Master Thesis

Chair for Theoretical Information Technology | RWTH AACHEN UNIVERSITY

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

Research Area
Machine learning and big data analytics

Keywords
FLISR, convolutional neural networks

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 distribution system operators (DSOs). Basically, FLISR can be separated into two parts: detecting the fault location and isolating it, and reconfiguring the grid such that those isolated loads and grid parts are provided with electricity. 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. This can be done by utilizing state of the art machine learning techniques, such as convolutional neural networks to come up with a machine learning based FLISR suitable for autonomous and self-healing power systems. 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, convolutional neural networks can be employed into an electrical grid in order to detect the fault location in a grid.

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 in machine learning methods and convolutional neural networks,
- Excellent knowledge in Python programming.

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