# Short term prediction of wind turbine production whith data minnig methods : direct approach and integrated approach.

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**Abstract :**
The Energy Transition Act defined by the French State has precise implications on Renewable Energies, in particular on its remuneration mechanism. Until then, a purchase obligation contract permitted the sale of wind-generated electricity at a fixed rate. Tomorrow, it will be necessary to sell this electricity on the Market (at variable rates) before obtaining additional compensation intended to reduce the risk. This sale on the market requires to announce in advance (about 48 hours before) the production that will be delivered on the network, so to be able to predict (in the short term) this production. The fundamental problem remains the variability of the wind accentuated by the geographical situation. The objective of the project is to provide, every day, short-term forecasts (48-hour horizon) of wind production using weather data. The predictions of the GFS model and those of the ECMWF model are used as explanatory variables. The variable to be predicted is the production of a wind farm. We do two approaches: a direct approach that predicts wind generation directly from weather data, and an integrated approach that estimates wind from weather data and converts it into wind power by power curves. We used machine learning techniques to predict this production. The models tested are random forests, Extreme Gradien Boosting (XGBoost), CART + Bagging, CART + Boosting, SVM (Support Vector Machine). The application is made on a wind farm of 22MW (11 wind turbines) of the Compagnie du Vent (that became Engie Green France). Our results are very conclusive compared to the literature.

## Références

Breiman, L. (2001). Random Forest. Machine Learning.

Kariniotakis G., Juban J. and Fugon L. (2008). Data mining for wind power forecasting. European Wind Energy Conference & Exhibition EWEC 2008, page 6.

Genuer R. (2010). Forêts aléatoires : aspects théoriques, sélection de variables et applications. PhD thesis, Université Paris Sud 11.

Hastie T., James G., Witten D. and Tibshirani R. (2013). An introduction to statistical learning. Springer.
Kariniotakis G. and Giebel G. (2009). Best practice in short-term forecasting. A users guide.

Mougeot M., Fischer A., Montuelle L. and Picard D. (2017). Statistical learning for wind power : a modeling and stability study towards forecasting. Wind Energie.

Zheng H., Kusiak A. and Song Z. (2008). Wind farm power prediction: A data-mining approach.
Wind Energy, 12(3) : 275-293.

Friedman J., Stone C. J., Breiman L. and Olshen R.A. (1984). Classiffcation and regression trees.
Chapman & Hall/CRC, pages 5-32.