

MICHIGAN STATE

UNIVERSITY

Project Plan Presentation

Machine Learning for Optimization of Carbon Removal

The Capstone Experience

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*From Students...
...to Professionals*

Project Sponsor Overview

- Sponsor Overview

- Founded by Carl Page in 2012.
- Mission is to make Earth sustainable by knowing and investing in the right technology.
- Partners with entrepreneurs, investors, governments, non-profits, and universities to achieve their goal.
- What they do:
 - Foster science
 - Influence policy
 - Back technology
 - Educate people about our options
 - Promote sustainable clean energy



Anthropocene Institute



Project Functional Specifications

- Project Overview
 - The removal of carbon dioxide is important to stabilize the Earth's climate.
 - Create a web application (Carbon Mapp) that shows the best places to implement different carbon dioxide removal techniques.
 - Carbon Mapp will display an interactive heat map of the United states for each chosen carbon dioxide removal techniques. The darker the color the better the location.

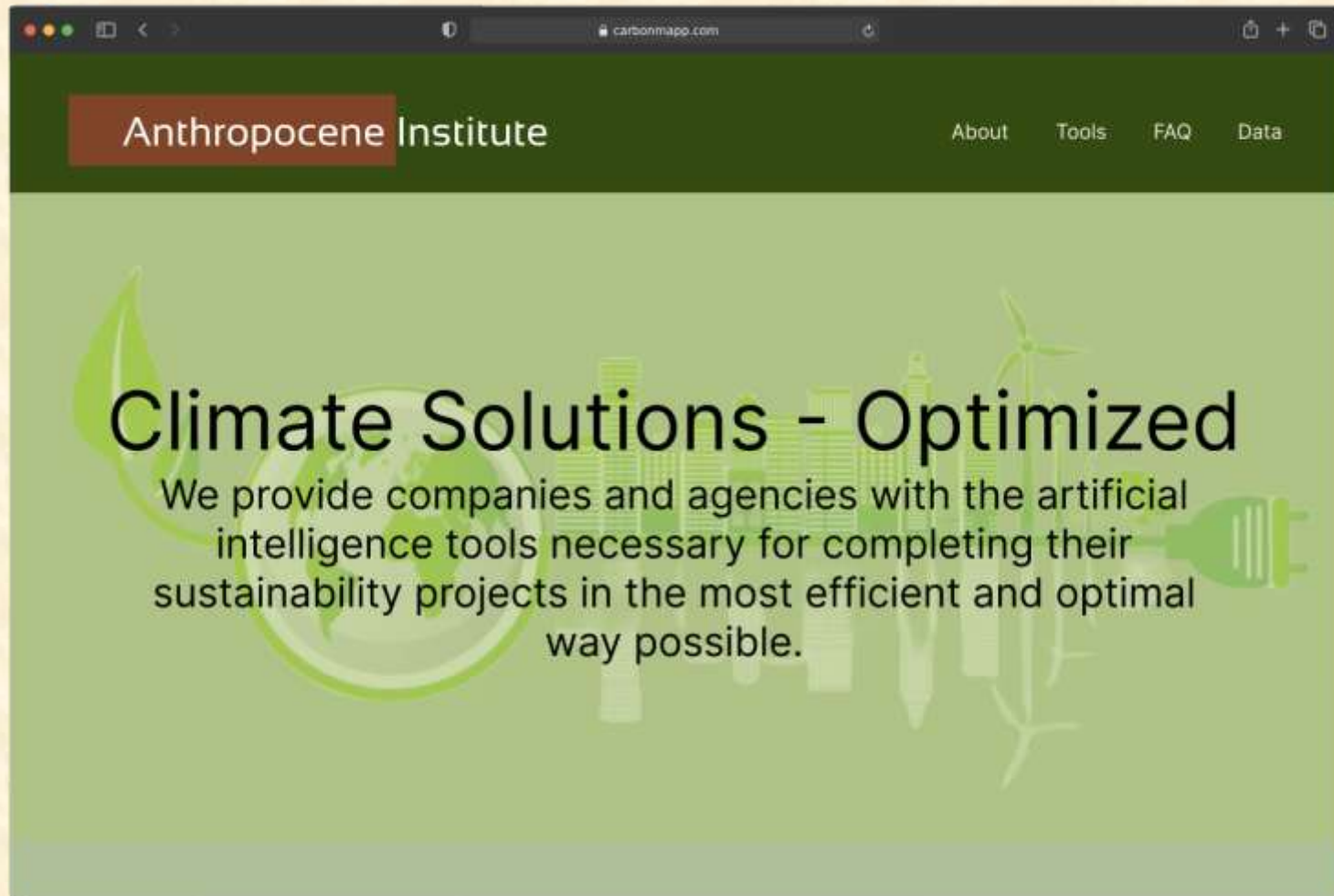


Project Design Specifications

- Web-app used by governmental agencies, private companies, entrepreneurs, and investors
- Information displayed in an interactive heat map
- Displays carbon removal efficiency, cost, and other relevant statistics.
- For people and organizations to become informed and help them make investment decisions.

