MA Proposal - PE Converter Parameter Prediction

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1 Motivation

Grid-following (GFL) converters are becoming an integral part of the modern power grid, as the share of Inverter-based Resources (IBRs) is increasing. Due to the low inertia of inverters, future grid control strategies must adapt to the changing landscape. Additionally, the integration of IT equipment opens up novel attack vectors for targeted manipulations. Hence, anomaly detection approaches become necessary to detect misbehaving inverters.

2 Proposal

In a previous work, a MATLAB GFL converter model was developed at EINS. Given a converter parameter and grid configuration, the model simulates the converter behavior, measured at the PCC. Based on the measurements, a grid-code aligned classification approach then applies rules to detect anomalies.

The goal of this thesis is to investigate the expressiveness of the anomaly features using Machine Learning (ML). Based on the simulated data, two models shall be trained, where one model uses the raw PCC measurements as input, while the other model uses the predicted anomaly features. Both models should predict the original converter parameters.

2.1 Goal

Design and train two machine learning models to predict the controller-parameters of a GFL converter (see Figure 1). Based on the resulting model accuracy, quantify the effectiveness of the anomaly detection algorithm and its features, and propose possible improvements to the rule-set of the anomaly detection algorithm.

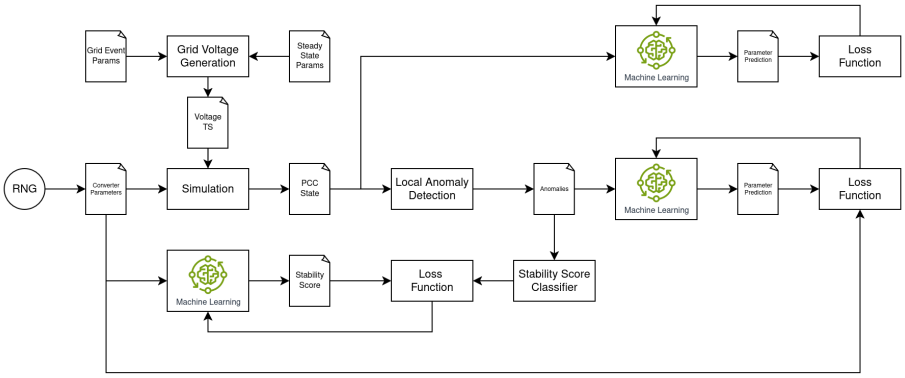


Figure 1: Overview

2.2 Prerequisites

- Background knowledge in electrical engineering and machine learning is strongly recommended
- Proficiency with Python and ML-related frameworks are recommended

References