

Continuous Visualization of CyRide Through an Interactive Map

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Evan Schlarmann, Endi Odobasic, Andrew McMahon, Braden Buckalew, Chiran Subedi
Client: Soliman, Mohammed Advisor: Selim, Mohamed

Introduction

Problem: The ARA team does not have a way to predict real-time bus mobile UE location when there is no connectivity with the base station.

Solution: The CyRide Visualization project aims to assist in implementing wireless mobile connectivity in Central Iowa by providing predictive data through a visually appealing mapping interface using a machine learning model based on historical data. This will support the ARA team in enabling research experiments with continuous locations of bus UE.

Intended Users:

- **ARA Researchers** need a reliable app to display UE data and predict connectivity trends.
- **CyRide** needs an in-house bus tracking solution to reduce costs and display bus locations.
- **Iowa State Students** need accurate connective data



Figure 1 : Example Route mapping with connectivity

Technical details

- React.js – JavaScript library for building dynamic user interfaces.
- Django – Python framework for building secure web applications.
- MySQL – Relational database management system.
- Git – Version control system for tracking code changes.
- GRU – Type of neural network for sequential data.

Standards

IEEE P3123 – Standard for Artificial Intelligence and Machine Learning (AI/ML)

Design Requirements

Functional Requirements

- Application must run on a Server
- Real-time Bus Tracking with Long/Lat Coordinates
- UE Pinging and Rest API
- Machine Learning GPS Prediction Algorithm
- Websocket
- Database

