EXPRESSION OF INTEREST FOR TECHNOLOGY TRANSFER

University of Kerala
Thiruvananthapuram
Kerala, INDIA 695 581

A MACHINE LEARNING-BASED WIND SPEED PREDICTION SYSTEM FOR HIGHER ALTITUDE USING LOWER WIND MAST

Name of the inventor(s): Dr K. Satheesh Kumar, Dr G. V. Drisya, and Dr P. Valsaraj

Name of the invention: A MACHINE LEARNING-BASED WIND SPEED PREDICTION SYSTEM FOR HIGHER ALTITUDE USING LOWER WIND MAST

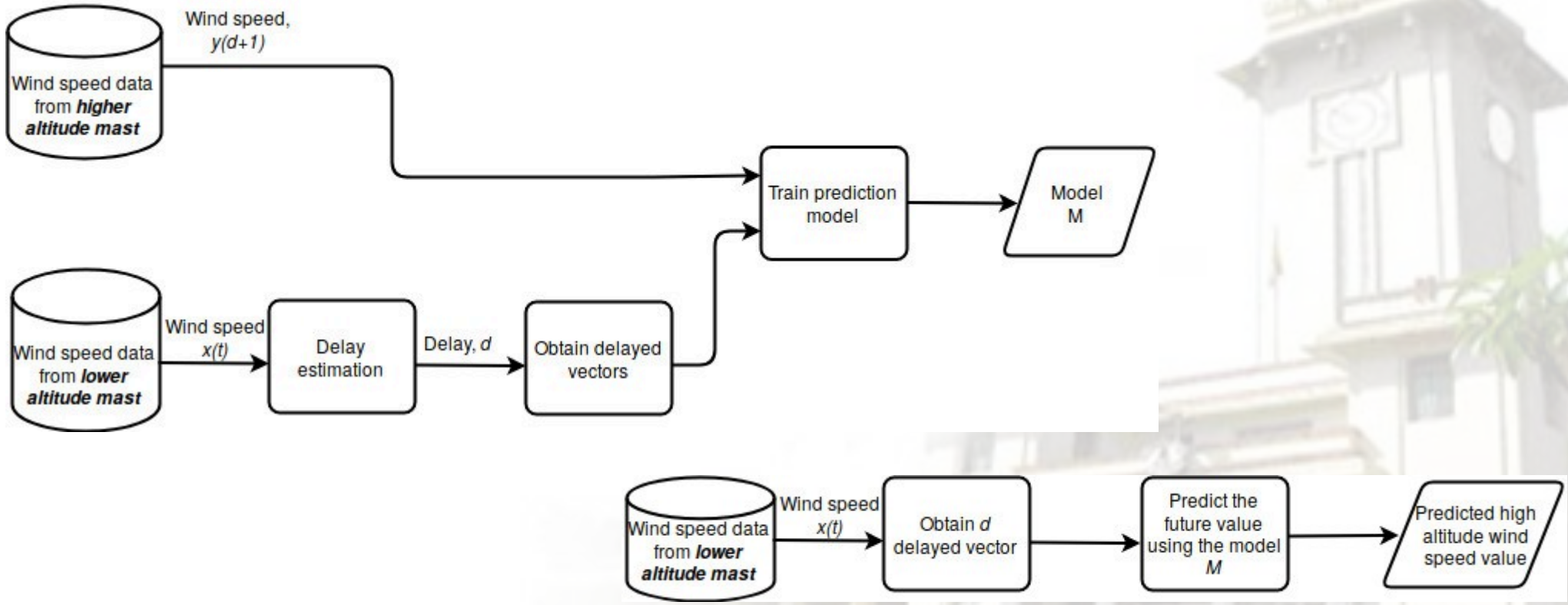
Patent Application & priority date
/ Patent Number & date of patent: 28-03-2019/533589, 18/04/2024

TRIC
UNIVERSITY OF KERALA

Brief description of the invention (Abstract):

The present invention involves a uniquely devised machine learning modelling technique which effectively generates wind speed forecasts at a higher altitude using wind data measured with a shorter wind measuring mast, which is easier to erect and maintain technically and economically. The model is trained one-time only with data from higher and shorter height levels of a real-sized reference wind mast erected at one location within a vast windy area. The one-time trained model can be employed with wind data from shorter wind masts erected at multiple other locations of interest within the same windy area to generate time-ahead wind forecasts at the higher altitude at those multiple locations.

