MICHIGAN STATE UNIVERSITY

Project Plan Presentation

Safe Journey AI

The Capstone Experience

Team Volkswagen

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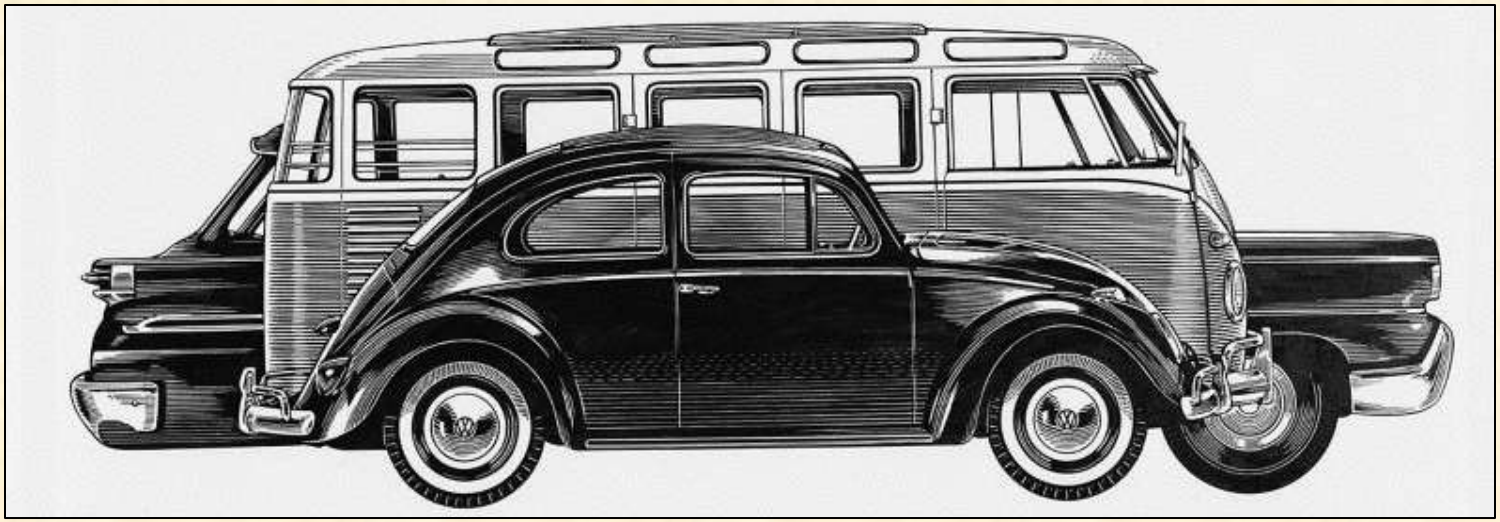
From Students…
…to Professionals

Project Sponsor Overview

- **Global Presence:** Volkswagen, a top car manufacturer globally, produces iconic models like the Beetle and Bus. It operates in over 140 markets with production in 12 countries.
- **Innovation and Sustainability:** Leading in electric vehicle (EV) innovation with the all-electric ID. series, Volkswagen plans to make 50% of its North American sales electric by 2030 and end internal combustion engine production by 2033.
- **Technology and Strategy:** Volkswagen's ACCELERATE strategy focuses on digitalization and electric mobility, with plans to launch ten new electric vehicles by 2026.
- **Capstone Project Alignment:** Our Safe Journey AI project aligns with Volkswagen’s goals by enhancing route planning with AI, using real-time safety ratings and data on crime rates, weather, and traffic hazards to provide a safer driving experience.