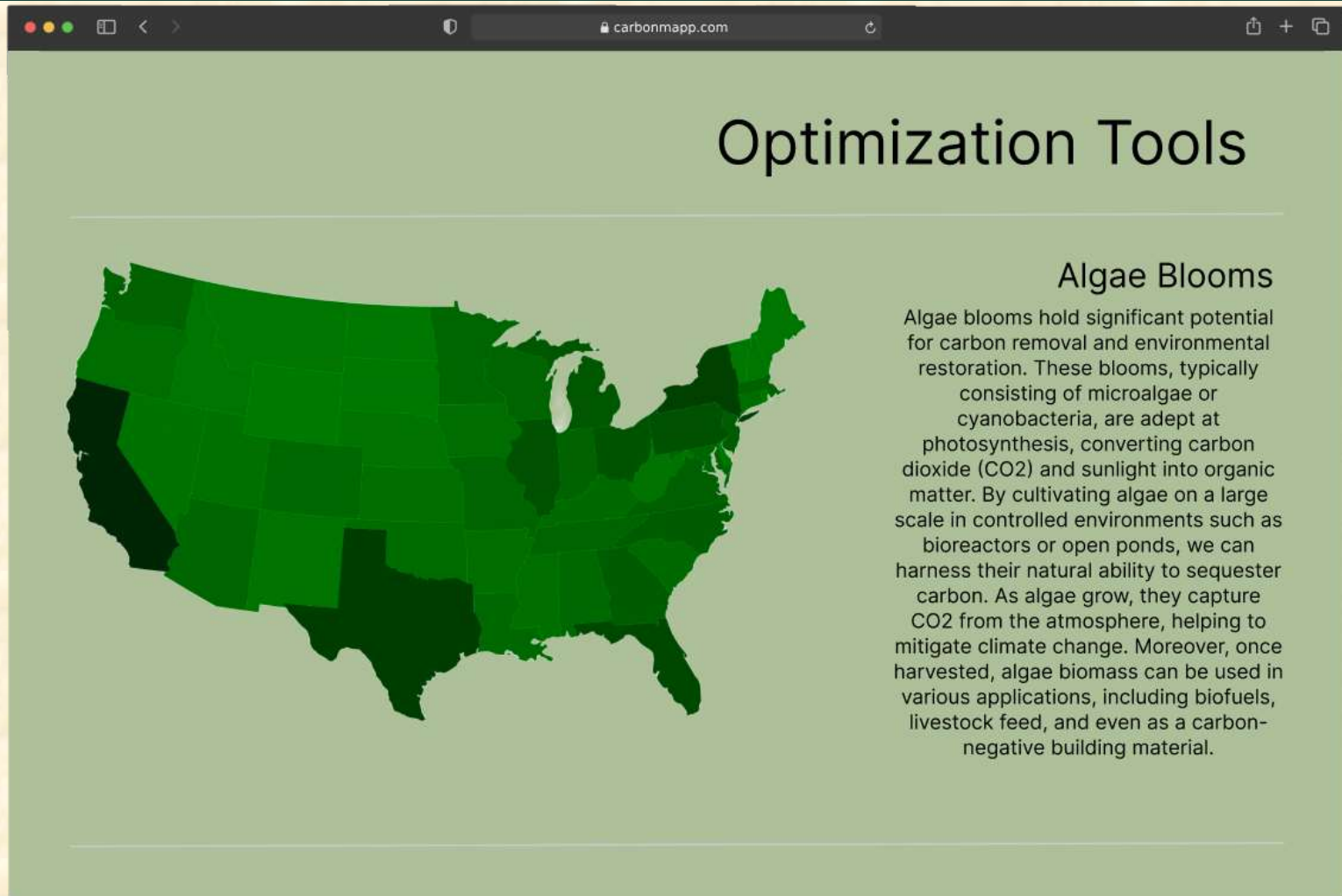


Screen Mockup: Homepage

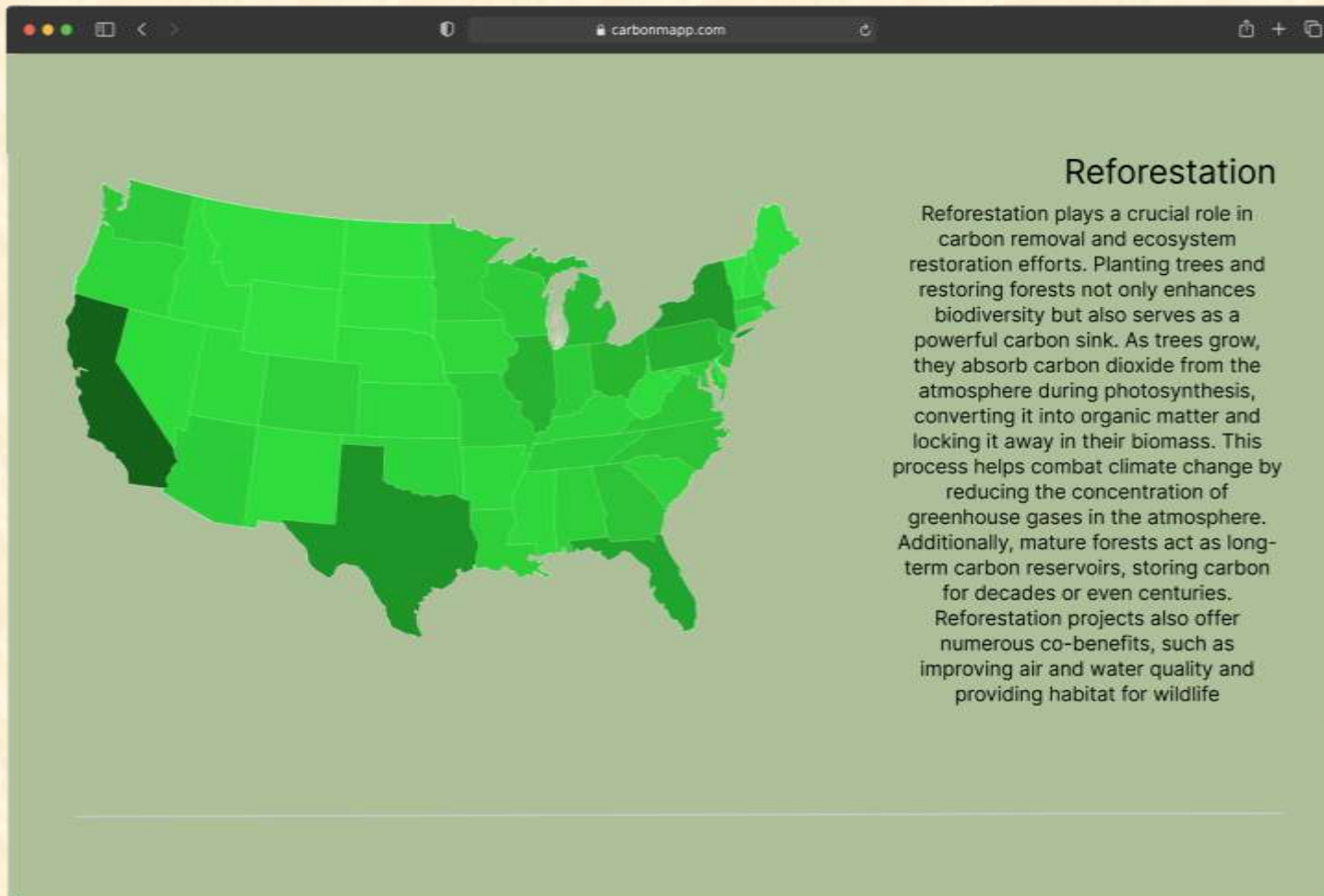


Screen Mockup: Algae Blooms

Homepage Link



Screen Mockup: Reforestation Homepage Link



Screen Mockup: Direct Air Capture Homepage Link



Screen Mockup: Algae Blooms Optimization Tool



Screen Mockup: Algae Blooms Optimization Tool (cont.)



Screen Mockup: Reforestation Optimization Tool (cont.)



Screen Mockup: Direct Air Capture Optimization Tool (cont.)