Graphical abstract:



TRIC
UNIVERSITY OF KERALA

Novelty of the invention:

Wind forecasting at a required height is usually done by erecting and maintaining a wind measuring mast of the same height. The present invention allows the wind energy industry to use a shorter and (hence) engineering-friendly wind mast setup in the field in place of the taller ones and perform the same task of wind forecasting at the higher height accurately.

TRIC
UNIVERSITY OF KERALA

Utility of the invention:

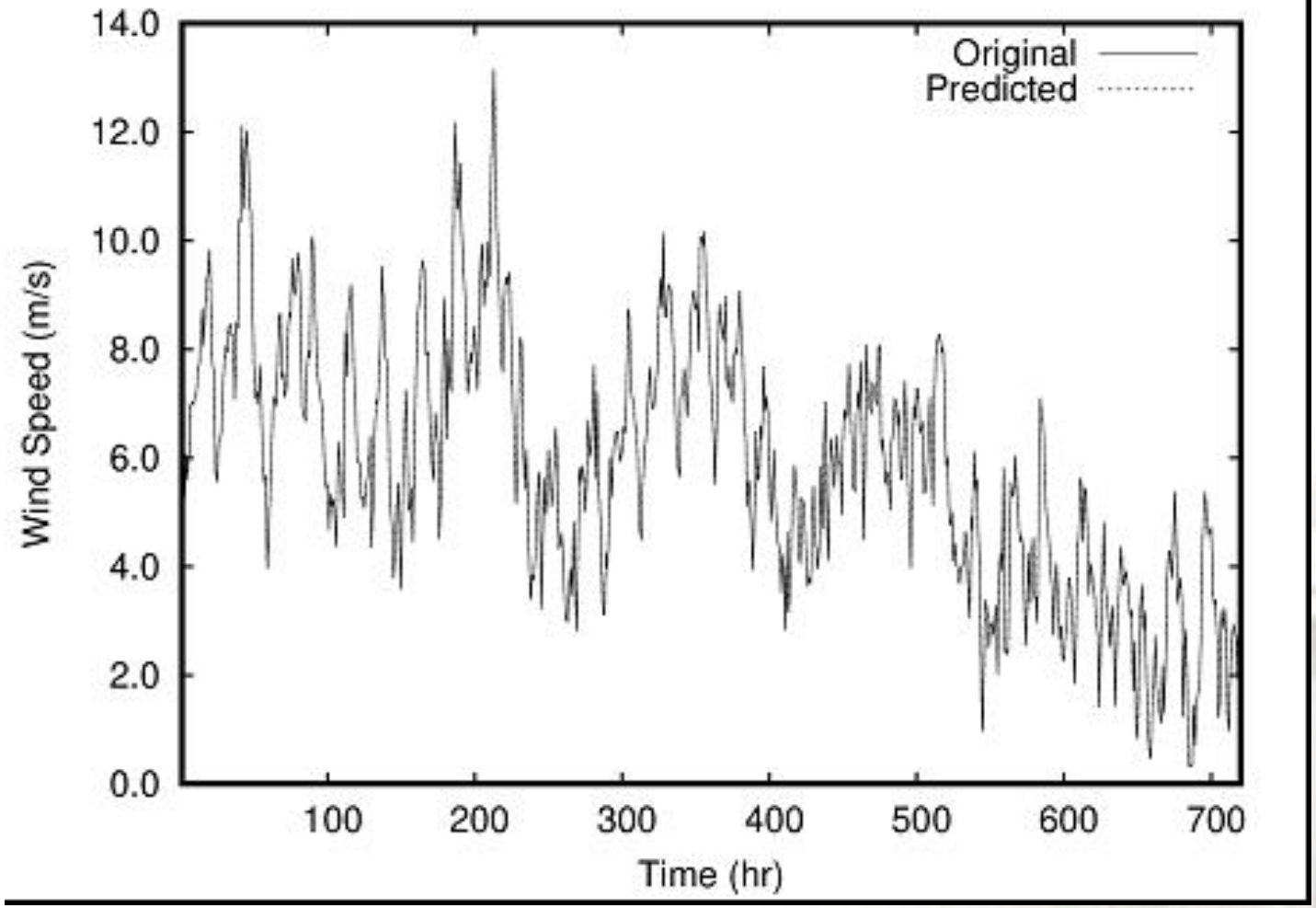
Accurate wind forecasting is crucial for the effective grid integration of fluctuating wind power. The new technology enables time-ahead wind forecasting at higher altitudes by using shorter wind measuring masts. This innovation will allow the wind energy industry to employ engineering-friendly shorter wind mast setups instead of complicated, taller ones in the field, thereby facilitating the wind energy industry significantly.