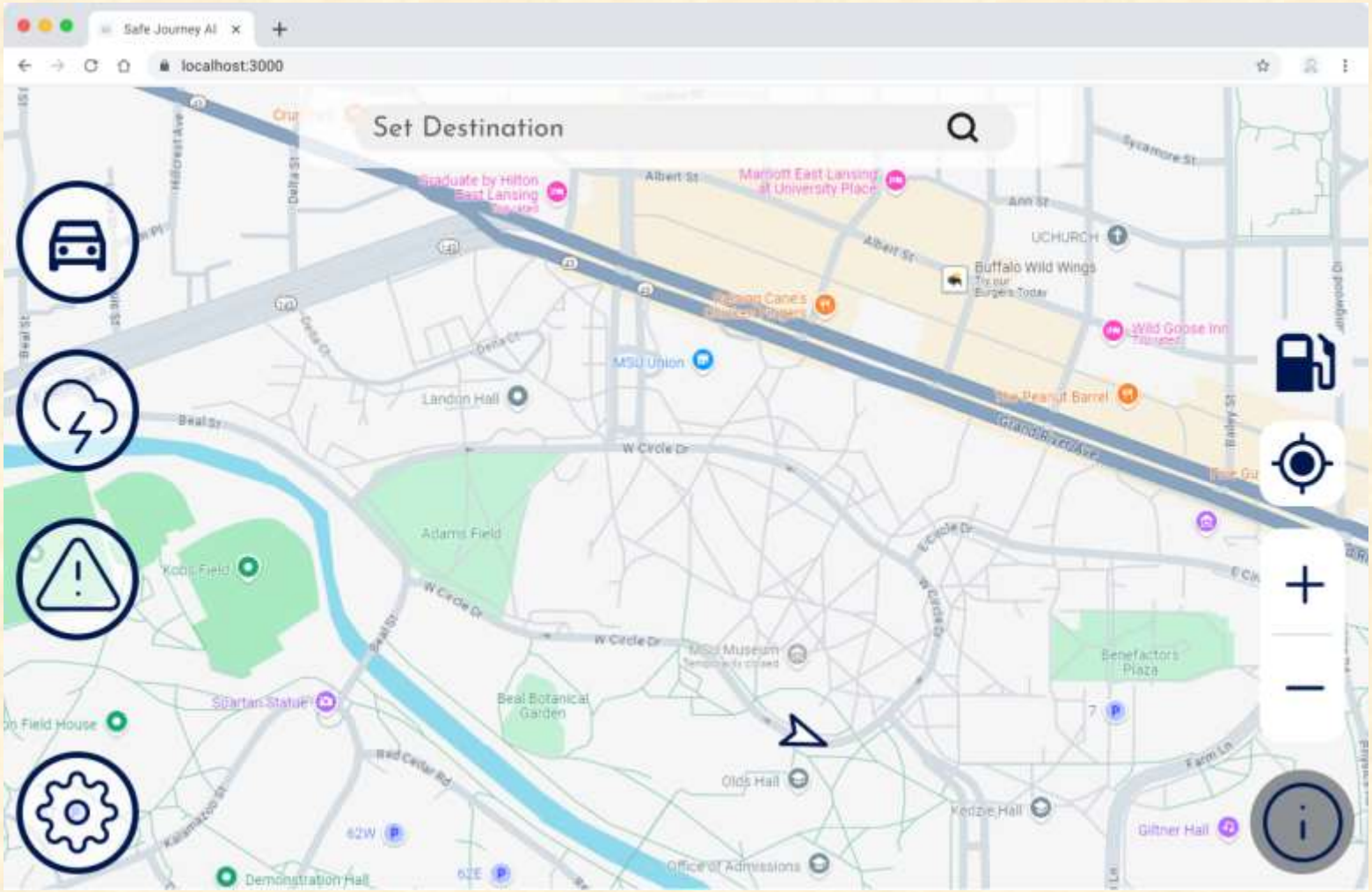
Project Functional Specifications

- **Problem Solved:** Safe Journey AI enhances driver safety by providing real-time updates on external risks such as crime rates, weather conditions, and traffic hazards.
- **Solution Overview:** The system leverages AI to aggregate data from multiple sources, offering real-time safety ratings and alternate route suggestions to mitigate risks during the journey.
- **Key Features:**
  - Provides alerts about safer refueling and parking options based on current weather and traffic conditions.
  - Monitors the route in real-time and adjusts safety recommendations accordingly.
- **User-Friendly Integration:** Designed for seamless embedding into Volkswagen's in-car applications, allowing for continuous journey monitoring with clear safety ratings and actionable recommendations.

