CAPSTONE PROJECT REPORT

UV Index Exposure Tracker Tool (Prototype)

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1. Client Introduction / Organization Background

Southern Skin Cancer Treatment Centers of America (SSCTCA), headquartered in Dallas, Texas, is a patient-focused medical organization specializing in sun-exposure-related dermatological conditions. Its mission is to improve patient health outcomes by combining research, preventive care, and accessible digital tools that empower patients to understand the risks associated with ultraviolet (UV) radiation.

The organization serves a broad client base, including high-risk skin cancer patients, post-treatment monitoring groups, and individuals seeking preventive guidance. While the organization has clinical staff, dermatologists, and administrative personnel, it currently lacks digital infrastructure for UV trend monitoring. With rising cases of skin cancer nationwide, SSCTCA identified the strategic opportunity to deploy a UV exposure tracking system to better support preventive interventions.

This project was designed in partnership with the client as a solo-developer initiative, providing a functional prototype that aligns with SSCTCA's patient education goals and future digital transformation roadmap.

2. Analysis Work Performed

This capstone project followed a structured analysis process inspired by systems analysis and design methodologies. The purpose of the analysis phase was to understand the client's current limitations, articulate a clear problem statement, evaluate existing technological gaps, and outline a viable pathway toward a functional solution.

<u>Problem Summary:</u>

Patients lacked a reliable method for viewing historical and forecasted UV index levels. Existing weather platforms do not support medical-use tracking or personalized monitoring capabilities. This created inefficiencies for both patients and support staff.

<u>Current State Evaluation:</u>

• Data: UV data was scattered across external sources with no unified access.

• Process: Patients inconsistently checked UV conditions, often relying on unreliable apps.

• People: Healthcare staff had to manually explain UV fluctuations without a visual tool.

• Technology: The organization did not maintain any UV data system or visualization tools.

Desired Future State:

The client envisioned a simple, web-based application where patients could enter a location and instantly receive UV trends across a ten-day timeline (five days prior and five days projected). The solution needed to be intuitive and accessible to individuals with little technical experience.

Options Considered:

Several approaches were evaluated, including backend-driven systems, enterprise-level weather analytics platforms, and a lightweight client-side model. Considering cost, timeline, and project scope, a client-side architecture using HTML, CSS, JavaScript, and Chart.js was selected as the optimal approach.

Project Planning:

The project plan consisted of milestone tracking, Work Breakdown Structures (WBS), schedule baselines, risk assessments, communication procedures, and change management processes as documented in the Project Charter. These ensured that the project progressed through analysis, design, development, and testing in an organized manner.

3. Design & Development Work Performed

The design and development phases translated requirements into a working prototype. This section follows a formal structure consistent with software engineering best practices.

Technical Architecture:

A browser-based architecture was selected due to its low cost, high accessibility, and suitability for rapid prototyping. All application logic resides client-side, drawing real-time JSON responses from the Open-Meteo API via HTTPS.

Infrastructure Considerations:

• Development Hardware: Standard laptop with web development tools.

• Software Stack: HTML5, CSS3, JavaScript, Chart.js.

• Network Needs: Reliable internet connection for API queries.

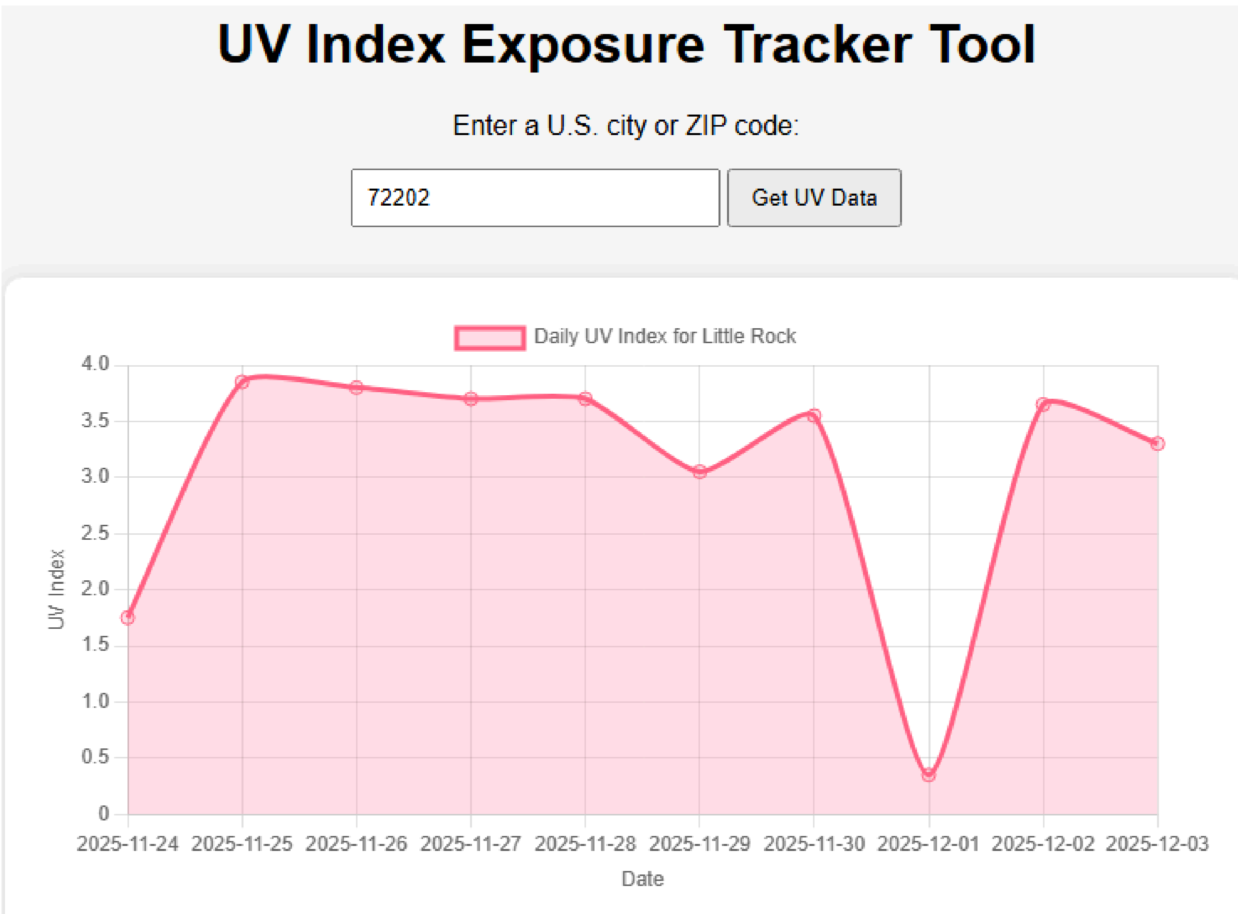
• Version Control: GitHub repository used to track commits.

