

Project Proposal – Team 6

Project Road Safety

Road Report AI

Project Overview

Road data is complex and highly subjective. Road conditions change frequently, and their effects on drivers are unpredictable. Because of this, emergency services cannot accurately predict where accidents are most likely to occur, and city planners lack a data-driven way to prioritize road improvements.

Road Report AI aims to solve this problem by using an artificial intelligence model trained on accident report records to generate a **numerical crash risk score** for roads based on their conditions. This will allow emergency services to prioritize surveillance and response, while also enabling city planners to identify and fix high-risk roads proactively.

Project Scope

Must-Haves

- Accident risk prediction model
- Crash likelihood numerical score
- Data preprocessing and feature engineering
- Front-end interface to view risk results
- Integration with accident datasets
- Google Maps data integration

Nice-to-Haves

- Real-time data updates
- Interactive map visualization
- Historical accident trend analysis
- Filtering by time, weather, or lighting

Stretch Goals

- Live city dashboard for emergency services
 - Road improvement recommendation system
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Project Objectives

- Train an AI model that predicts crash likelihood from road data
- Provide a usable interface for risk visualization
- Support emergency services and city planners with predictive insights

Measurable Goals

- Model accuracy $\geq 75\%$
- API response time $< 2 \text{ seconds}$
- Risk score generated in under **2 seconds**

Success Metrics

- Prediction accuracy
- System response time
- User satisfaction from test group

Specifications

User Interface (UI) Design

- Platform: **Web Application**
- Key Screens:
 - Map-based risk display
 - Road search
 - Risk score output
- Interaction:
 - Search bar
 - Map clicks
 - Filter menus

Backend & APIs

- Database: PostgreSQL
- API Framework: **FastAPI**
- API Type: **REST API**
- Authentication: Oauth
- Data Privacy: Secure storage and restricted access

Data & AI Model

- **Dataset Source:** TxDOT CRIS Query Tool
 - **Additional Data:** Google Maps API, Street View data
 - **Preprocessing:** Cleaning, normalization, feature engineering
 - **Model Architecture:** PyTorch neural network
 - **Output:** Crash likelihood numerical score
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Tech Stack

- **Frontend:** Vue.js, Vite, NPM, TypeScript
 - **Backend:** Python
 - **Database:** PostgreSQL
 - **AI/ML:** PyTorch, Pandas, NumPy
 - **APIs:** Google Maps API, US Weather.gov API
 - **Version Control:** GitHub
 - **AI Tool:** Gemini
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Hardware Requirements

- Developer laptops
 - Internet access
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Software Requirements

- Python
 - Node.js
 - PyTorch
 - GitHub
 - Google Maps API
 - VS Code / IDE
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Project Timeline

Phase	Duration	Tasks	Deliverables
Phase 1	02/13 – 02/27	<p>Clean data set and define the inputs that the model will take as a base (time, weather, location, road type, traffic). Normalize the logs. Make a general coordinated information log. (3 people)</p> <p>Look into map API, figure out how to query AI models for information and determine what a probability and score means. Begin working on Figma for frontend. (2 people)</p> <p>Meeting 1: General definition agreed on. Resources and source of data agreed upon. Finalize technology and agree on definition of tasks</p> <p>Meeting 2: Data set acquired, Figma done or close to done</p>	<p>Clean dataset Figma Dataset schema Documentation</p>
Phase 2	02/28 – 03/13	<p>Begin creating the prototype AI phase. Begin iterating and get some form of consistent output. Begin evaluating initial output and comparing it to expected output. (2-3) people. Reform data as needed.</p>	<p>Wireframes Prototype model Model documentation</p>

		Finish figma and add wireframes. Begin making frontend models based on the figma. Begin writing endpoints to gather and send necessary data to the AI model. Postman should be able to query information at minimum	
Phase 3	03/14 – 04/3	Wrap model iteration, create a full model with a trained prediction function and link it to the backend. Receive coordinates or addresses from frontend (as well as information defined in phase one) and return risk score/probability in a way that is consistently defined.	Functional MVP Working AI model Basic full stack functionality
		The frontend should finish the general page design and implement functionality. Finish API communication with the backend and begin looking into real time updates. As time permits, begin incorporating map API	
Phase 4	04/04 – 04/17	Continue iterating on the AI, perhaps work on getting the AI to accept different modes of inputs (if subscription fee decided upon so including any extra information from the base model). Begin testing and fine tuning based on test results	Functional MVP App Refined AI Model if necessary
		Incorporate some sort of map API in the frontend. Make the map interactable, if an app add location service, work on heat map, allow for future prediction and data manipulation	
Phase 5	04/18 - 5/1	General bug fixes for front and backend. Move away from developing new features and wrap up the systems that already exist. Finish documentation and begin writing final reports and preparing for the demo. As time allows, continue to tune model accuracy.	Final system Demo Documentation Presentation slides

Team Leader Rotation

Duration	Team Leader
02/13 – 02/27	Dennis Keithly
02/28 – 03/13	Kade O'Bar
03/14 – 04/3	Ben Stidham
04/04 – 04/17	Christopher Chaiban
04/18 - 5/1	Jose Rodas

Project Team

Role	Team Member	Responsibilities
Frontend Developer	Ben	UI development
Backend Developer	Jose	API & Database
ML Engineer	Dennis	AI/ML models
QA Tester	Christopher	Testing
Project Coordinator	Kade	Integration & documentation

Links

- GitHub Repository for Frontend: <https://github.com/djkeithly/Road-Report-AI>
- GitHub Repository for Backend: <https://github.com/djkeithly/Road-Report-AI-Backend>
- Agile Board: <https://github.com/users/djkeithly/projects/2/views/1>
- Design Document:
<https://www.figma.com/board/twMfGaebiY9D2FjfYVYh4t/Untitled?t=MeRwHd9WOi86OmtT-1>