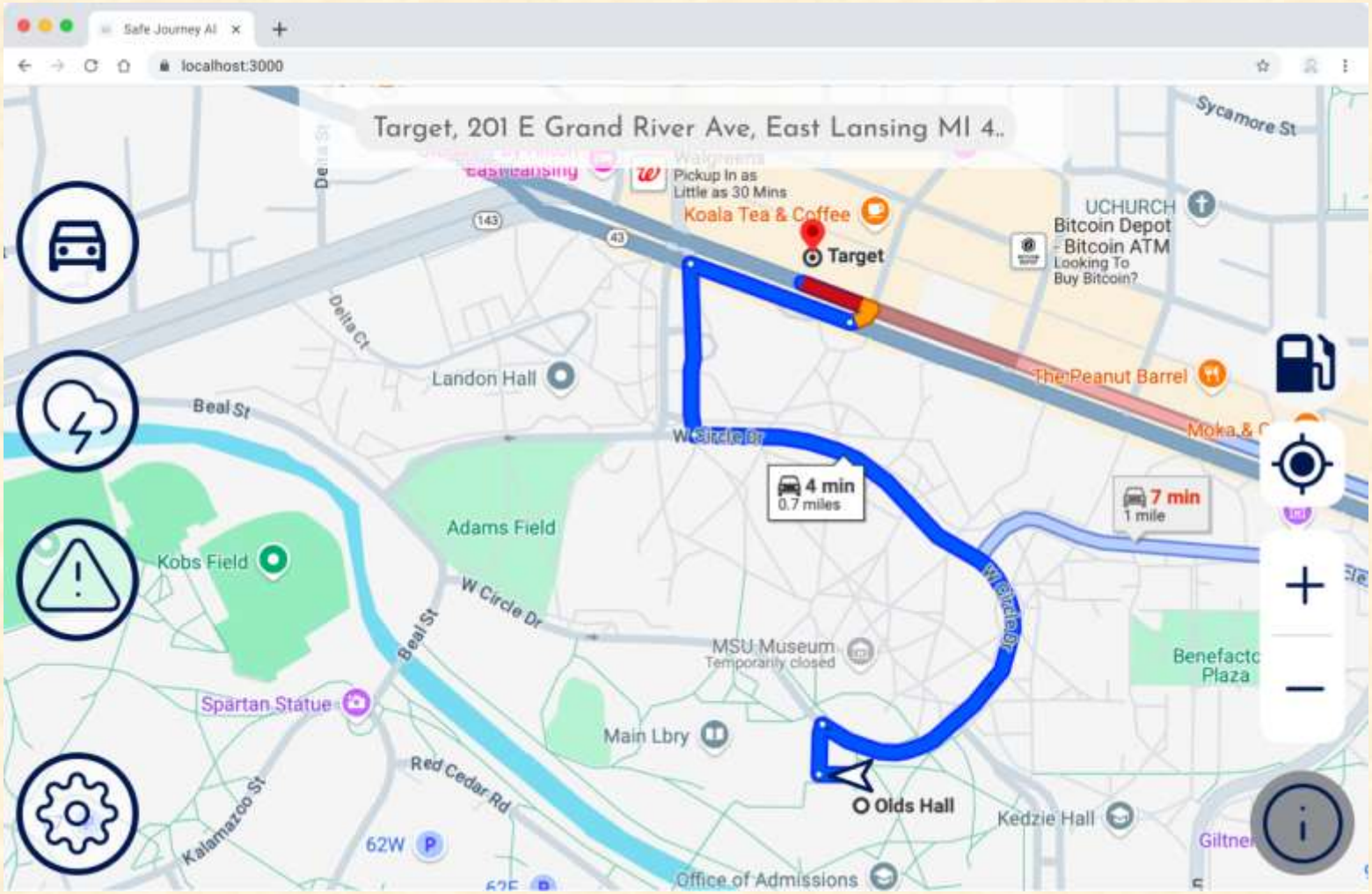
Project Design Specifications

- **Integration with Volkswagen:** The system is embedded into Volkswagen's infotainment navigation, providing drivers with real-time safety insights during their journey.
- **Data-Driven Route Optimization:** Analyzes historical crime data and current weather conditions to assess route safety. The system dynamically reroutes based on emerging risks and custom thresholds the user may change.
- **User-Friendly Interface:** The interface is designed for ease of use, tailored for left-side navigation in Volkswagen vehicles. It provides clear, actionable safety ratings and route options.
- **Real-Time Alerts:** The software delivers real-time alerts for high-risk areas, weather conditions, and traffic hazards to ensure drivers stay informed and make safer choices.

