MICHIGAN STATE UNIVERSITY

Project Plan Presentation

Ocean Carbon Pollution Cleanup

The Capstone Experience

Team Anthropocene Institute

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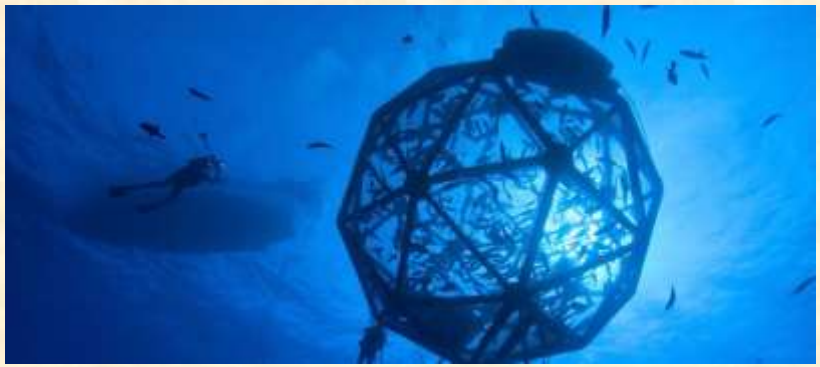
Fall 2024

From Students…
…to Professionals

Project Sponsor Overview

- Ultimate goal of making Earth abundant and sustainable for all generations to come
- Provides funding to upcoming technologies and promotes education about climate breakthroughs
- Want to solve the climate dilemma by 2030 through investing in the right science and technology