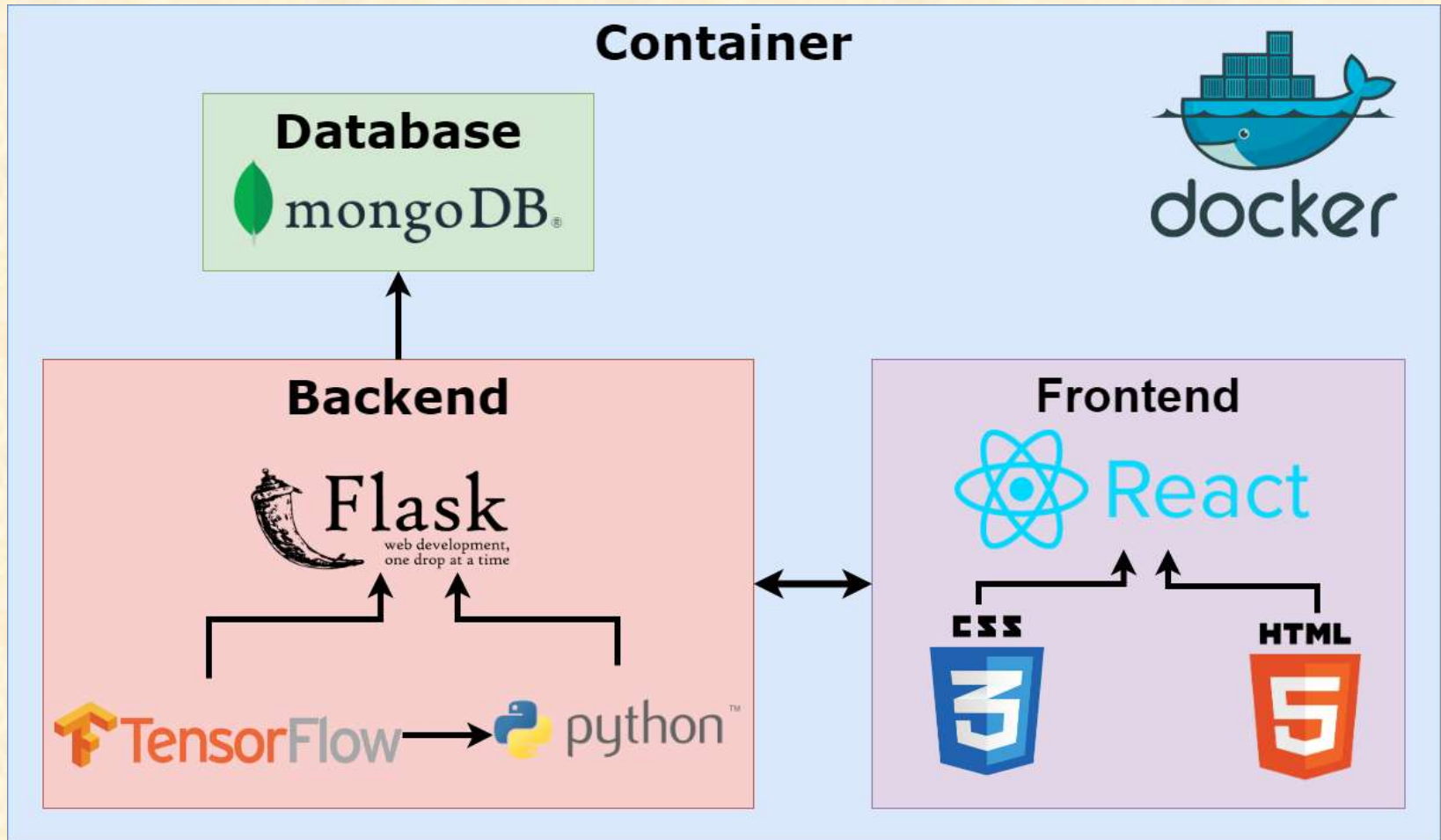


Project Technical Specifications

- React.js Framework
- Flask Backend
- TensorFlow Machine Learning
- Python Data Scraping
- MongoDB Database
- Containerized using Docker



Project System Architecture



Project System Components

- **Hardware Platforms**

- CSE Server / Anthropocene Institute Server

- **Software Platforms / Technologies**

- VSCode/PyCharm: Development
- Docker: Container
- MongoDB: Database
- React: JavaScript library for building web application
- Flask: Python web framework
- TensorFlow: Python machine learning library



Project Risks

- **Collecting Data for the Machine Learning Model**

- *Description:* Sourcing sufficient and relevant data for the model is a challenge especially if expanding the granularity of the project.
- *Mitigation:* Heavily research government, non-profit sites with a focus on individual states, and consult Michigan State University's Environmental Sustainability professors.

- **Updating the web tool and the machine learning model periodically**

- *Description:* Regular updates are necessary for the machine learning model and the web tool to keep pace with constantly changing data.
- *Mitigation:* Develop a web scraper script that will periodically get and preprocess the data for the machine learning model.

- **Implementing the web tool to handle web scraping and updating of the website**

- *Description:* Frequent backend execution may cause strain on the infrastructure and cause potential performance problems, server loads, and downtime.
- *Mitigation:* Optimize code and algorithms to be efficient and continuously test that the backend infrastructure can handle updates.

- **Expanding the scope of the project.**

- *Description:* Expanding the tool from a US to global map needs uniform data that may not be available throughout.
- *Mitigation:* Ensure full functionality of the US heatmap with potential expansion to other countries as project extension following discussions with the client.



Questions?

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