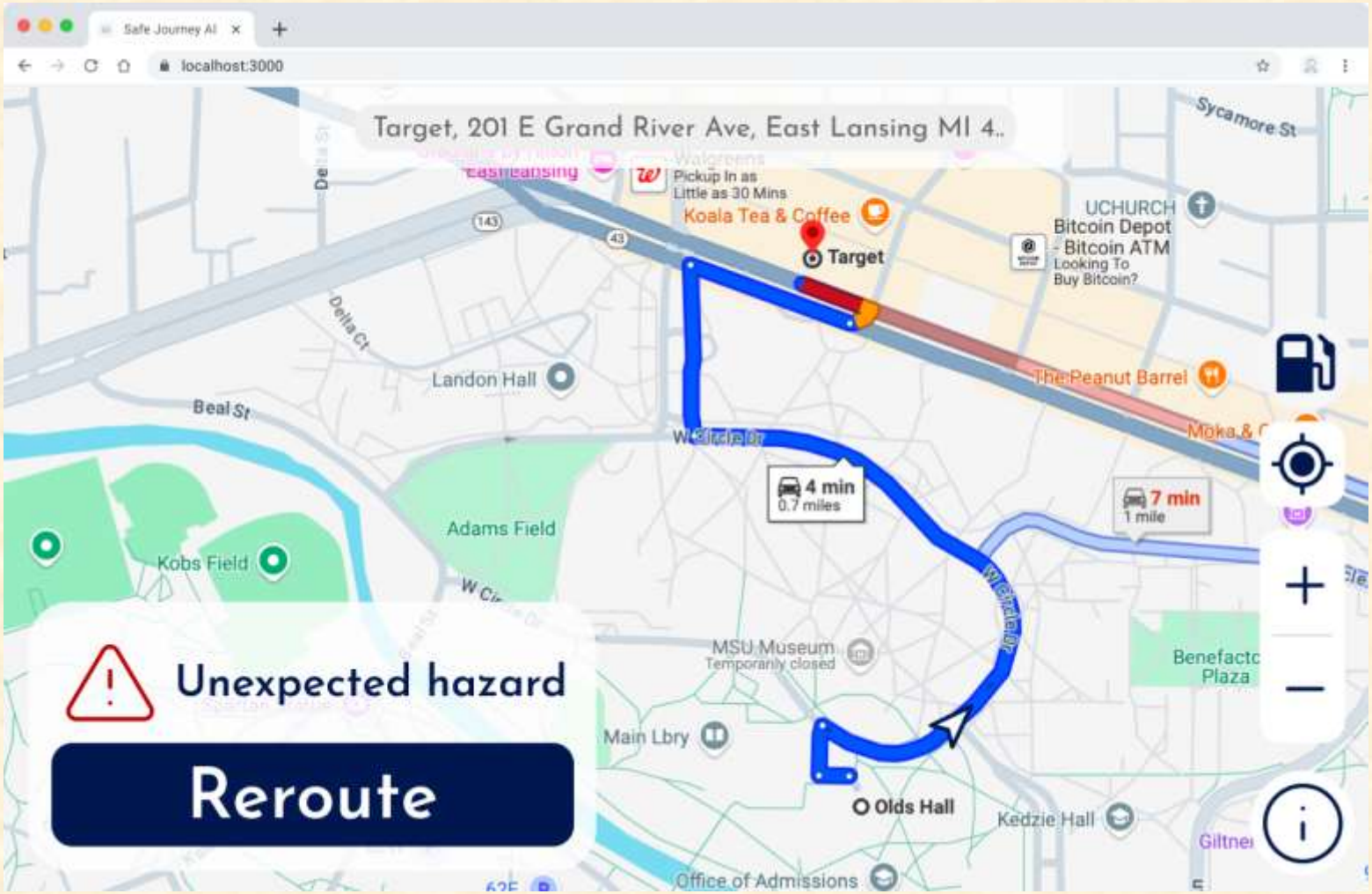
Screen Mockup: Base Map



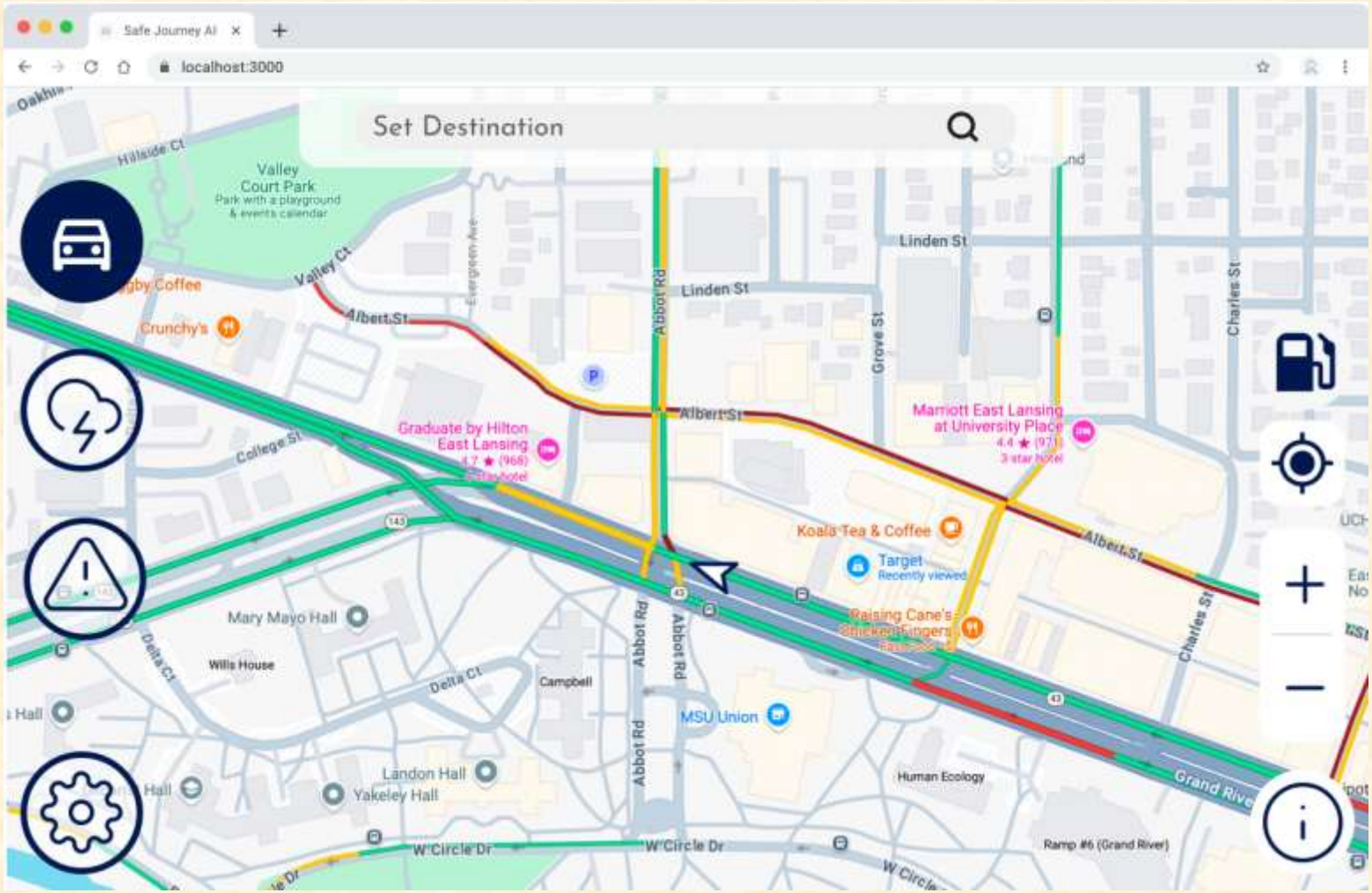
Screen Mockup: Route Selected



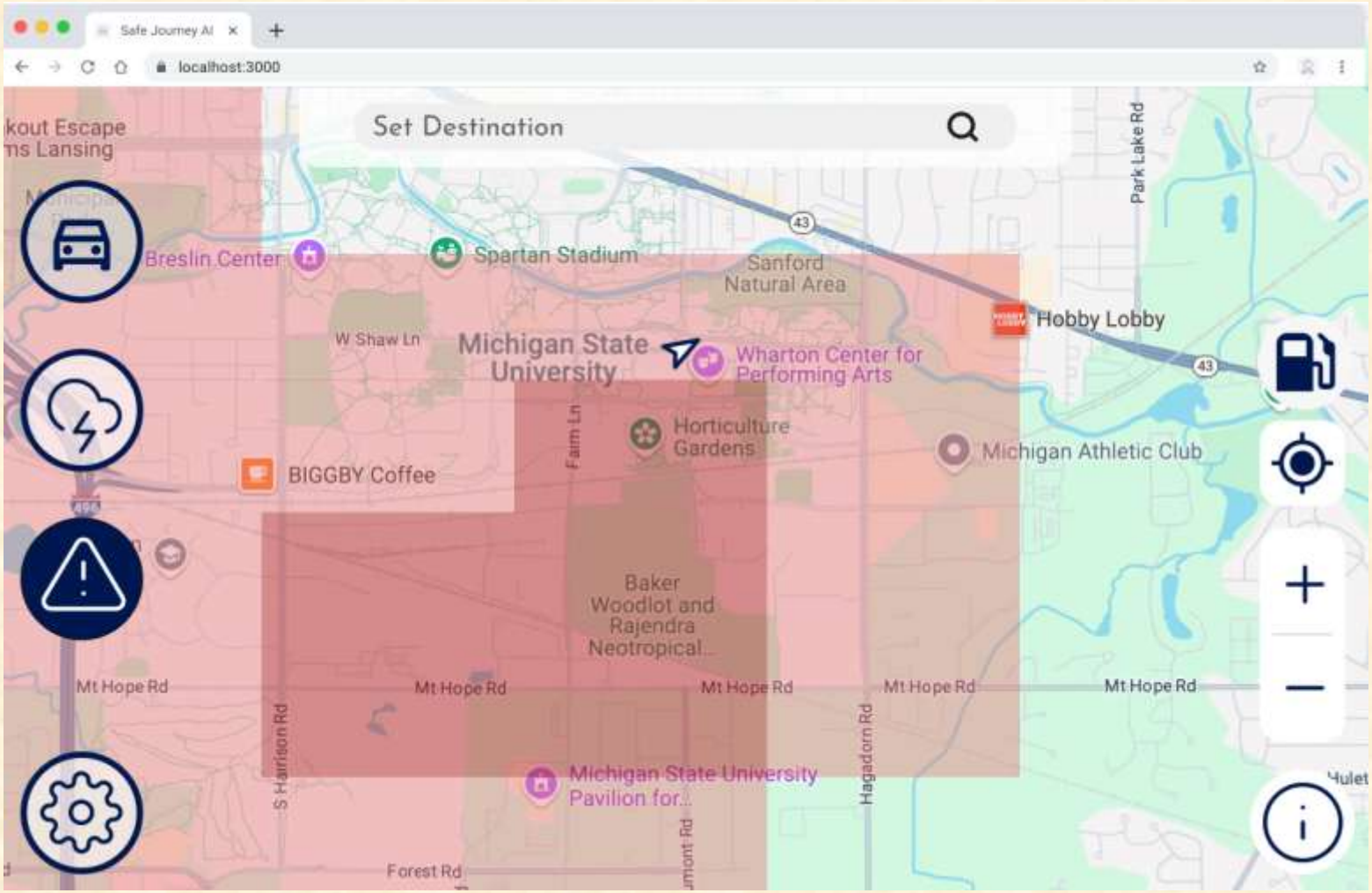
Screen Mockup: Real-time Alert



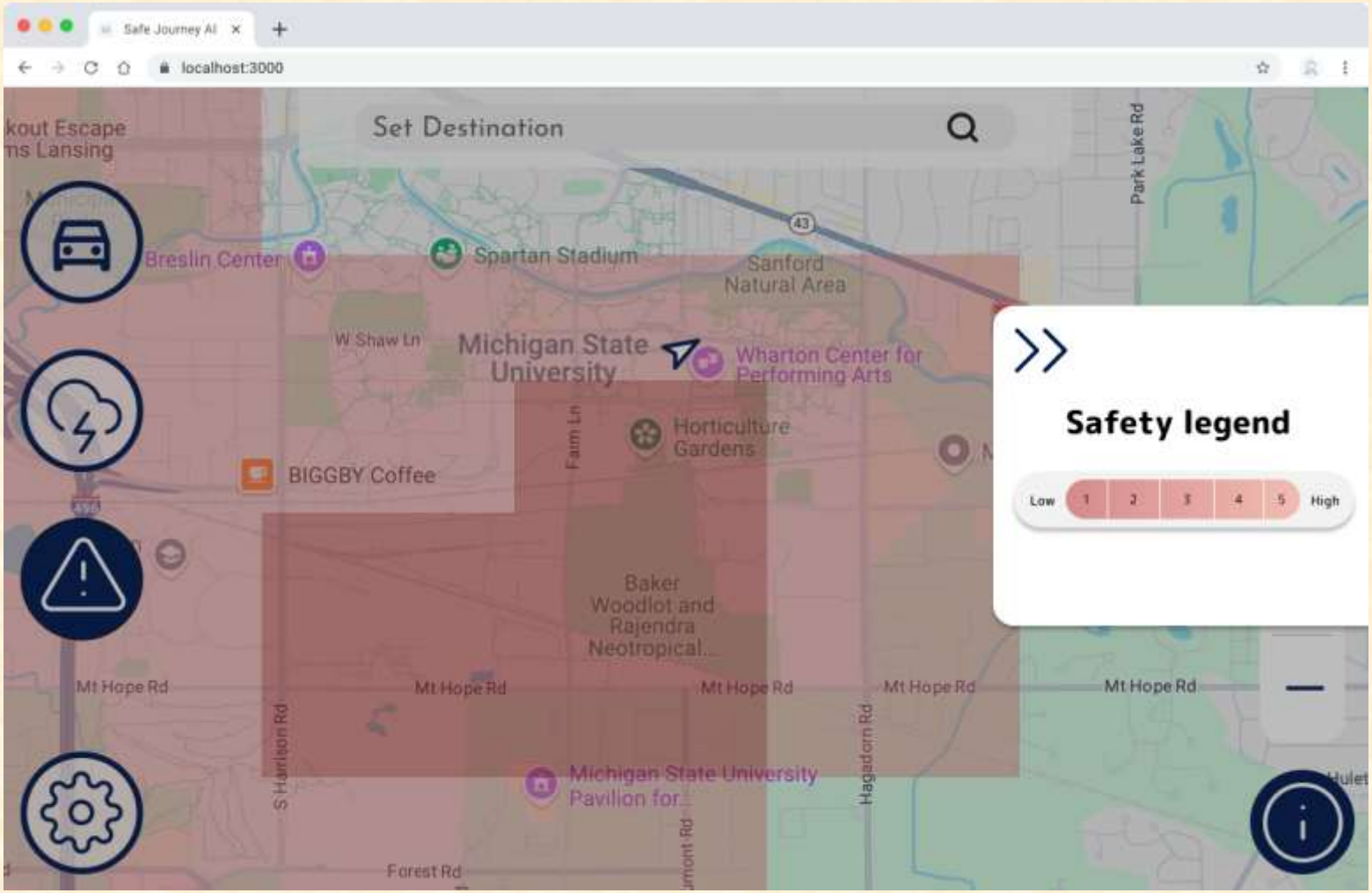
Screen Mockup: Traffic Map Overlay



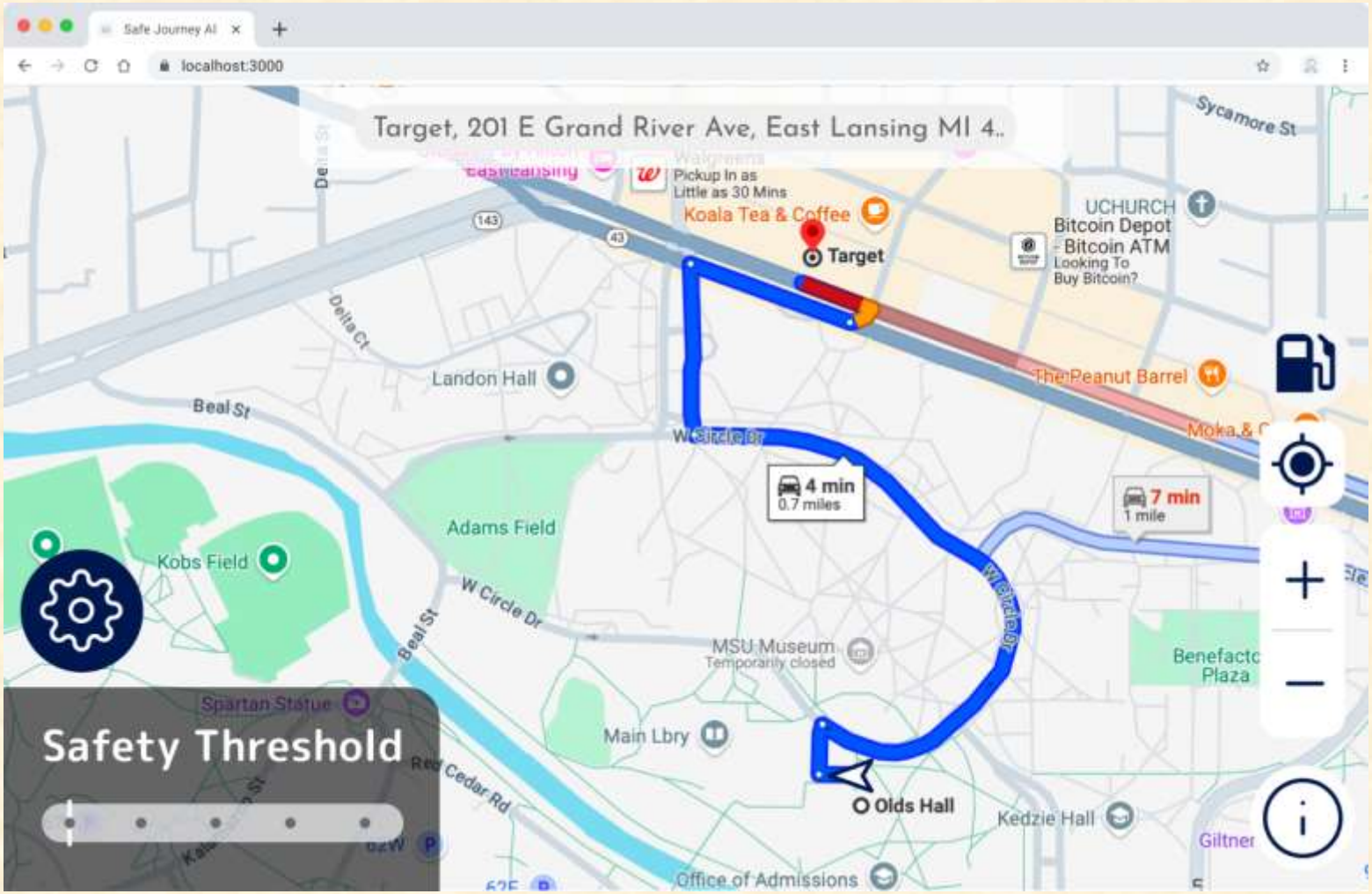
Screen Mockup: Safety Map Overlay



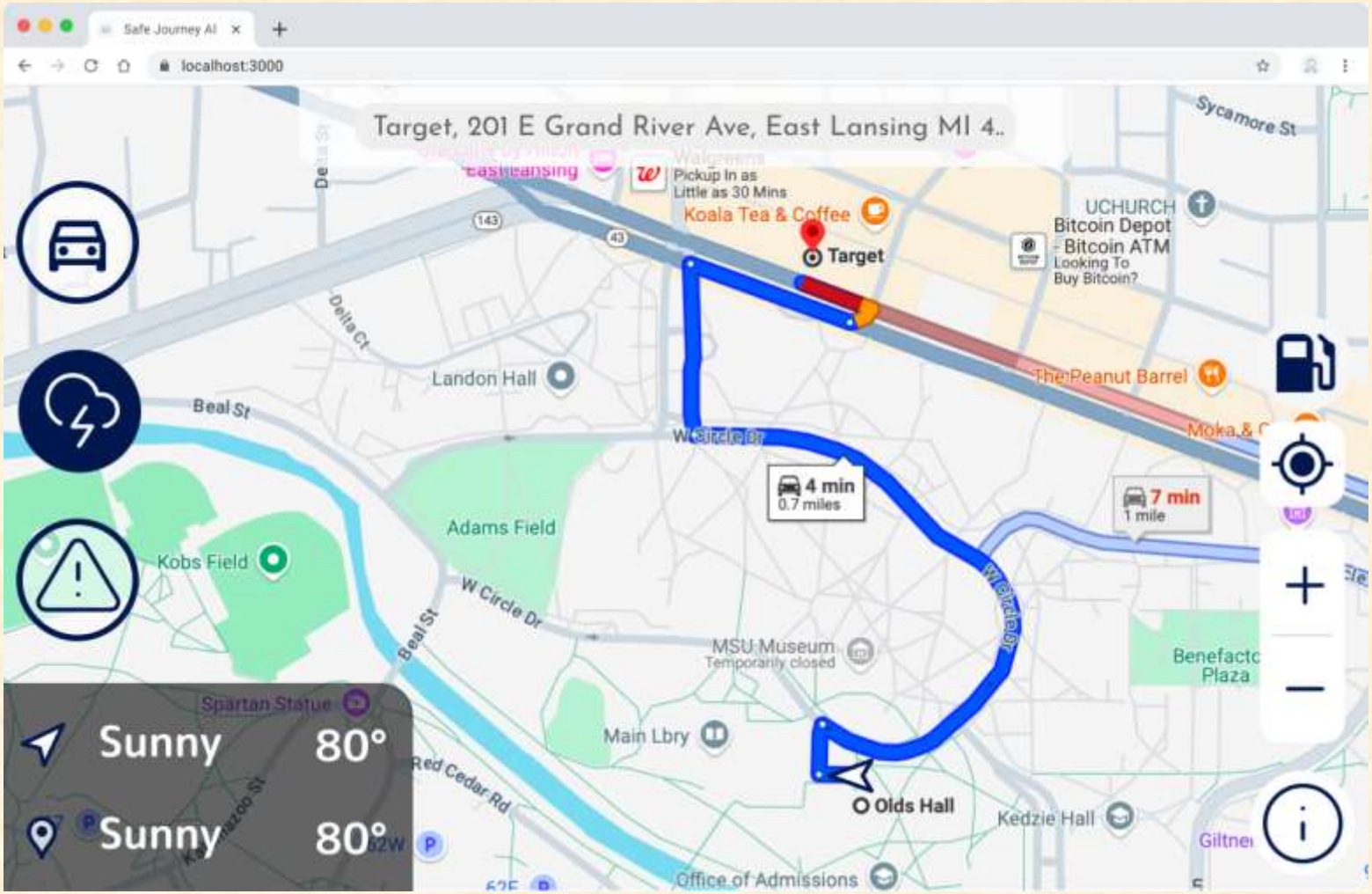
Screen Mockup: Safety Map Information



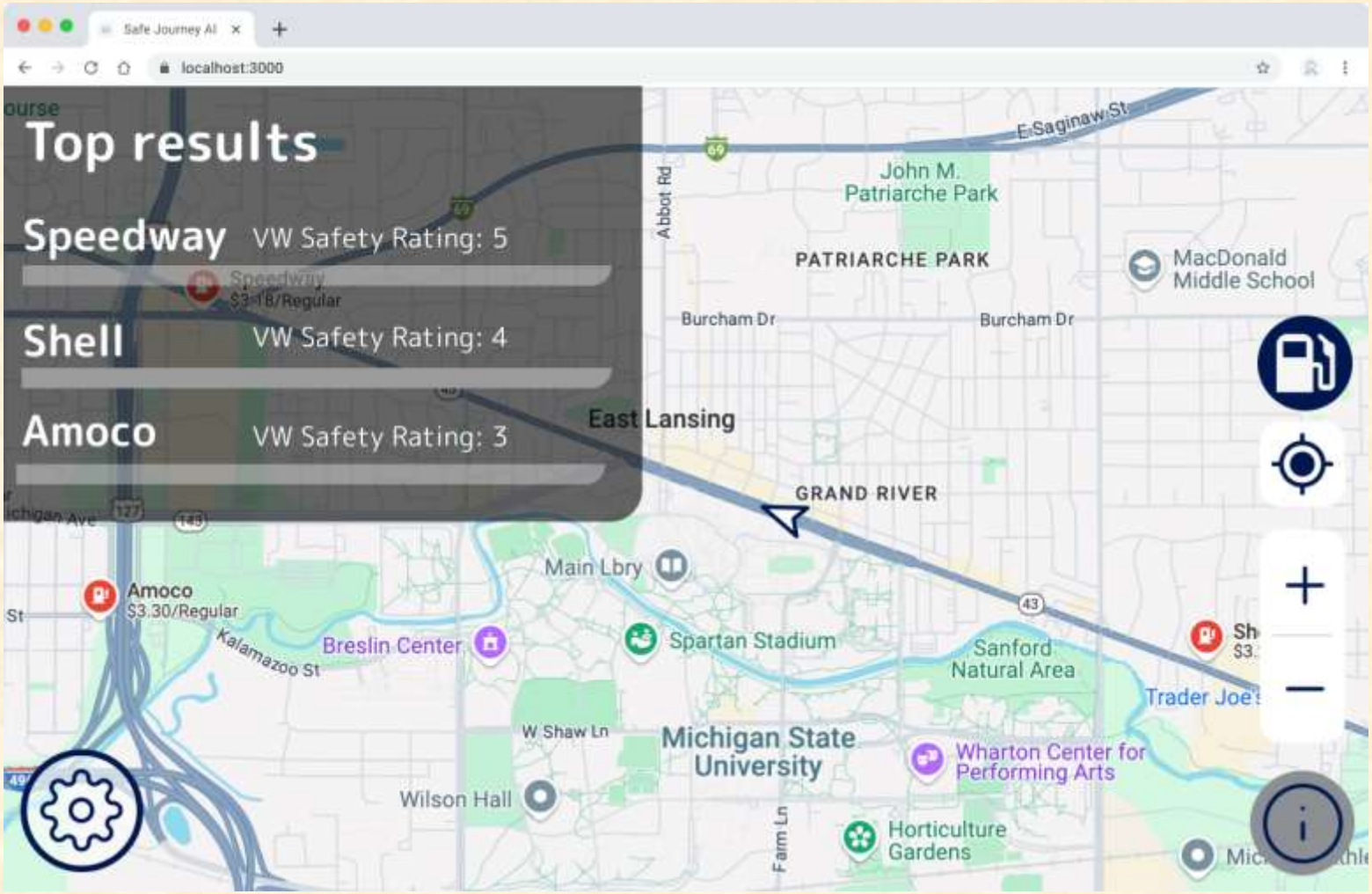
Screen Mockup: Adjusting Safety



Screen Mockup: Weather at Locations



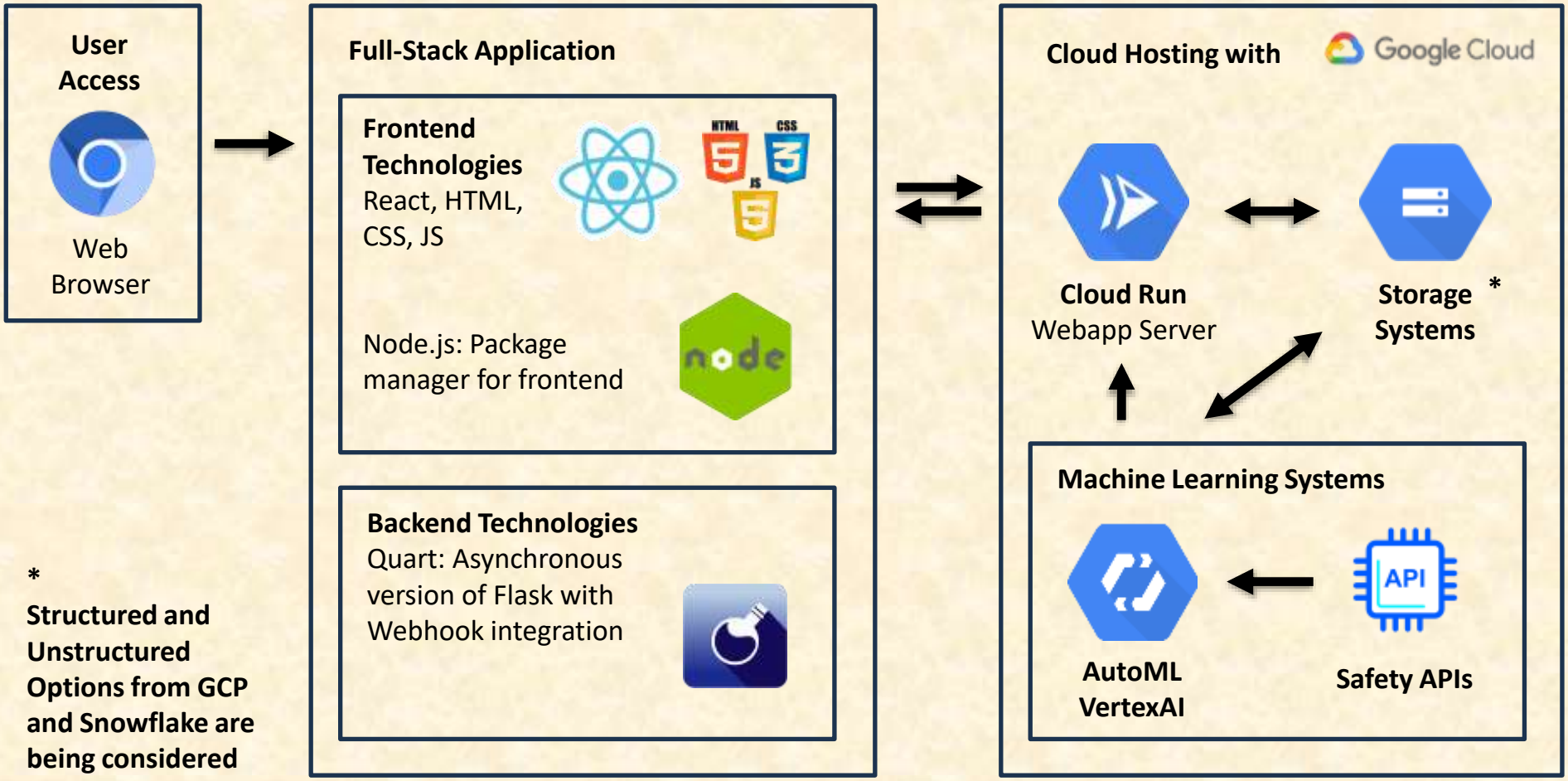
