LITERATURE SURVEY

1.1 TITLE: Current methods and advances in forecasting of wind power generation.

AUTHOR: A. M. Foley, P. G. Leahy, A. Marvuglia, and E. J. McKeogh.

DESCRIPTION:

Wind power generation differs from conventional thermal generation due to the stochastic nature of wind. Thus, wind power forecasting plays a key role in dealing with the challenges of balancing supply and demand in any electricity system, given the uncertainty associated with the wind farm power output. Accurate wind power forecasting reduces the need for additional balancing energy and reserve power to integrate wind power. Wind power forecasting tools enable better dispatch, scheduling and unit commitment of thermal generators, hydro plant and energy storage plant and more competitive market trading as wind power ramps up and down on the grid. This paper presents an in-depth review of the current methods and advances in wind power forecasting and prediction. Firstly, numerical wind prediction methods from global to local scales, ensemble forecasting, upscaling and downscaling processes are discussed. Next the statistical and machine learning approach methods are detailed. Then the techniques used for benchmarking and uncertainty analysis of forecasts are overviewed, and the performance of various approaches over different forecast time horizons is examined. Finally, current research activities, challenges and potential future developments are appraised.

1.2 TITLE: Analysis of wind energy time series with kernel methods and neural networks.

AUTHOR: O. Kramer and F. Gieseke.

DESCRIPTION:

Wind energy has an important part to play as renewable energy resource in a sustainable world. For a reliable integration of wind energy, the volatile nature of wind has to be understood. This article shows how kernel methods and neural networks can serve as modeling, forecasting and monitoring techniques, and, how they contribute to a successful integration of wind into smart energy grids. First, we will employ kernel density estimation for modeling of wind data. Kernel density estimation allows a statistically sound modeling of time series data. The corresponding experiments are based on real data of wind energy time series from the NREL western wind resource dataset. Second, we will show how prediction of wind energy can be accomplished with the help of support vector regression. Last, we will use self-organizing feature maps to map high-dimensional wind time series to colored sequences that can be used for error detection.

1.3 TITLE: Analysis of wind energy time series with kernel methods and neural networks.

AUTHOR: O. Kramer and F. Gieseke.

DESCRIPTION:

Wind energy prediction has an important part to play in a smart energy grid for load balancing and capacity planning. In this paper we explore, if wind measurements based on the existing infrastructure of windmills in neighbored wind parks can be learned with a soft computing approach for wind energy

prediction in the ten-minute to six-hour range. For this sake we employ Support Vector Regression (SVR) for time series forecasting and run experimental analyses on real-world wind data from the NREL western wind resource dataset. In the experimental part of the paper, we concentrate on loss function parameterization of SVR. We try to answer how far ahead a reliable wind forecast is possible, and how much information from the past is necessary. We demonstrate the capabilities of SVR-based wind energy forecast on the micro-scale level of one wind grid point, and on the larger scale of a whole wind park.

1.4 TITLE: Age-fitness Pareto optimization.

AUTHOR: M. Schmidt and H. Lipson.

DESCRIPTION:

We propose a multi-objective method for avoiding premature convergence in evolutionary algorithms and demonstrate a three-fold performance improvement over comparable methods. Previous research has shown that partitioning an evolving population into age groups can greatly improve the ability to identify global optima and avoid converging to local optima. Here, we propose that treating age as an explicit optimization criterion can increase performance even further, with fewer algorithm implementation parameters. The proposed method evolves a population on the two-dimensional Pareto front comprising (a) how long the genotype has been in the population (age); and (b) its performance (fitness). We compare this approach with previous approaches on the Symbolic Regression problem, sweeping the problem difficulty over a range of solution complexities and number of variables. Our results indicate that the multi-objective approach identifies the exact target solution more often that the age-layered population and standard population methods. The multi-objective method also performs better on higher complexity problems and higher dimensional datasets -- finding global optima with less computational effort.

1.5 TITLE: Short-term prediction of wind farm power: A data mining approach.

AUTHOR: A. Kusiak, H. Zheng, and Z. Song.

DESCRIPTION:

Multivariate time series models were built to predict the power ramp rates of a wind farm. The power changes were predicted at 10 min intervals. Multivariate time series models were built with data-mining algorithms. Five different data-mining algorithms were tested using data collected at a wind farm. The support vector machine regression algorithm performed best out of the five algorithms studied in this research. It provided predictions of the power ramp rate for a time horizon of 10–60 min. The boosting tree algorithm selects parameters for enhancement of the prediction accuracy of the power ramp rate. The data used in this research originated at a wind farm of 100 turbines. The test results of multivariate time series models were presented in this paper. Suggestions for future research were provided.

S.No	Year	Author	Title	Algorithm	Disadvantage
1.	2012	A. M. Foley, P. G.Leahy ,A.Marvuglia, and E. J. McKeogh.	Current methods and advances in forecasting of wind power generation	Data- Mining	Some of the data science related properties and terms are not well defined in detail
2.	2011	O. Kramer and F. Gieseke.	Analysis of wind energy time series with kernel methods and neural networks.	Support Vector Regression	Concentrated mostly on the wind power based on neural networks and kernel-based methods rather than including any other methods of data science and machine learning like support vector regression.
3.	2011	O. Kramer and F. Gieseke.	Short-term wind energy forecasting using Support vector regression.	Support Vector Regression	Should have worked out this paper based on the advanced techniques such as Neural networks
4.	2010	M. Schmidt and H. Lipson.	Age-fitness Pareto optimization.	ALPS Algorithm, Pareto Algorithm, Deterministic Crowding Algorithm.	As it is a multi-objective approach if failure or interruption occurs in any one of the objectives then the system fails
5.	2009	A. Kusiak, H. Zheng, and Z. Song.	Short-term prediction of wind farm power: A data mining approach.	Data- Mining	Wind speed can be predicted fairly accurately based on its historical values; however, the power cannot be accurately y determined given a power curve model and the predicted wind speed.