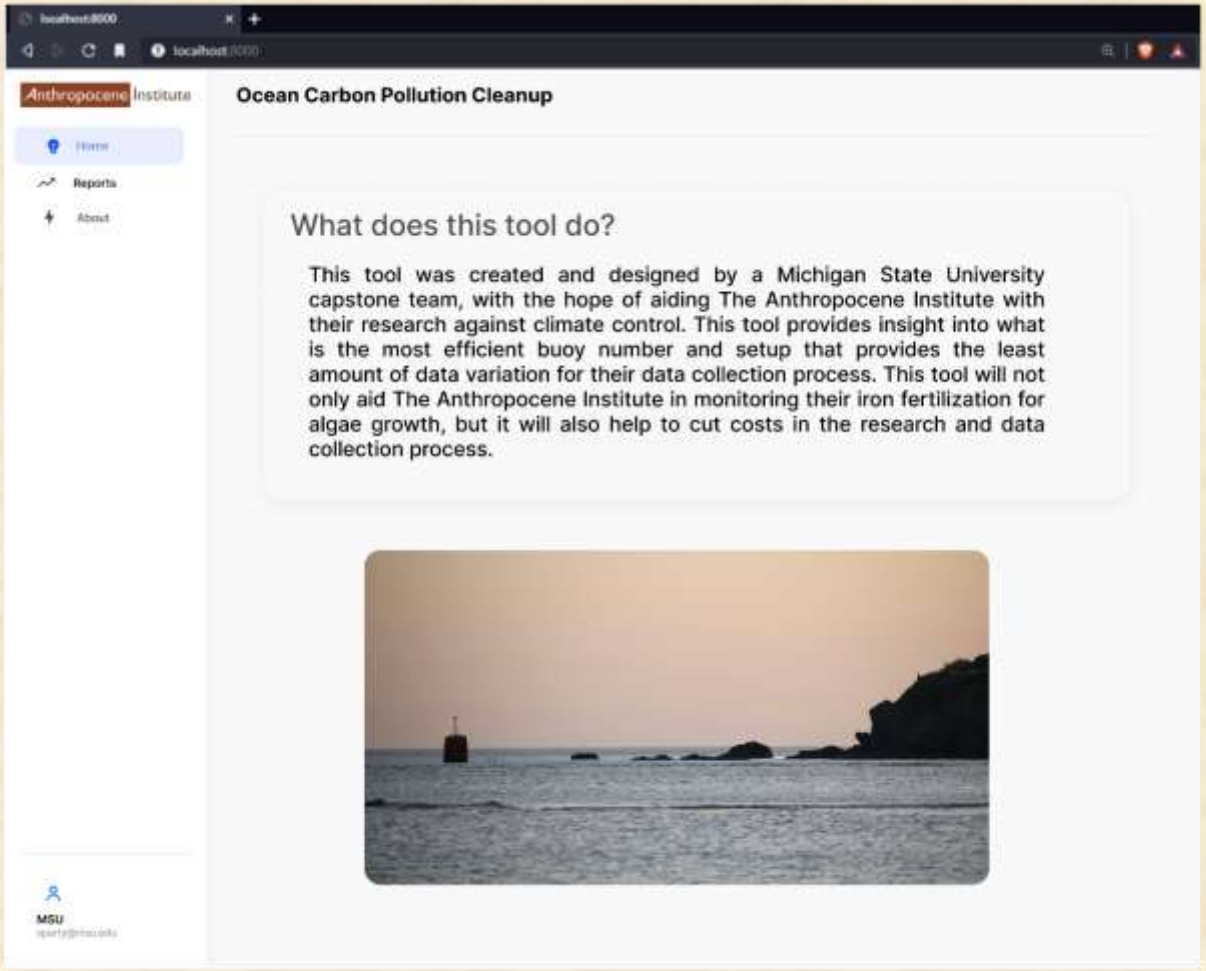
Project Functional Specifications

- Design an ocean sensor network configuration for an iron fertilization experiment
- By modeling various proposed buoy layouts and comparing how effective data collection will be
- Create visualizations and graphs of the prospective outcomes to convey potential experimental results

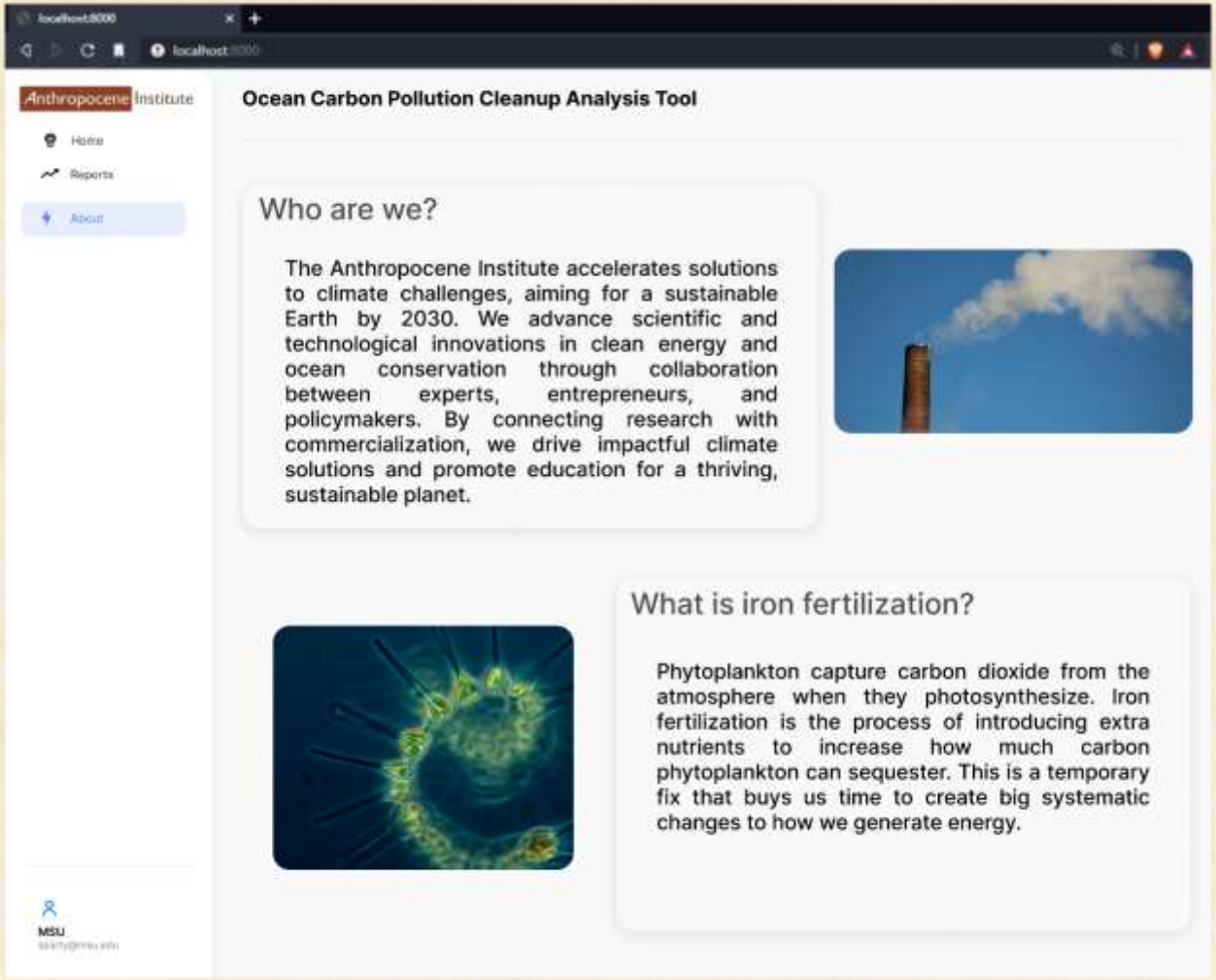
Project Design Specifications

- Home Page
- About Page
  - Background of sponsor and science behind experiment
- Report Page
  - Buoy variance results
  - Interactive map for users to optimize buoy placement
  - Recommendations for physical sensor placements based on simulated network
  - Visualizations and graphs of results

