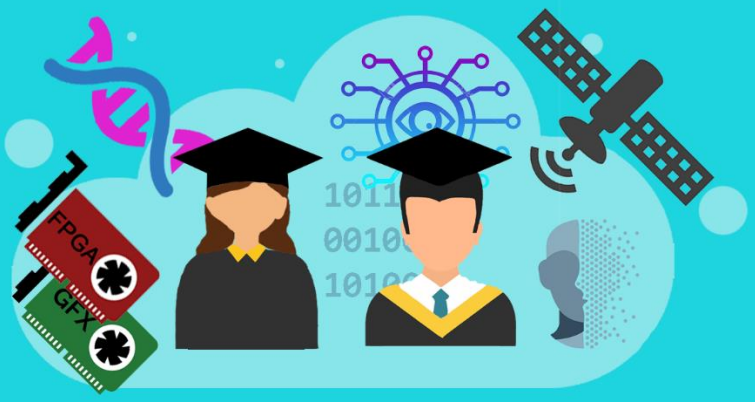
Diploma Thesis

Microproccessors and Digital Systems Laboratory



Improvement of sky-imaging PV production forecasts with application of deep learning

Recent developments in penetration of renewable energy into the grid have challenged regulators and producers around the globe. High penetration of photovoltaic (PV) and wind installations changes how loads are matched with energy production, as weather conditions are purely stochastic and cannot be controlled. Connected energy markets between countries now exchange power with prices that are defined one or two days ahead, based on production forecasts. Complimentary to the day-ahead market, a (more expensive) minute-ahead market is also operated for balancing reasons and mitigation of sudden ramps.

In this context, forecasting of renewable energy production for future minutes is becoming crucial. Many techniques, like numerical weather predictions, that are proven on hour/day forecast horizons fail to perform in these short time and area scales. One of the latest solutions to this challenge, specifically for PV installations, is the use of cameras that monitor the sky and report on cloud coverage with temporal and spatial resolutions that are suitable for typical systems.

The purpose of this thesis is to extend a previously published SotA solution, based on machine learning approaches like autoregressive neural networks, in order to improve the accuracy of forecasts with horizons up to 30 minutes. A complete integration into a multistage DNN will be targeted, exploring reusability of features and exploration of available DNN for movement detection and quantization. Optionally, after the models have been validated through simulations, they will be ported on an embedded platform to showcase real time capabilities.

PREREQUISITES

Basic knowledge on Neural Networks, Linux, Scripting (Python, Bash etc.)

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