AI for Offshore Wind

The primary objective of the master's thesis revolves around the development of an advanced artificial intelligence (AI) system with the capability to accurately forecast and anticipate the intricate dynamics exhibited by offshore wind systems under a wide range of diverse and challenging marine weather conditions. By harnessing the potential of cutting-edge technologies and methodologies, this research aims to bridge the gap between theoretical knowledge and practical application within the realm of renewable energy.

To achieve this ambitious goal, the training process of the AI system will be meticulously carried out, leveraging the immense power of simulation data acquired through comprehensive numerical simulations executed via specialized software. These simulations serve as an invaluable tool for generating realistic scenarios that accurately depict the complex interplay between offshore wind systems and the various meteorological and oceanographic factors that influence their behavior.

The obtained simulation data will encompass an extensive array of parameters, encompassing wind speed, direction, wave height, current velocities, and other relevant environmental factors. This comprehensive dataset will enable the AI system to learn and discern the intricate patterns, correlations, and nonlinear relationships that exist within the offshore wind system dynamics.

The AI model will undergo a rigorous training process, involving the utilization of state-of-the-art machine learning algorithms specifically tailored for this complex task. These algorithms will analyze the simulation data, iteratively adjusting and optimizing their internal parameters to effectively capture the underlying dynamics of the offshore wind system under diverse meteorological and oceanic conditions.

Upon successful training, the developed AI system will possess the ability to accurately predict the behavior of offshore wind systems in real-time, based on the given meteorological and oceanographic input. This powerful tool will have significant implications for the renewable energy sector, enabling more informed decision-making processes, optimizing operational strategies, and enhancing the overall efficiency and reliability of offshore wind farms.

Ultimately, this master's thesis project aims to contribute to the advancement of renewable energy research and pave the way for the integration of AI technology into the domain of offshore wind systems. By harnessing the power of artificial intelligence and leveraging the insights gained from

sophisticated simulations, this study aspires to revolutionize the way we understand, analyze, and harness the potential of offshore wind energy resources in a sustainable and efficient manner.

Goals:

- Selection of the algorithm for the creation of an accurate AI model.

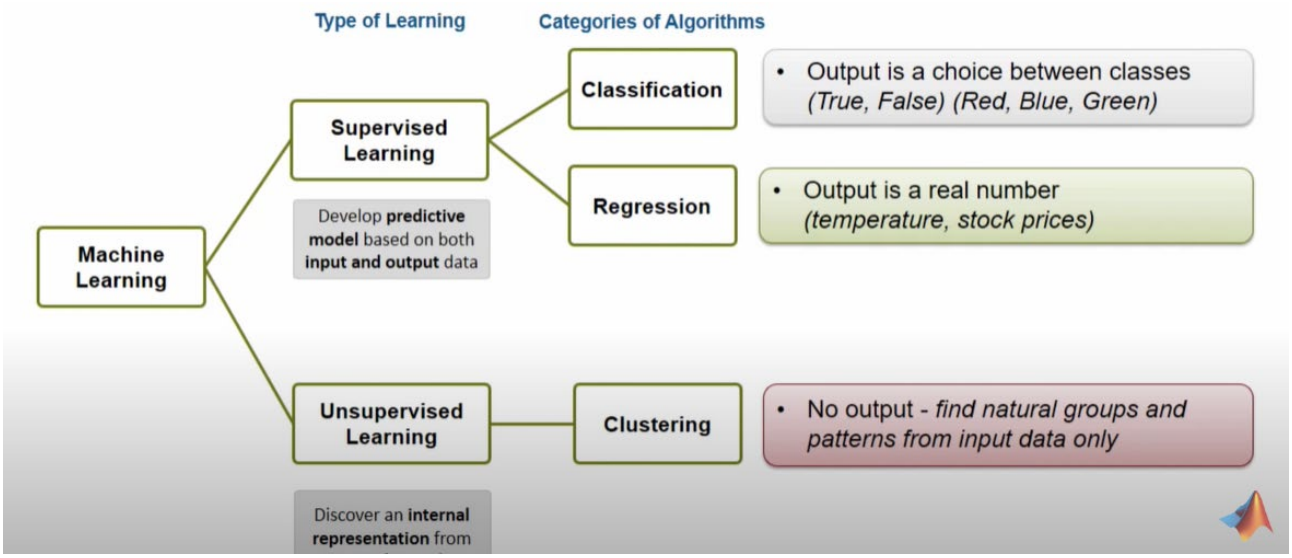

Figure 1-Machine Learning Techniques

- Comparison and validation of the AI model VS the dataset (numerical simulations).
- Creation of a User-Friendly interface.
- Extension of the AI with different offshore wind systems (optional).

Requirements

- Master's Degree in Mechatronic, Electronic, Mechanical, Robotic, or Aerospace Engineering
- Good programming skills with MATLAB.
- Minimum grade of graduation 100/110.
- Strong interest in renewable energies and topics related to climate change and environmental protection.