Renewables time series generation using machine learning for the optimal operation of wind and solar parks

Background

Nowadays, the grid integration of renewable energy sources (RES) is being broadened because of environmental concern, taking advantage of the smart grid functionalities. However, the nature of RES, which are highly variable and intermittent, hinders the reliable electricity supply and may have negative effects on system stability. To this end, a set of time series scenarios is often developed in order to capture the uncertainties induced by RES. As a result, system and RES operators can take better decisions regarding the economic dispatch, unit commitment, and the optimal operation of RES. To generate new realistic scenarios, data-driven methods based on machine learning have started being developed while offering better performance compared to the existing model-based approaches.

Objective

Within this work the student will have the opportunity to tackle a challenging real-world problem by developing data-driven models for wind and solar power scenario generation. Furthermore, the influence of various features, such as wind speed, solar radiation, temperature etc., will be examined and finally an evaluation of different models' performance is expected to be delivered. In particular, different generative adversarial network (GAN) architectures are to be tested and evaluated. Importantly, this thesis corresponds also to students who have zero experience with machine learning, but they are eager to dig into this disruptive field and develop their own solutions. The thesis can be written either in German or English.

Approach and tasks

1. Literature review
2. Development of various scenarios generation models
3. Assessment of the influence of different feature selection
4. Evaluation of the results

Requirements

- Working independently
- Basic knowledge of linear algebra
- R/Python or Matlab

Start date: immediately!

Interested students please contact
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