Review on AI-Based Digital Twins for Energy Systems

Brief Description of the Project:

Digital twins, virtual replicas of physical objects or systems, hold immense potential for revolutionizing the simulation and monitoring of energy systems, e.g. photovoltaic (PV) or wind generation or loads. In this research internship, the student will explore a mini-review focused on AI-based digital twins for energy systems. The primary objective is to investigate existing AI applications, functionalities, advantages, and disadvantages within the context of digital twins, illustrate how these models can significantly contribute to the future of (energy) simulation.

Additionally, if required, there is room and flexibility for students to express their own interests in this topic and to focus on a more specific topic. Even the potential development of an AI algorithm for creating a digital twin is given.

Key facts:

Supervisor(s): Sebastian Zieglmeier and Paal Engelstad (Department of Technology systems, ITS)

Preferred Background of Candidate(s): Electrical Engineering, Computer Science, Renewable Energy Systems, Mathematics or related fields are encouraged to apply. Knowledge of Programming, Modelling or an interest in AI would be beneficial.

Number of Available Projects: 1-2 (Flexibility is provided for students to explore various aspects within the broader topic of AI-based digital twins for energy systems and the possibility for group work exists.)

Preferred Project Period: The project period is flexible and will be determined collaboratively between the supervisor and the selected student.

Background and Outline of Project Work:

In the evolving landscape of energy systems, digital twins—virtual counterparts of physical entities—offer a transformative role in simulating and monitoring processes. The student(s) undertaking this research will conduct a brief review of existing AI applications in digital twins, specifically focusing on energy systems. The project allows room for students to explore their specific interests within the broader topic, including the potential development of an AI algorithm for creating digital twins.

Tasks may include (not all necessary):

1. Surveying and evaluating existing AI applications in digital twins for energy systems.

2. Assessing the functionalities, advantages, and disadvantages of identified AI applications in the context of digital twins.

3. Optionally, developing a simple AI algorithm for creating a digital twin, depending on the student's interest.

Expected Output:

The culmination of this research internship is anticipated to yield a brief report detailing the regarding task like a mini-survey or the developed AI based Digital twin.

Depending on the project's findings, there is potential for a publication or further cooperation e.g. in form of a master's thesis.

This internship presents a unique opportunity for motivated student(s) to contribute to the ongoing research at ITS and can level up their knowledge in programming, AI, and sustainable energy solutions. The selected candidate(s) will have the autonomy to guide their research direction, offering a valuable and enriching experience with the flexibility to explore various aspects of AI and digital twin technology based on their interests in close collaboration with the supervisors.