Nonfunctional Requirements

- Real-time updates must be within a 4 sec window

Design approach

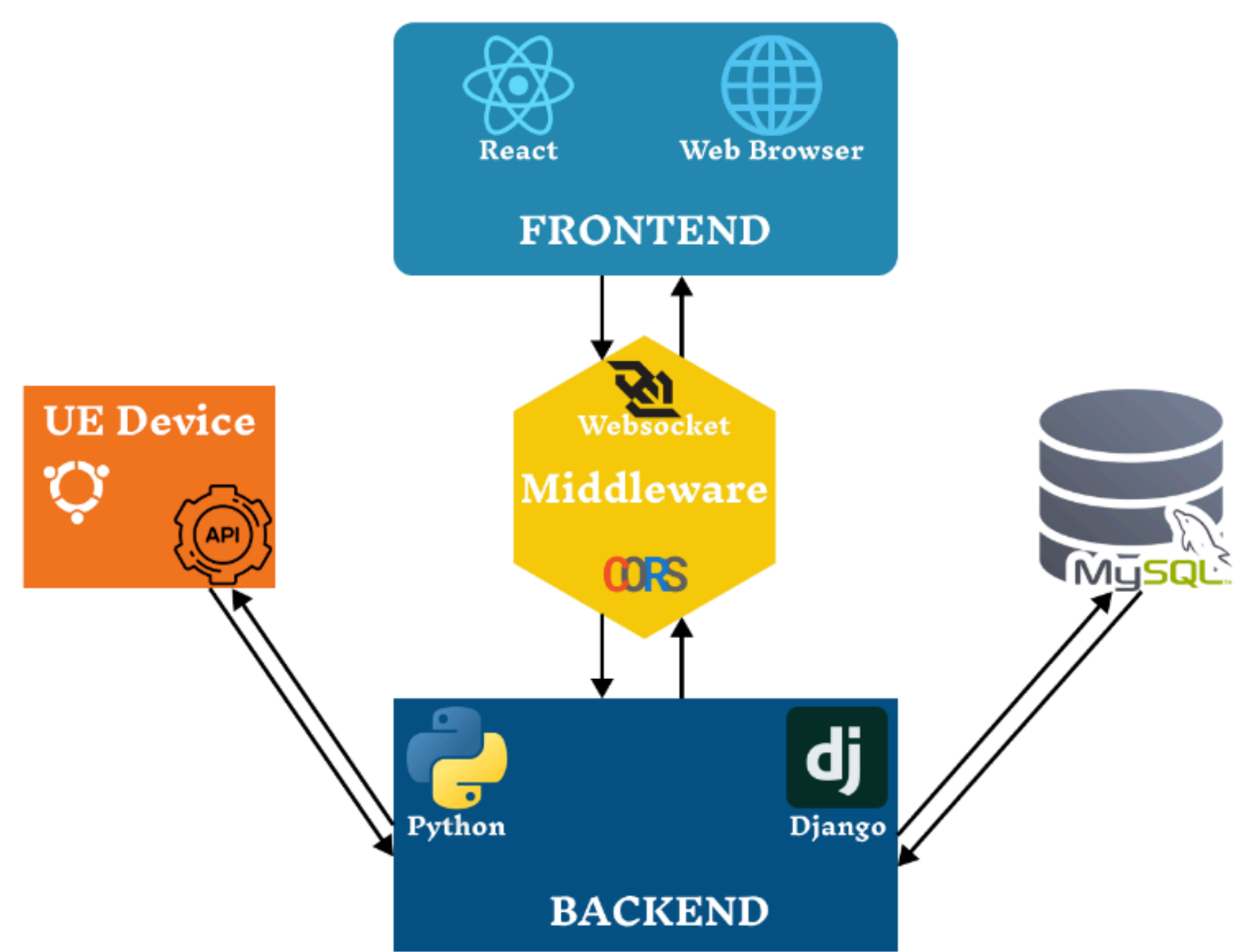


Figure 2 : Design Block Diagram

Testing

- Django/Jest Unit Tests
- Django Integration Tests
- Playwright End to End Tests
- CI/CD Integration

