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Short-Term Wind Speed Prediction Based on Artificial Intelligence

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Abstract

The utilization of renewable energy resources is mainly related to the problem of the prediction precision of wind speed. Based on wind speed data, the definition of wind energy potential emphasizes ensuring the efficiency and reliability of wind energy systems. The objective of this work is to present a comprehensive review of artificial intelligence (AI) techniques applied to forecast short-term wind speed.

The study compares systematically six different AI models, ranging from machine learning models like high-capacity models that comprise Random Forests, Support Vector Machine, autoregressive moving average (ARMA), Linear and Logistic Regression to more complex models like Long Short-Term Memory (LSTM) networks.

The models are trained and validated against extensive historical records of wind speeds. This paper covers some analysis related to the hourly data collected at the west of the Mediterranean Sea (Mugla City at the Latitude: 556335 and Longitude: 4070184 [ED-50 formats]), between 2001 and 2002.

The study highlights the greater significance of new predictive analytics as a move towards ending the issues of incorporating renewable energy sources into traditional power systems. The study also provides useful insight into AI-based forecasting system design and implementation, paving the way for breakthroughs in environmental applications.

Keywords: Wind energy, sustainability, data driven predictions, machine learning, artificial intelligence