AI-VVO sdmay22-36 Weekly Update #4

10/18/2021 - 10/24/2021

Front End (Maps API Research)

- Pros:
  - Simple library - easy implementation
  - Cross-platform support
  - Wrapped existing javascript as a React component
  - Many tutorials
- Cons:
  - No server-side rendering
  - Can be slow with extensive map data

- Pros:
  - Integration with D3 library
  - Lightweight
  - Renders map as SVG - easy to work with HTML
  - Extensible with React components
- Cons:
  - Can have performance issues
  - Small development community - not commonly used

Front-End (Maps API Research cont...)

- Pros:
  - Open source
  - Simple implementation and integration
  - Free
  - Maps can be downloaded for offline use
- Cons:
  - Lower coverage

- Pros:
  - Javascript interface for easy development
  - Most commonly used Map API with lots of documentation
- Cons:
  - Closed system - all info is the property of Google
  - Google hides some of the data
  - Charges for some use of mapping services

Front-End (Next Week)

- We will be moving forward with OpenStreetMaps (OSM)
- We will begin researching the best way to integrate the current application
- We will develop designs for integrating OSM with the current architecture and codebase

Back-End (Database Research)

Pros

- Fast data retrieval
- Flexible and scalable
- Supports SQL
- Easy to work with Data

Cons

- May take up more space due to BSON formatting

Pros

- Graph database
- Very fast data retrieval
- Requires less code than SQL
- Good for complex data relationships

Cons

- Does not support SQL
- May be unnecessary if our data relationships are not that complex

Back-End (Database Research)

Pros

- Uses less disk space than other options
- Built in HTTP api which would reduce backend code
- Good for Real time Data retrieval and updates

Cons

- No SQL support
- Not great at handling complex data

Pros

- Good for complex data relationships
- Base Django easily supports PostgreSQL
- Lots of documentation
- Could create custom data types if needed

Cons

- Slower than the other options

Back-End (Docker file Research)

Last year's team:

- Django
  - One base image for dependencies
  - One base image for install
- Frontend
  - React
  - Install serve
- Nginx
- tensor flow

New Plan:

- Django dependencies
- Django install
- Frontend - React
- Install serve
- Nginx
- tensor flow

Back-End (Next Week)

- We will continue to use Postgres as it seems to be the best option for what we need.
- We will work on fixing the issues the previous team had with Postgres and making sure the current project works with it
- We will continue looking into better organization of Docker files.

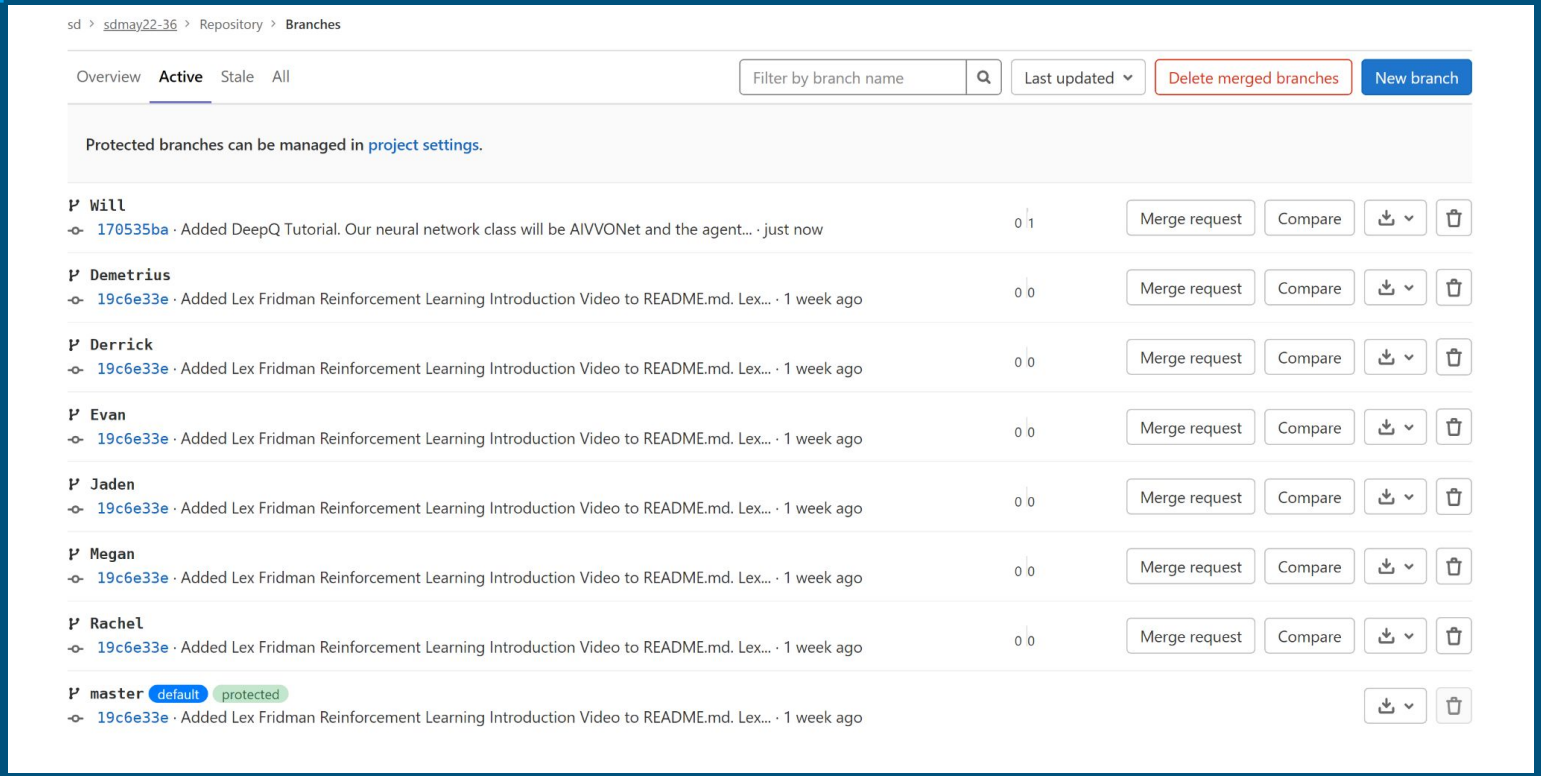
Machine Learning (This Week)

- Branched Git into branches for each member to preserve integrity of the master branch
- Used git pull and git checkout {branchname} to switch our working branch on our virtual machines on the CyberPower Testbed to our individual development branches
- Will use PyTorch nn module to implement our neural network class
- Will have an agent “GridController” class that will learn from an off-policy model. The ideal control choices will be learned through experimentation by the GridController.
- Deep Q Learning will work great since the action space for the power control problem is discrete (set number of actions)

Machine Learning with Phil video on Deep Q Learning

- https://www.youtube.com/watch?v=wc-FxNENg9U&ab_channel=MachineLearningwithPhil

Git Branches Created



Machine Learning (Next Week)

- Prototype the Deep Q Learning model on Google Colab
- Define the action space
- Start formulating the structure of the layers in the convolutional neural network for grid control
- AIVVONet will be the neural network class name
- GridController will be the agent class name
- These two classes will provide functionality to control the grid given a discrete number of actions in the action space. In this project, there is a discrete number of actions in the action space, because there are a set number of positions for the voltage regulators and the capacitor bank.
- Formulate the mathematics to calculate the new values of the buses after engaging a control mechanism