Architecture of the Future Low-Carbon, Resilient, Electrical Power System

Future Architecture of the Network (FAN) – Te Whatunga Hiko

Workstream 1 –Summer Project

Project title: Development of an Offline Plotting and Analysis Software Tool

Relevant Workstream(s): WS 1

This project is offered to help in the ongoing research in the Future Architecture of Network (FAN) programme, where the benefit, design and analysis of DC electricity grids are explored. The FAN project is a 7-year, New Zealand wide research program led by the University of Canterbury. The project is broken into five workstream, where this summer student project is a part of Workstream 1, which is the development of fast and accurate numerical analysis tools to simulate large-scale hybrid AC/DC grids, such as for Power-Flow Analysis, Fault Analysis, Harmonic Analysis, Transient Stability, and Electromagnetic Transients. Also, WS1 proposes a future architecture of the hybrid AC/DC.

Project Description:

Offline plotting and analysis tools are crucial in big data analytics and data science for visualizing and interpreting large datasets. These tools enable the creation of detailed and interactive plots, charts, and graphs without requiring an internet connection. Using programming languages like C++, Python, or R, developers can leverage libraries and frameworks to facilitate the exploration of complex data, aiding in identifying patterns, trends, and anomalies. These tools support a range of file formats and integrate seamlessly with various data science frameworks, enhancing their utility in both research and industry applications.

This project involves developing a software tool for offline plotting and analysis of outputs from the proposed hybrid transient simulation tool under Workstream 1 of the FAN project. The tool should be capable of reading datasets from the following formats:

1. Binary output file
2. Text output file
3. CSV output file
4. COMTRADE output file

The tool should enable customized plotting with features such as:

1. Standard graph (single y-axis variable vs. time)
2. Poly graph (multiple y-axis variables vs. time)
3. X-Y plot
4. Bar plot

Additionally, the tool should perform data analytics, including:

1. Discrete Fourier Transform / Fast Fourier Transform analysis
2. Prony analysis

The successful candidate will select and learn a programming language (C++, Python, or R) to develop the graph analysis tool.

Helpful Resources:

https://www.pscad.com/software/enerplot/overview

Specific requirements:

- BE(Hons) - Electrical and Computer Engineering (EEE) student, Computer Science or Software Engineering- student, Mechatronics -Student - Third (second Pro) or Fourth (Third Pro) year. Masters of Applied Data Science.
- Familiarity with one of the programming languages; C++, Python and R.
- Some familiarity with development of dashboards for data analysis.
- Excellent academic track record
- High proficiency in written and spoken English
- Enthusiastic applicants (any nationality) that want to make a positive impact in the world and can work in a collaborative environment

Potential Supervisor(s): Veerabrahmam Bathini, Josh Schipper, Neville Watson

Based in: University of Canterbury, EPECentre