Masterarbeit
Machine learning methods for solving OPF problems

The optimal power flow (OPF) problem is one of the key optimization tasks for the operation and planning of electrical energy systems and, in a modified form, a part of many operating tasks and applications. It is solved repeatedly every day for different inputs and in different applications. From the optimization of market balancing processes and reliability calculations to redispatch calculations.

Traditionally, OPF problems are solved precisely using analytical optimization methods. However, due to the complexity and problem size of real OPF applications, these algorithms often lead to rather long calculation times. This can cause problems, especially given the ever-increasing complexity and growing operational uncertainties. Innovative procedures based on machine learning methods and deep neural networks (e.g. graph-based neural networks (GNN)) can help to find sufficiently accurate solutions in a shorter time or, in combination with classic optimization methods, drastically reduce the overall computing time.

Core tasks and objectives of the thesis: :

Firstly, suitable methods are to be identified based on existing applications. One of these methods will then be implemented and tested on real network utilization cases.

Your profile:

Degree in engineering or industrial engineering (electrical engineering, computer science, mechanical engineering, energy technology) or computer science

- You are interested in current research topics relating to the energy supply of the future
- Basic knowledge and initial experience with programming tasks in Python
- Basic knowledge of machine learning and artificial neural networks

What we offer:

- Intensive and reliable support during your thesis
- Flexible time management and your own air-conditioned workplace with good IT equipment
- A great atmosphere with lots of joint activities for students and assistants
- Lots of industry contacts and help with finding internships
- The possibility of a subsequent doctorate or employment if you perform very well

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Key Points

- Machine-learning and DNN
- Optimal Power Flow
- Artificial intelligence for solving optimization tasks