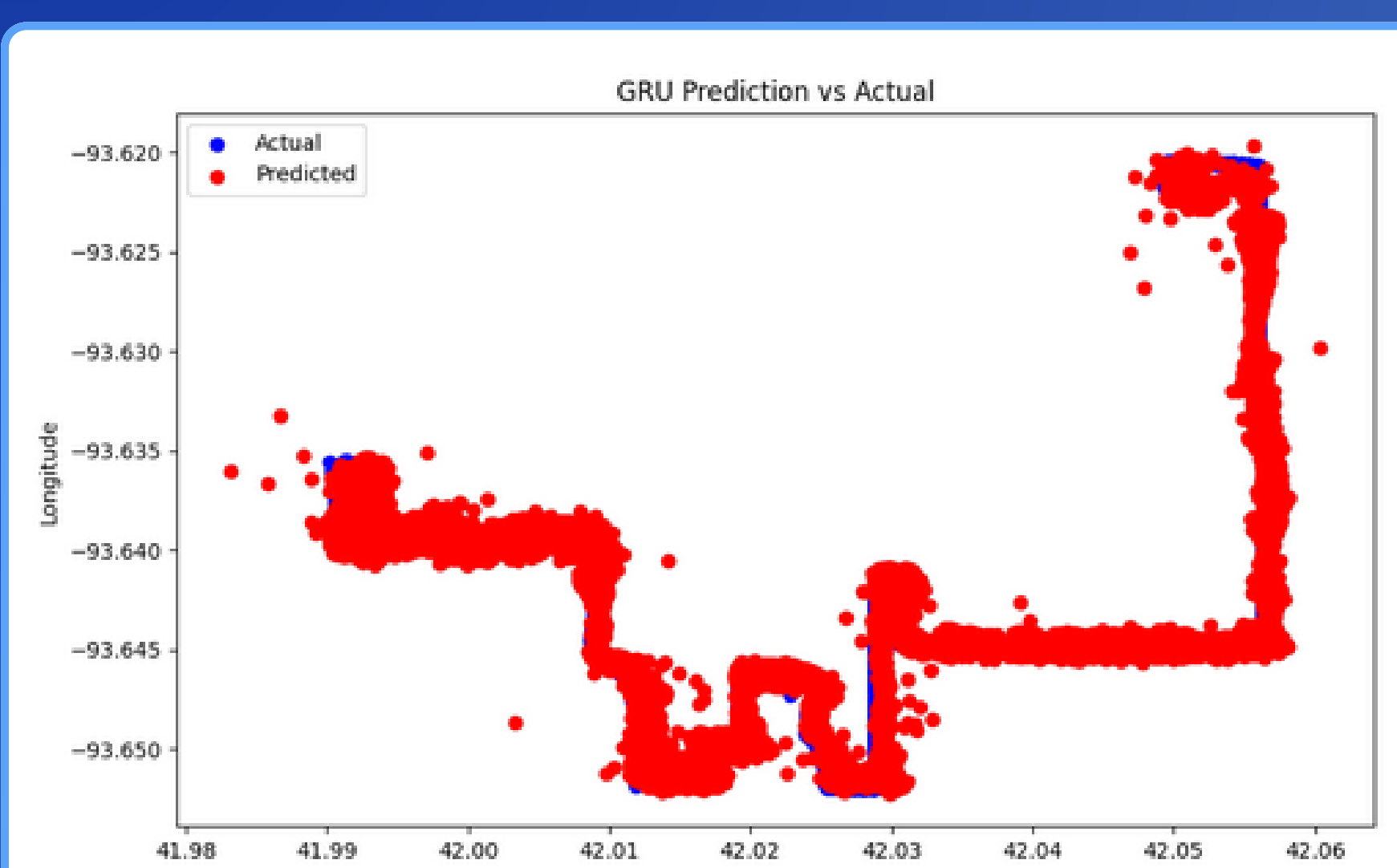


Figure 3: GRU Model Route Predictions

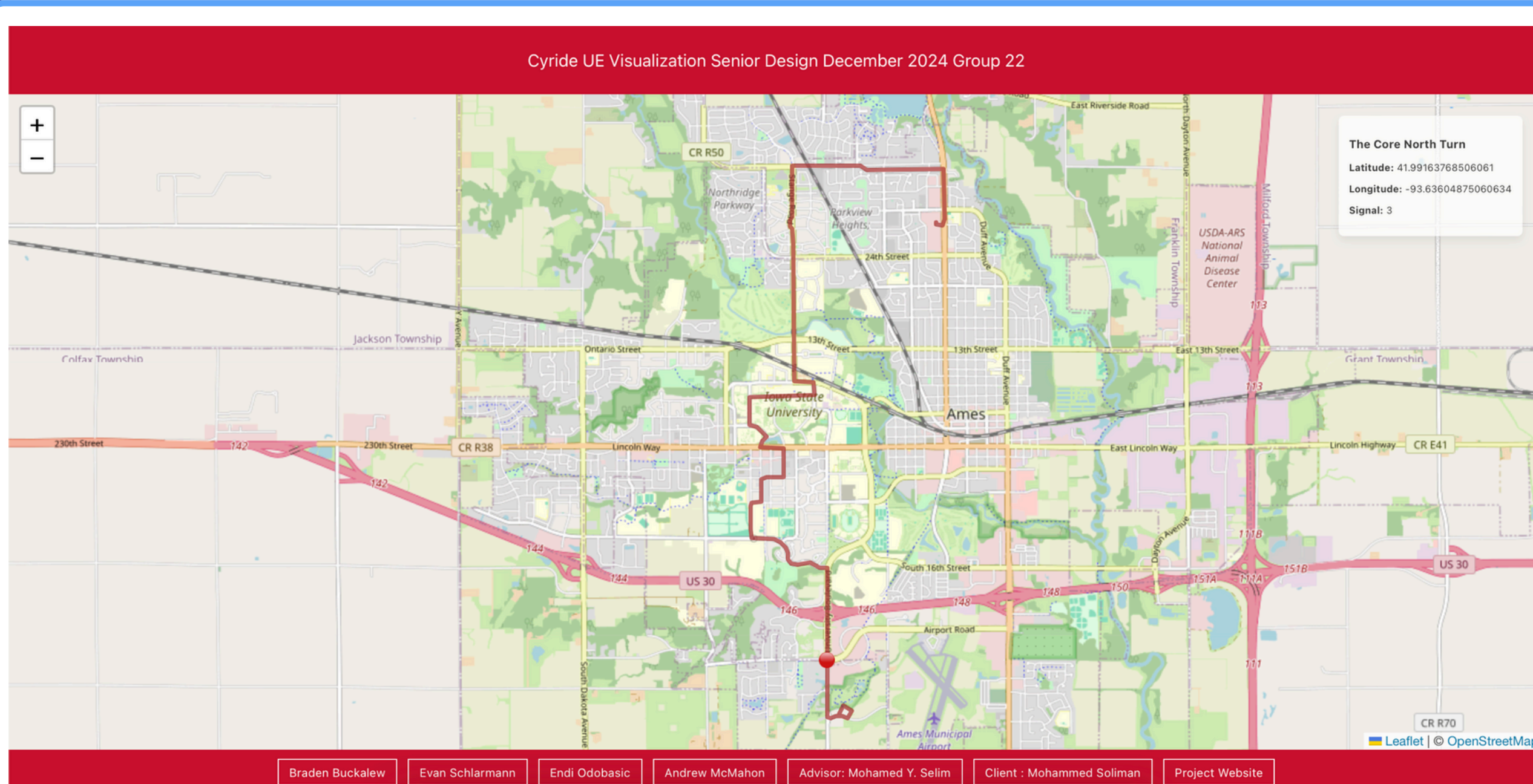


Figure 4: Leaflet Map UI

Team Website

