

# **Using Artificial Intelligence to Analyze Wind Energy Production**

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## **Abstract**

Wind speed and non-linear fluctuations are key components of aerodynamic load prediction and wind turbine performance. These loads are important in calculating the electricity generated by the wind turbine and the stress on the rotor blades, especially the fatigue of structural components. Many works have been carried out in recent years to estimate wind speed and wind energy based on physical modeling where a large amount of data is obtained from the weather forecast, statistical modeling using input and output data to find some patterns and hybrid modeling where a combination of data is used. In the present study, we will combine some physical aspects related to wind speed and wind turbine machine characteristics including wind rose, site location such as roughness, and other geometrical characteristics with the Artificial Neural Networks (ANN) to obtain the most accurate forecasting data and accurately predict annual energy production. The data used in this study were provided by KACARE, the King Abdullah City for Atomic & Renewable Energy, for some cities in Saudi Arabia based on the hourly local meteorological measurements data from 2013 to 2016. The model developed has been performed by using WEKA software for ANN and windographer for wind distribution density and wind rose. The obtained information is then retrieved and used to predict annual wind energy production. The significance of the study relies on its ability to use Artificial Intelligence to predict daily average wind speed and ensure a secure and reliable electrical power output.

## **Keywords**

Artificial Intelligence, Wind Energy, Wind Speed, and ANN