

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:

- 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.

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.)

- Jaden Alamsya - I researched how to use svg files to create custom icons and how they can be used in our map display to visually tell the user what each node is doing. I am currently looking into how we can create the custom icons with the svg files based on the data that will make up our map display.
- Demetrius Christou - I created an api that would allow frontend users to register an account. I also was able to modify the existing database setup so that someone on one of the VMs would be able to connect to the database running on another person's VM. I also created a python script that would demonstrate how the ML team will be able to pull off data from the influxdb database so that the data stored on there can be used in the

ML algorithm. I also added Neo4j into docker and have been working on getting properly integrated into the overall project.

- Evan Dinnon - This week I worked to create a script to open and run OpenDSS for testing. I was successfully able to open and run the provided OpenDSS model using only Python. Also worked to build my understanding of OpenDSS so we can better work to create custom models. I also got the project setup and running on the provided Windows VM for development and testing.
- William Dulaney - I coordinated with the backend team to ensure functional communication between all machines and components of the project. I researched time-series simulations in OpenDSS to be used in the real-time simulation of the grid for ML training. I was the architect of a four step process that included pulling present values from the InfluxDB instance to the client virtual machine, submitting a creation request to the Windows virtual machine with OpenDSS using the present values pulled from the InfluxDB instance, pushing the results from OpenDSS to the client machine and then submitting the results from the client machine to the InfluxDB to update the feeder values. I researched the Python-OpenDSS API packaged with all installs of OpenDSS which will enable us to implement this four step process. This process will enable us to train the ML algorithm and to run real-time grid simulations without actually having to input values manually in an OpenDSS GUI.
- Rachel Owens - I created and tested the axios “post” functionality that will send registration data to the backend server and database for storage. I worked to debug our axios function to get it working correctly. This involved updating axios header information and adding in security tokens to the axios object. I worked with Derrick to get this functionality working with the registration page he created and with Demetrius to coordinate the frontend to backend communication.
- Megan Phinney - I put all my energy toward the documentation. I used my rough draft from last week to format and update the current README.md. I rearranged the document so the information I see as most valuable was on the top and the information that is intended for future developers is at the bottom. I also formatted the document to increase the readability. I also started working on explaining our technical project in more non-technical language to again increase readability.
- Derrick Vang - I created a javascript file for the registration page on the frontend, I used the previous teams login file as a template to work off of. I also worked with Demetrius to get the end to end communication working and had to edit the authactions file to add in a method to send a post request to the backend with a new user's username and password.

o Pending issues (If applicable: Were there any unexpected complications? Please elaborate.)

- There are no pending issues.

Advisor Input: It is very important that you meet regularly with your advisor. Please have your advisor select one of the options below.


_____ I am pleased with the progress the team is making.

_____ The teams progress could use some minor improvements.

_____ The team's progress has some major concerns.

Your advisor's selection must be confirmed by either an email attached to this report (merge files into a single pdf) or a physical signature obtained from an in person meeting. Please provide this report to your advisor at least 1 week before the due date so that they have time to respond.

Signature:

 **Gelli, Ravikumar [E CPE]** 6:07 PM (11 minutes ago) ☆ ↩ ⋮
to Evan, sdmay22-36@iastate.edu ▼

Dear Students,

Thanks for the report and reminders. Appreciated.

Response: I am pleased with the progress the team is making.

Best,
Gelli