

EE/CprE/SE 492 GROUP PROGRESS REPORT

Group number: sdmay22-36

Project title: AI-VVO (Artificial Intelligence Volt-VAR Optimization)

Client: Dr. Gelli Ravikumar

Advisor: Dr. Gelli Ravikumar

Team Members:

1

- Jaden Alamsya
- Demetrius Christou
- Evan Dinnon
- William Dulaney
- Rachel Owens
- Megan Phinney
- Derrick Vang

o **Project Summary:** (Short summary about the project. What are the design goals? Have the direction or scope of the project changed? This should be about a paragraph in length.)

The goal of this project is to develop a machine learning application that optimizes the power delivered across a smart electric power distribution system. We are designing and developing a software tool that utilizes AI-based Volt-VAR optimization (VVO) for ensuring the voltage profiles are within the prescribed threshold bands, particularly in the case of grids in which there are high penetration of Distributed Energy Resources (DERS) integrated into modern, smart electric power distribution systems. The scope of this project has seen some minor changes, but overall has maintained its charted path outlined in the design document.

o **Accomplishments** (Please describe/summarize as to what was done, by whom, when and, collectively as a group since the last report. This should be about a paragraph or two in length. Bulleted points are acceptable as well. Please keep only your technical details related to your project. Figures, schematics, flow diagrams, pseudocode, and project related results are acceptable, but please ensure that they are legible (clear enough to read) and to provide an explanation. If researching a topic, please add a few details about what was learned and how it is relevant to the project. If two or more people worked on a single task, be sure to distinguish how each member contributed to the task. Specific details relating to the assistance provided to other members may be included here.)

- **Derrick:** I began looking into how to combine the grid and the osm map together. One thing I found was that I could reuse some of the old team's code to help move their grid onto our map based grid. I also found out how to get the application to run on my Mac so I could run through some tests.
- **Evan:** This week I worked with Will to clean up and prepare the git repository for the work we will be doing this semester. We merged all our previous branches to master in order to ensure we are all on the same page. We then created new branches for each of us to work off of. Next, we began exploring OpenDSS for simulating grid values. We will be using this tool and the simulation data it provides to know if our algorithm has reached a converging solution. In the coming weeks we will install OpenDSS on our Windows VM and configure it to pull data from our backend database.

- **Jaden:** I mainly brushed up on React Leaflet in preparation for finishing the map display that we are currently working on. I rewatched a tutorial video and played around with adding markers and polylines.
- **Will:** I got started with the distribution grid simulator, OpenDSS, for simulating the smart distribution system in order to develop the main learning loop of the machine learning algorithm. OpenDSS is needed for running simulations based on control mechanism changes to know if we are converging to an optimal power flow solution. We will install OpenDSS on a Windows VM on the PowerCyberTestbed. I coordinated with the backend team so that the model parameters such as bus topology and real/reactive power values can be pulled from the Neo4J server and the Influx database.
- **Megan:** I spent this week refamiliarizing myself with our project. I spent some time looking over my notes from last semester which included a vague plan for last semester. I also relooked over the code. Recently with my internship I've been using Docker-compose so I am now more familiar with that system and understand that portion of the project more. With that, I also understood where things needed to be tweaked and updated.
- **Rachel:** I worked on refamiliarizing myself with the project and the requirements. I reviewed the frontend requirements and what we will be implementing this semester. I also began reviewing react leaflet and how to implement custom icon markers. We have our vector images and should create the icons in a separate file so that they can just be dropped into our map file and be updated as needed.
- **Demetrius:** I refamiliarized myself with the database in order to help the ML team get the data that they need for their algorithm off of the database. I also went through and made sure that all the previous code was still working on my virtual machine so that I can help the other members if they are having trouble working with the database code that I made last semester. I also began looking into the best way to store the grid data which seems to be Neo4j. So I am looking into how to implement that database into the project as well.

- Pending issues (If applicable: Were there any unexpected complications? Please elaborate.)
 - There are no pending issues. All roadblocks have been solved.

○ **Advisor Input/Signature:**

Please select one of the options below and sign.

- _____ I am pleased with the progress the team is making.
- _____ The teams progress could use some minor improvements which I will discuss with them.
- _____ The team's progress has some major concerns that I will discuss directly with Dr. Bigelow
bigelow@iastate.edu , 515-294-4177

Signature: _____

○ **Client Input/Signature:**

Please select one of the options below and sign.

- _____ I am pleased with the progress the team is making.
- _____ The teams progress could use some minor improvements which I will discuss with them.
- _____ The team's progress has some major concerns that I will discuss directly with Dr. Bigelow

bigelow@iastate.edu , 515-294-4177

Signature: _____