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Short-Range hourly wind speed forecasting using Support Vector Regression

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In recent years, the use of wind power has expanded significantly in Spain and other countries, and shall continue in the future as well. On the one hand, in everyday operation and maintenance of wind power facilities, predicting the future output of wind speed and power is of key interest. On the other hand, the structure of electricity markets imposes upon the producer to forecast the future production level, which thus forces the producer to be subject to possible deviations. These deviations lead to economic losses; therefore there is a strong need to predict as accurately as possible. In fact, there is currently a growing interest in wind prediction to improve operation and maintenance tasks.
To deal with these issues, Gamesa (a Spanish company, world leader in the development, construction and sale of wind farms, and also in wind turbine's operation and maintenance services) has been developing a forecast system (called MEGA), not only to cover their own requirements, but to offer it to customers for electricity market operations and for O&M (Operation and Maintenance) tasks. In fact, this field has become a very important business area for the company lately.
Also, MEGA has a web-based interface to provide a friendly and useful environment for users.
Gamesa's forecasting model consists of several combined numerical weather prediction (NWP) models and MOS techniques to reduce systematic errors and enhance the forecasting accuracy, taking into account specific characteristics of each wind farm. Likewise, short-range forecasting models for wind speed and power have been implemented taking advantage of measured data from wind farms.
Regarding hourly wind power such short-range model is based on recursive least squares filters and autoregressive models.
In this paper we will show an assessment of the capacity of a soft computing approach (Support Vector Regression), for hourly wind speed prediction in key horizons for Spanish electricity market sessions (until a time horizon of nine hours ahead), as a tool to improve our currently available forecasts in such time horizons.
We have employed a SVR technique for time series forecasting, and we have run experimental analyses on real scenarios with data from several of wind farms which Gamesa manages in O&M issues.
We have tried to develop a short-range prediction model for hourly wind speed at wind farm level, and we have tried to answer if we can use this technique for reliable forecasts and value-added improved forecasts for such time horizons, and how much information from the past is relevant.
Up to now, we have reached encouraging results, and we are convinced that there is still an improving margin.
Experimental results show improvements in all of the studied time horizons (regarding our reference model forecasts -MOS wind speed outcome-, in terms of MAE and MSE errors). Results in the five nearest time horizons are reasonably good (from 10% to up to 60%, depending on wind farms and horizons). In farther ones, improvements are less than 10%.