Non-obvious nature of the invention:

Wind forecasting at a height is done so far by using past data at the same height obtained from a wind mast of the same height. Obtaining the same result using past data at a shorter height is not known so far. The present innovation addresses this problem/ requirement.

TRIC
UNIVERSITY OF KERALA

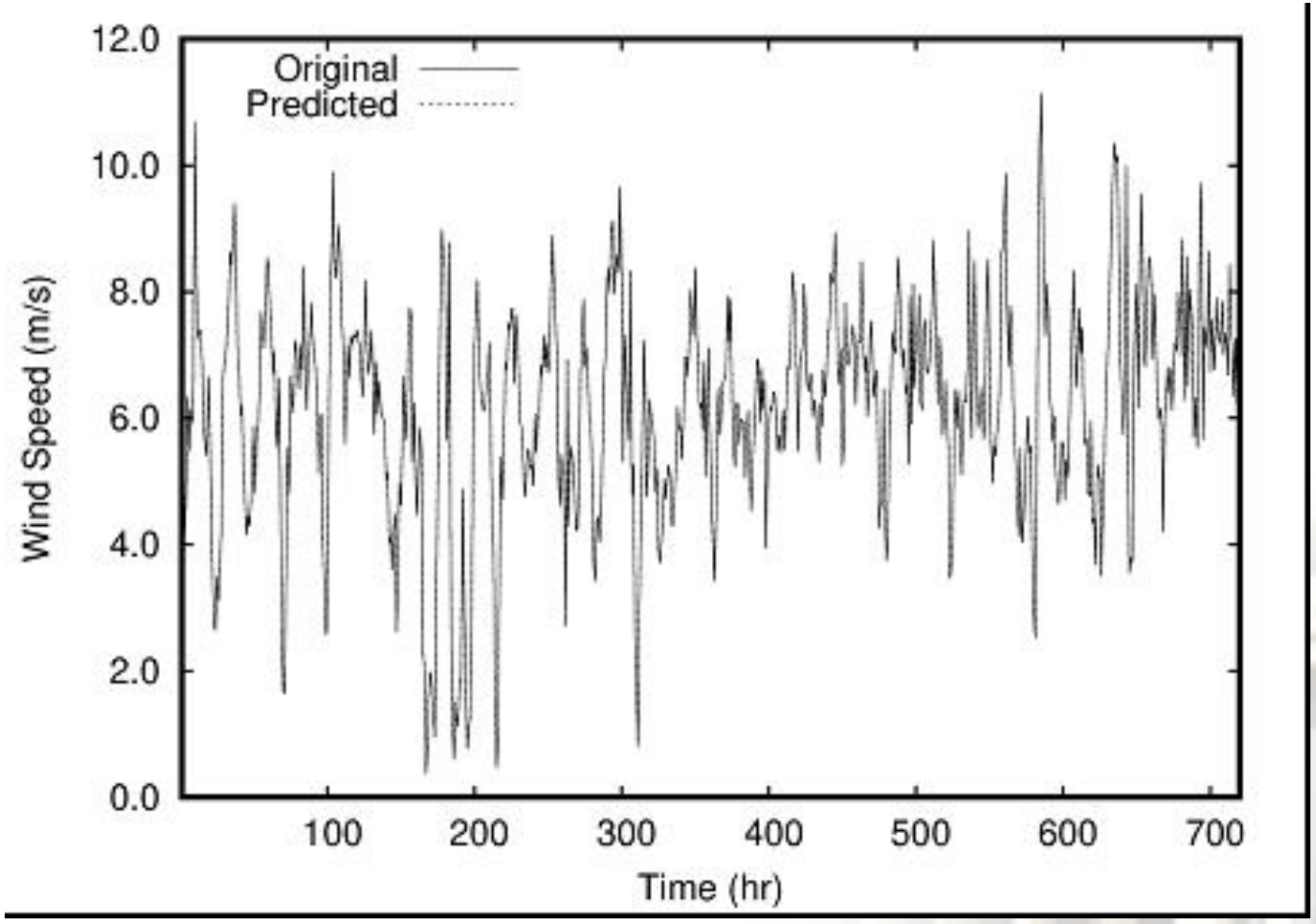
Results:



