COMPUTER SCIENCE
DATAVETENSKAP

Master/CivIng. Thesis Proposal 30 hp

Machine Learning for Renewable Energy Management

The integration of renewable energy (RE) sources into power grids and advancements in ICT such as Cloud and Edge Computing have significant potential for the development of smart energy grids, where a customer has production, consumption and storage capabilities leading to the prosumer concept. The variability of RE production gives to the prosumer an active role for the operation of the smart grid contributing to CO2 reduction for flexible and sustainable energy systems. Hence, coordination for energy production and management among distributed prosumers is essential to exploit the potential of large scale RE trading.

In this thesis, you will improve your understanding about AI empowered smart grid and the further requirements for Edge/Cloud integration beyond the initial smart grid architecture. This will enable you to provide research and innovation, such as the development of comprehensive AI and ML algorithms enabling the optimization of distributed energy management schemes facilitated by Cloud/Edge integration, the development of extensions and updates towards Cloud/Edge of Virtual Power Plant platforms for integrating them with ML algorithms. The results will lead to more flexibility and robustness of distributed RE production and trading, which is central to the development of the smart grid concept towards AI empowered future energy systems. Regarding robustness, it is important to develop methods which allow to better predict the supply and demand of RE along with quantifications of RE uncertainties. To that extent, partner Glava has operating Solar panels and windpark with related weather stations, where data over the last 5 years is available. In addition, it is possible to connect to relevant data in real-time.

The main aim of this thesis is to develop new methods based on Machine Learning to better quantify the variability and uncertainty of RE production and/or supply. Alternatively, the student can focus on the integration of Machine Learning methods to predict RE supply and demand into the IoT platform Thingsboard for the SmartGrid usecases.

Contact: Prof. Dr. Andreas Kassler (andreas.kassler@kau.se)
External Partner: Glava Energy Center

Glava Energy Center

Karlstad University
651 88 Karlstad Sweden
Tfn +4654-700 10 00
Fax +4654-700 14 97
cs@kau.se