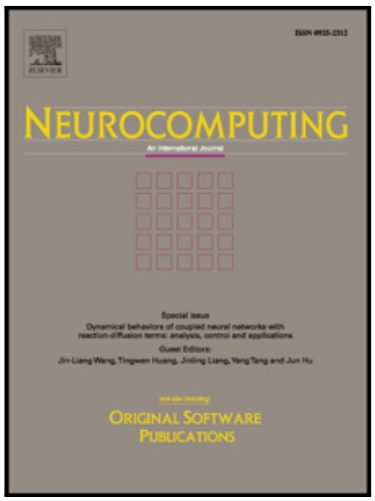

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Regression Tree Ensembles for Wind Energy and Solar Radiation Prediction

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Abstract

The ability of ensemble models to retain the bias of their learners while decreasing their individual variance has long made them quite attractive in a number of classification and regression problems. In this work we will study the application of Random Forest Regression (RFR), Gradient Boosted Regression (GBR) and Extreme Gradient Boosting (XGB) to global and local wind energy prediction as well as to a solar radiation problem. Besides a complete exploration of the fundamentals of RFR, GBR and XGB, we will show experimentally that ensemble methods can improve on Support Vector Regression (SVR) for individual wind farm energy prediction, that GBR and XGB are competitive when the interest lies in predicting wind energy in a much larger geographical scale and, finally, that both gradient–based ensemble methods can improve on SVR in the solar radiation problem.

Keywords: Ensembles, Regression, Random Forest, Gradient Boosting Regression, XGBoost, Wind Energy, Solar Radiation

1. Introduction

A most desired property of any model is to make as compatible as possible the often conflicting goals of small bias and small variance. After the introduction of Random Forests by Leo Breiman [3] and of Gradient Boosting by Jerome

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