Actual wind speed time series at 80m height at Kulathumedu (Idukki District) in comparison with the corresponding values predicted using the wind data at 50m height at the same location by employing the prediction model trained with wind data at 80m and 50m heights from Malambuzha (Palakkad District).

TRIC
UNIVERSITY OF KERALA

Results:



Actual wind speed time series at 80m height at Malambuzha (Palakkad District) in comparison with the corresponding values predicted using the wind data at 50m height at the same location by employing the prediction model trained with wind data at 80m and 50m heights from Kulathumedu (Idukki District).

Clauses applied for /protected (for granted patents):

1. A machine learning-based system for predicting one hour ahead wind speed, consisting of:

   a wind mast to measure wind speed at 50 metre altitude;

   a support vector machine (SVM) learning model ;

   wherein the support vector machine (SVM) learning model is trained with hourly wind speed data at 80 metre and 50 metre altitude over a period of one year at a reference location, and wherein the trained support vector machine (SVM) learning model is capable of predicting one hour ahead wind speed at 80 metre altitude at any other location using wind speed data from a shorter wind mast of 50 metre altitude erected at that location.

2. The machine learning-based system for predicting wind speed as claimed in claim 1,wherein alternative machine learning methods are employed instead of the support vector machine (SVM) learning model.

3. The machine learning-based system for predicting wind speed as claimed in claim 1 and claim 2, wherein time ahead wind speeds at any higher altitude instead of 80 metre are generated using measured values from any lower height instead of 50 m.

4. The machine learning-based system for predicting wind speed as claimed in claim 1, claim 2 and claim3, wherein higher or lower time resolution wind speed data are predicted in place of hourly data.

5. The machine learning-based system for predicting wind speed as claimed in claim 1, claim 2, claim 3 and claim 4,wherein the machine learning model is trained with past data over any period instead of one year.

Fields where the invention finds application:

The invention is of great practical help to the wind energy industry in wind forecasting tasks for the proper grind-integration of the fluctuating wind power produced.

TRIC
UNIVERSITY OF KERALA

Whether the work has been published:
(Authors, year, title of publication, Journal name, volume, page no)

P. Valsaraj, Drisya Alex Thumba, K. Satheesh Kumar/2022/Machine learning-based simplified methods using shorter wind measuring masts for the time ahead wind forecasting at higher altitude for wind energy applications/Renewable Energy and Environmental Sustainability (an International Journal from EDP Sciences, France)/Vol.7/Article 24

https://doi.org/10.1051/rees/2022012

Contact us @
tricku@keralauniversity.ac.in
Ph: +91 9074529255