading out for groceries.

In essence, AtmosAlert is not just a weather app—it's a personal health shield against the changing climate.

FUTURE SCOPE

AtmosAlert, while currently serving as a robust platform for personalized weather-health awareness, holds immense potential for further development and expansion. Here are some forward-looking ideas that can elevate the platform to the next level:

- Real-Time Sun Exposure Tracking via Camera Input
  Integrate advanced computer vision techniques using OpenCV and TensorFlow to analyze selfies for signs of sunburn, dehydration, and sweating, enabling real-time sun exposure alerts and guidance.

- Gamification and Leaderboards
  Introduce leaderboard-based health challenges—such as hydration reminders, sun safety quizzes, or outdoor exposure management tasks—to encourage a healthy, competitive spirit among users and boost engagement.

- Multi-Language Support and Localization
  Add support for multiple regional and international languages, making the platform accessible to a more diverse population across different geographies and increasing climate-health literacy at a global scale.

- Wearable and IoT Integration
  Extend the system's functionality by integrating with smartwatches and fitness bands to track user vitals (e.g., heart rate, body temperature) for enhanced health risk predictions based on both environmental and physiological data.

- Emergency Alert System
  Build an automated alert mechanism that pushes location-based emergency health advisories during extreme weather events (e.g., heatwaves, high UV index) via SMS or in-app notifications.

- Community Forums & Expert Interactions
  Enable moderated forums where users can ask questions, discuss symptoms, or get advice from medical professionals, dermatologists, and climate scientists.

- AI-Driven Health Recommendations
  Use AI to offer tailored product recommendations such as sunscreens, hydration kits, or protective gear based on user profiles and risk predictions.

ACKNOWLEDGEMENT

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