Data Architecture:

The system retrieves structured JSON data, including hourly UV index values and timestamps. These are processed into chart-ready arrays. No personal data is processed, minimizing privacy risks.

User Interface Design:

The interface features a search bar, a fetch button, and a Chart.js-rendered line graph. The UI was designed with patient accessibility in mind—clear labels, minimal text, and intuitive interactions.



Application Development:

JavaScript modules handle user input processing, API URL formation, asynchronous fetch operations, JSON parsing, dataset transformation, and visualization rendering. Error-handling modules ensure graceful recovery from invalid city names or network failure.

Testing Methodology:

Unit tests validated the correctness of the parsing logic, while integration tests assessed end-to-end functionality. Performance benchmarks confirmed data retrieval and visualization occurring under the 3-second requirement. User Acceptance Testing (UAT) was performed alongside the sponsor to validate clarity, accuracy, and usability.

4. Professional Responsibilities

The project adhered to standards outlined in the ACM Code of Ethics, emphasizing the creation of reliable, transparent, and safe computing systems. Ethical considerations included ensuring the accuracy of health-related data and informing the user of data limitations. While HIPAA did not apply due to the absence of personal data, the project maintained secure communication protocols via HTTPS and avoided any unnecessary data storage.

5. Teamwork (Solo Project)

As a solo capstone project, all project responsibilities were executed independently. This required self-management across multiple roles traditionally divided among team members. Key teamwork-related skills demonstrated include:

• Leadership: Setting clear goals, organizing timelines, and making design decisions.

• Collaboration: Maintaining consistent communication with the sponsor and faculty mentor.

• Accountability: Completing all deliverables on schedule and documenting progress.

• Conflict Resolution: Addressing technical obstacles through research, testing alternatives, and making informed engineering decisions.

This project demonstrates the ability to function as a self-sufficient project team while maintaining professional standards and stakeholder engagement.

6. Support & Integration

To ensure future sustainability, the system should be integrated into SSCTCA’s patient education portal. Recommendations include:

• Hosting the tool on a secure organizational server.

• Periodic monitoring of Open-Meteo API uptime and reliability.

• Adding patient accounts and long-term exposure logs in future expansions.

• Establishing a monthly or quarterly maintenance cycle to evaluate performance metrics.

• Conducting periodic reviews with dermatologists to ensure clinical relevance.

These steps will position the prototype for full deployment and long-term organizational value.

7. Summary / Conclusions / Lessons Learned

The UV Index Exposure Tracker Tool successfully fulfilled its goal as a functional prototype supporting patient awareness of UV exposure. The project demonstrated competencies in systems analysis, design, coding, testing, and documentation.

Lessons learned included:

• The effectiveness of lightweight client-side tools in rapid prototyping.

• The importance of clear and continuous communication with stakeholders.

• The value of designing for usability, especially in patient-facing tools.

• The need for structured planning when executing a solo project.

Overall, the project reflects a strong alignment with ABET student learning outcomes and demonstrates readiness for professional computing practice.

8. References

Open-Meteo API Documentation

ACM Code of Ethics

MDN Web Docs (JavaScript Reference)

Chart.js Developer Documentation

Project Charter (Allen, 2025)

Analysis & Design Document (Allen, 2025)

ABET Capstone Guidelines