Institut für Elektrische Anlagen und Netze

Master thesis

Enhancing the Generalization of Deep Learning Models through Entropy Theory-Based Random Grid Topology Generation

Initial Situation and Motivation

In the simulation of electrical power systems, there is a need for different grid topologies, e.g. to be able to test different feed-in and fault scenarios. By using deep learning and artificial neural networks, a method for creating diversified grid topologies is to be developed in order to provide a more extensive database for their training.

Research Question

To what extent can the generation of random network topologies contribute to improving the generalisation of deep learning models in the control of power systems?

Approach/Methodology/Task Description

The first step involves developing a program that creates an empty grid model, similar to a Sudoku puzzle, with each cell representing a different type of facility. The program then progressively assigns equipment to each cell and updates potential types for the remaining cells based on the previous selection, aiming to reduce the system's overall entropy. By constantly considering and adjusting for physical and operational constraints of electricity systems, such as power balancing and voltage level limits, the physical feasibility of the generated grid topology is ensured. The expected result is a diverse collection of grid topologies that provides a broader data base for training deep learning models, thereby enhancing their generalization capabilities. This research could also be beneficial for organizations seeking to evaluate control or protection algorithms under a variety of grid conditions.

Organizational

Start immediately.

Contact person/supervisor

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