Screen Mockup: Gas Station List



Project Technical Specifications

- **Technology Stack:**
  - **Frontend:** Built using **React** for fast, responsive UI development, managed with **Node.js**.
  - **Backend:** Developed with **Quart Python** for asynchronous programming and webhook compatibility.
  - **Hosting:** Deployed on **Google Cloud Platform (GCP)** using **Cloud Run** for scalable serverless execution.
- **Machine Learning:**
  - **Vertex AI (AutoML)** on GCP powers routing models, analyzing crime rates and weather data for safe route suggestions.
- **Data Storage:**
  - Data stored on **GCP** or **Snowflake**, ensuring secure and scalable data management.
- **Real-Time Decision Making:**
  - **TensorFlow** and **Scikit-learn** power real-time, dynamic route updates.
- **Key Features:**
  - Provides real-time safety alerts and alternative routes based on crime and weather data.
  - Fully integrates with Volkswagen's navigation system for an intuitive user experience.

Project System Architecture



Project System Components

- Software Platforms / Technologies
  - Web Application: accessible via web apps on Volkswagen infotainment units running Chromium
  - Cloud Run: Hosting the full-stack application on Google Cloud Platform for serverless Docker deployments
  - Storage Systems: Structured and Unstructured data storage on GCP or Snowflake (Potential client-Snowflake deal)
  - Machine Learning Models: Crime ML model, Weather ML Model, Real-time alerts ML model
- Development Environments
  - Python venv, Vite: Web application development
  - AutoML/Vertex AI: Training and running ML models
  - Machine Learning: Python, TensorFlow, Sci-kit learn

Project Risks

- Ethical Considerations
  - Application could be biased against low-income areas with regards to safety concerns
  - User customizable safety rating threshold
- Sending ML & AI Responses to front-end
  - The team has no experience on sending data from backend to fronted
  - Implementing webhooks that can send payload to the maps service
- Web app turn by turn directions
  - No resources on GPS navigation for any web application
  - Option to pivot to a step-by-step directions API without GPS navigation
- Simulated Route Navigation Testing
  - No real time GPS on the web application to test navigation
  - Inject a list of fake location coordinates to simulate movement along a route

Questions?