Master Thesis

Chair for Theoretical Information Technology | RWTH AACHEN UNIVERSITY

Scalable Fault Location and Service Restoration for Large Smart Grids using Deep Neural Networks

Research Area
Machine learning and big data analytics, power grid engineering

Keywords
FLISR, power grid simulation and optimization

Description
Fault location isolation and service restoration (FLISR) is an important functionality for reliable and sustainable power grid operation. FLISR is usually a part of the advanced distribution management system (ADMS) used by the distributed system operators (DSOs). Basically, FLISR can be implemented into two parts: detecting the fault location and isolating it, and reconnecting those isolated loads and grid parts. However, implementing FLISR for large scale power grids with few number of sensors is a challenging task.

Goal
This thesis aims to provide a scalable solution for FLISR implementation, involving its two parts mentioned earlier. This can be done by utilizing state of the art machine learning techniques. This study starts by comparing the available FLISR solutions and presenting their advantages and limitations. Afterwards, the thesis should focus on FLISR's scalability issues in power grids, along with the practical challenges and constraints. For this matter, deep neural networks can be employed into a modern-day electrical grid. As the current focus of this work is mostly on the Distribution Level of a power system, the concepts can be extended into the Transmission Level.

The developed algorithm can be tested on some benchmark distribution systems like the IEEE-13,37,123,342 etc. For this purpose, different use cases or scenarios can be identified based on possible fault locations, and optimal power restoration options.

Requirements
- Good understanding of power systems and some machine learning algorithms.
- Excellent knowledge in Python programming, and power grid simulation tools.

Contact

- Arash Behboodi ✉ arash.behboodi@ti.rwth-aachen.de ☎ +49 241 80 22198
- Rana Alhalaseh ✉ rana.alhalaseh@ti.rwth-aachen.de ☎ +49 241 80 27708