EE / CprE / SE 492 – sdmay21-23

Grid AI

Week 1/2 Report

1/25/21 – 2/8/21
Client: Dr. Ravikumar Gelli
Advisor: Dr. Ravikumar Gelli

Team Members:

Justin Merkel –– *ML Developer, Backend Developer*
Patrick Wenzel –– *Frontend Developer*
Abhilash Tripathy–– *Frontend Developer*
Karthik Prakash –– *Backend Developer*
Abir Mojumder -- Backend Developer

Weekly Summary

The main objectives for the initial weeks was to understand the Machine learning model and how the components (database and user interface) will interact. Several improvements to the ML model prototype were made by Justin described in more detail below. The web interface design is still being researched; the main focus being the design of endpoints to ensure functionality with Flask. Progress is also being made to the neo4j database; we are trying to figure out how to move large amounts of data from the nodes automatically using Cypher and finally Neo4j can now run as a Docker container for cloud operation.

Past Week Accomplishments

- Justin - Improvements to the ML Model prototype
    - Incorporating the kVh power consumption of the previous node in the power grid's path. This requires edits to the current data preparation script to look at the node power line connections. This allows the model to predict the consumption more accurately since the value will relate to the consumption of the previous node in the grid.
    - Adding a temporal component to the ML model predictions. This is including the previous hour's power consumption to the features that the ML model uses to predict. This also increases the accuracy since the power consumption does not change drastically over time.
    - Increasing the number of neural nodes and layers of the DNN. Another improvement is to increase the amount of layers and the number of nodes inside those layers of the ML model. There are diminishing returns to doing this since overfitting becomes a problem. However, the previous model was too small to provide real benefits to predictions

No Depth or Time | Depth of 1 and Previous Output
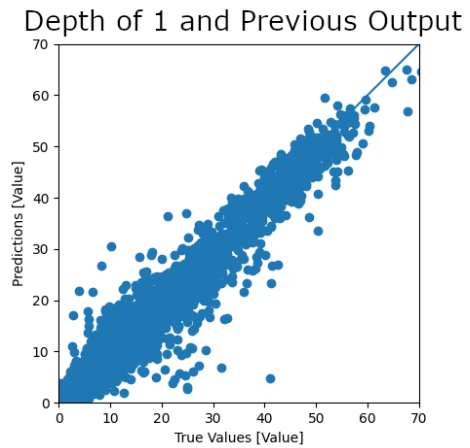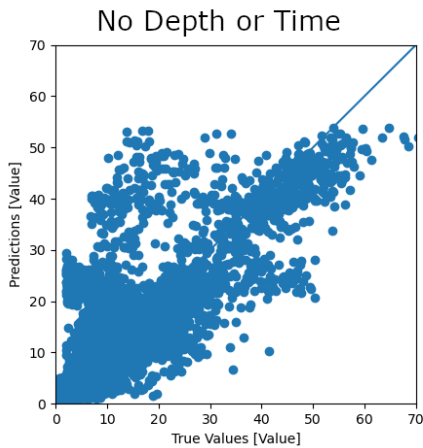
- ○ This image is showing a visual representation of how significant the improvements affect our ability to predict as a result of the work done.
- Karthik - Began testing Neo4j instance
  - ○ Familiarized myself with Neo4j interface
  - ○ Attempted to load required node data into graph
  - ○ Gained knowledge with Cypher, the graph query language, to enable fast, custom queries

- Abir - Learning neo4j Cypher language
  - ○ Initializing dummy nodes with some data, still need to figure out all the required data for each node, and relationship between nodes.

Pending Issues
Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Justin Merkel	Improving ML Models	10	10
Patrick Wenzel	Studying Dashboard React code to figure out structure and how to route the pages in Flask	7	7
Karthik Prakash	Working on completed Docker instance of Neo4j to use as database	5	5
Abir Mojumder	Started neo4j with initial 100 node setup with flask/python.	5	5
Abhilash Tripathy	Researching/ learning the making and structuring backend flask endpoints, developing UI on frontend	6.5	6.5

Plans for Coming Week

- Justin - Improve the data preparation script to include data from all 240 nodes (full grid) now that the model can predict the Feeder A values reasonably well. Investigate other areas of improvement.
- Patrick - Take what I've learned from the structure and start designing some pages and include custom components. Would also like to route all of these pages as well.
- Abhilash - Make flask endpoints and middlewares for different requests.
- Abir - Figure out endpoint code for the backend and a method to import/export data from spreadsheets to neo4j database.
- Karthik - Continue learning how to implement Neo4j; Be able to load all necessary node data into a docker instance of Neo4j and be able to efficiently manipulate it as needed