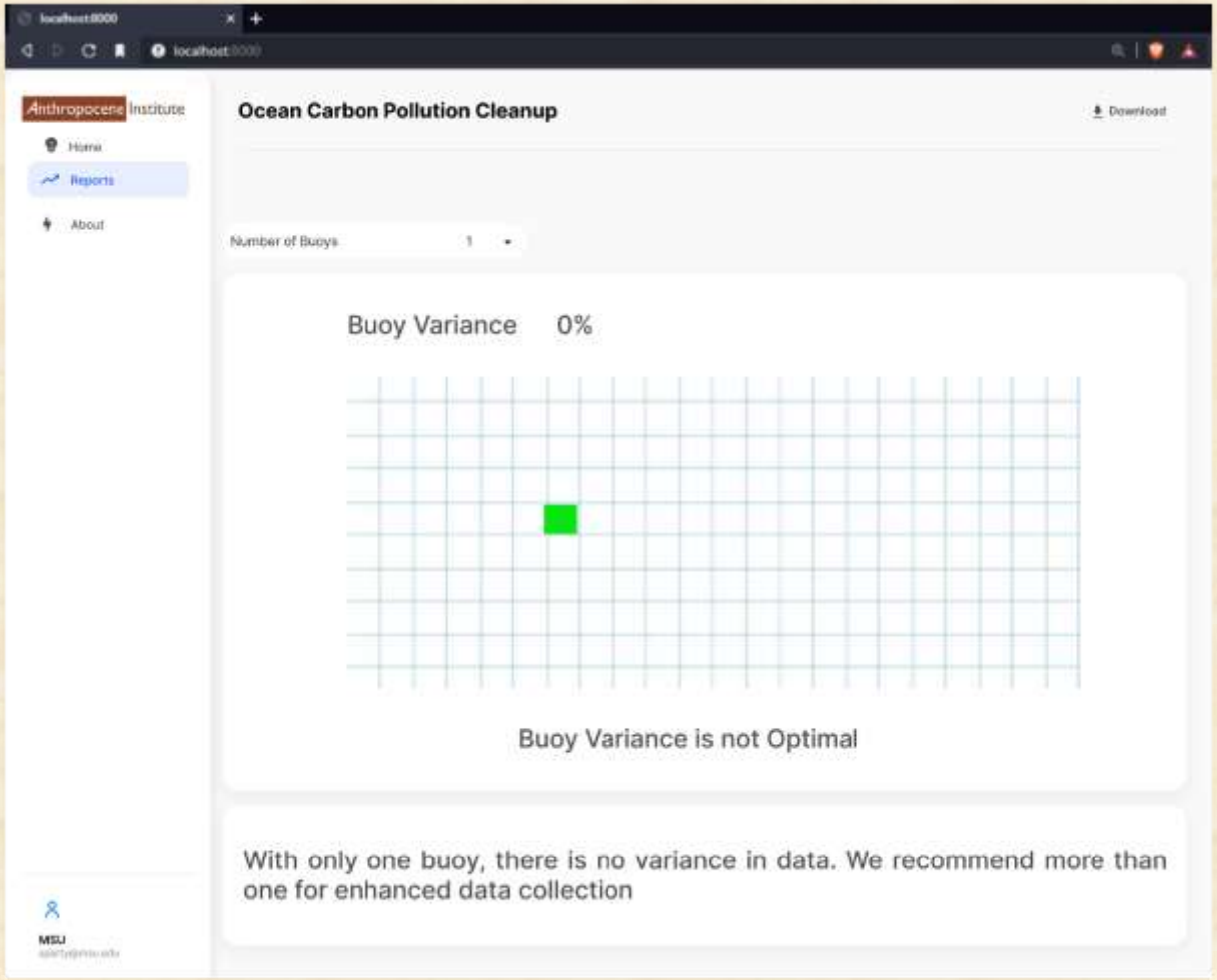
Screen Mockup: Home



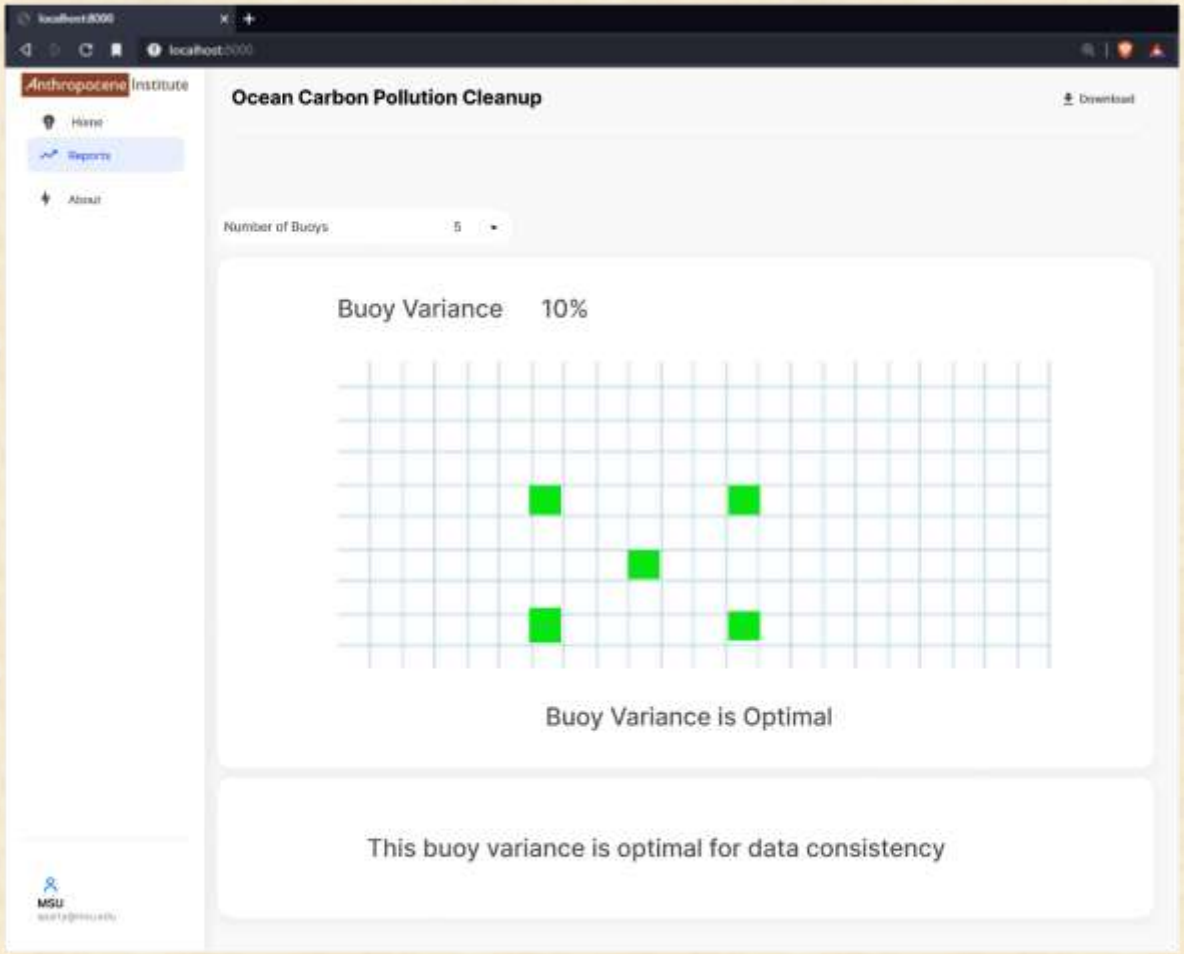
Screen Mockup: About



Screen Mockup: Suboptimal Report



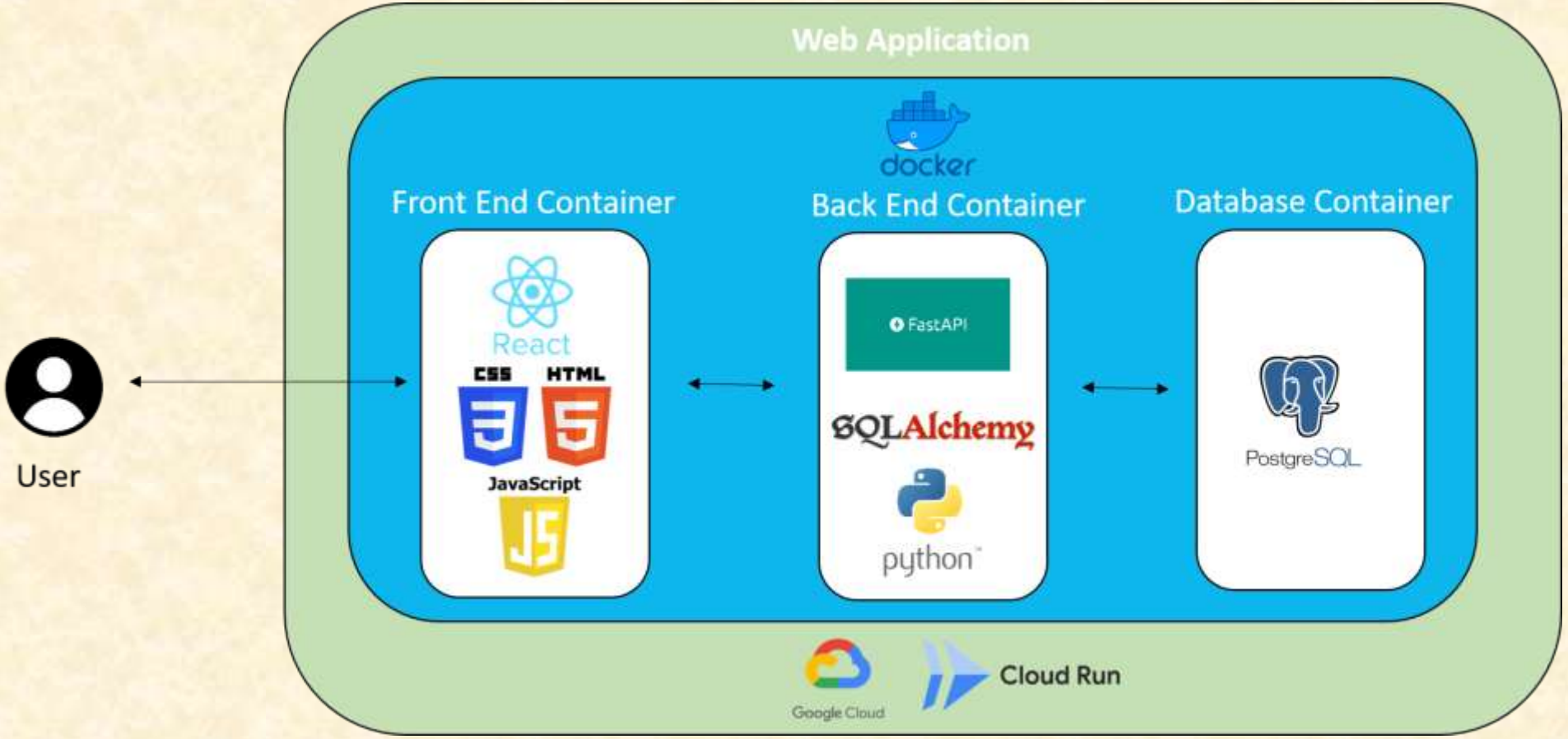
Screen Mockup: Optimal Report



Project Technical Specifications

- Front End - React
  - Front end library for building user interfaces
  - External JavaScript libraries to create visualizations (maps and graphs)
- Backend – SQLAlchemy, Python & FastAPI
  - SQLAlchemy is a backend component to connect the database to FastAPI
  - Python to do statistical analysis on data passed into the API and determine buoy variance
  - FastAPI is a framework for building asynchronous web APIs
- Database – PostgreSQL
  - Scalable structured data storage (for optimized access)
- Web Hosting – GCP & Cloud Run
  - Hosting provided by Anthropocene Institute

Project System Architecture



Project System Components

- Hardware Platforms
  - None
- Software Platforms / Technologies
  - React
  - TailwindCSS
  - Google Cloud Platform
  - PostgreSQL
  - SQLAlchemy
  - FastAPI
  - Docker
  - Chart.js

Project Risks

- Background Knowledge
  - We don’t have background knowledge about the scientific processes that we are meant to be modeling
  - Resources from our sponsor, reaching out to MSU oceanography professor, and our own independent research
- Calculating Data Discrepancies
  - Determine mathematical functions to analyze statistical discrepancies among selected buoys in a network
  - Research statistical methods to determine best methodologies to compare sensor data and discuss with scientists from Anthropocene Institute to validate our methodology
- Structuring Data
  - We have yet to receive any data, we don’t know what data will be included, but we know it will be unstructured
  - Work with our client to determine key data and use libraries, such as Spacy, to structure data
- Developing Interactive Mapping Software
  - Design grid map with ideal level of interactivity for configuring buoy sensor network
  - Work with software engineer from Anthropocene Institute to develop interactive components that suit our clients specifications

Questions?