Title : Evaluation of bivariate distributions of GFS and ECMWF wind speed forecasts by Kullback Leibler divergence

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Abstract :
The French State's Energetic Transition Law has precise implications on Renewable Energies, in particular its compensation mechanism. Until now, a purchase obligation contract made it possible to sell wind-generated electricity at a fixed rate. Tomorrow, it will sell this electricity on the market (according to variable rates) before obtaining additional compensation to reduce the risk. This sale on the Market requires to announce in advance (approximately 36 hours before) the production that will be delivered on the network, thus to be able to predict (in the short term) this production. To this end, we will use wind weather forecasts to transform them into wind production forecast using statistical models. However, several models provide forecasts of atmospheric variables (wind, temperature, pressure, humidity, etc.) on a global or local scale. Some of these forecasts are free while others are not free. In our Predict'Eol project, we have forecasts of atmospheric variables of the GFS model (Global Forecast System) and the ECMWF (European Center for Medium-Range Weather Forecasts) model. Therefore, our first approach is to study and compare the performance of these two models. The results of this study will allow us either to choose the best forecasts or to make a possible aggregation of the two models if it turns out that this aggregation offers better precision. In this paper we make a comparative study between the GFS and ECMWF forecasts. Wind being the most important variable in wind energy production we restricted the study to this variable. To do this, we will study the GFS and ECMWF wind forecasts at the same geographical position taking as reference data the actual measurements of a pylon not far from this position.

Key words : ECMWF and GFS forecast skill, Kullback Leibler divergence, bivariate distribution of the wind

Bibliography
Mamadou DIONE is a PhD student in statistics at ENSAE Paris Tech. After a Master degree in mathematical engineering at the University of Lyon 1 followed by an internship at EDF R & D in 2015, he began in 2016 a PhD thesis in applied mathematics (statistical specialty). He works on machine learning methods for the short-term prediction of wind farms production and the implementation of a tool for predicting wind energy production of ENGIE Green France.

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