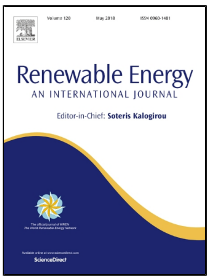
Accepted Manuscript



Wind Turbine Health State Monitoring Based on a Bayesian Data-driven Approach

Zhe Song, Zijun Zhang, Yu Jiang, Jin Zhu

PII:	S0960-1481(18)30240-4
DOI:	10.1016/j.renene.2018.02.096
Reference:	RENE 9827
To appear in:	*Renewable Energy*
Received Date:	10 June 2017
Revised Date:	09 January 2018
Accepted Date:	18 February 2018

Please cite this article as: Zhe Song, Zijun Zhang, Yu Jiang, Jin Zhu, Wind Turbine Health State Monitoring Based on a Bayesian Data-driven Approach, *Renewable Energy* (2018), doi: 10.1016/j.renene.2018.02.096

Wind Turbine Health State Monitoring Based on a Bayesian Data-driven Approach

Zhe Song[1*], Zijun Zhang[2], Yu Jiang[1] and Jin Zhu[3]

[1] School of Business, Nanjing University, 22 Hankou Road, Nanjing, China 210093, Email: zsong1@nju.edu.cn; yujiang@nju.edu.cn; Tel. 86-25-83621041; Fax 86-25-83621041;
[2] Department of Systems Engineering & Engineering Management, P6600, 6/F, Academic 1, City University of Hong Kong, Hong Kong, Email: zijzhang@cityu.edu.hk;
[3] State Grid Jiangsu Electric Power Company, 215 Shanghai Road, Nanjing, China;

* Corresponding author

Abstract

The efficient wind turbine monitoring and the identification of abnormal turbine states are crucial to advance the wind farm operations and management. This paper presents a pioneer study of identifying wind turbine health states based on their SCADA data. A Bayesian framework is introduced to explore the feasibility and potential of identifying abnormal turbine states based on SCADA data only. Three methods, the bin method, the multivariate normal distribution based method, and the Copula method, are applied and compared in the Bayesian framework development based on SCADA data of two commercial wind turbines. A comprehensive study is conducted to analyze the pros and cons of three methods. Computational results demonstrate the effectiveness of the proposed methods and the Copula method outperforms other two after a careful model calibration. Extending the Bayesian Copula model to produce the one-step ahead prediction of turbine health states is also explored. In addition, the advantage of the proposed framework is further validated by comparing with the classical power curve based monitoring methods. Generated results show the feasibility of identifying turbine health states with SCADA data and the great potential of further enhancing the health monitoring function.

Keywords: *Wind energy, Wind turbine health, Fault diagnosis, Bayesian Approach, Data-driven.*