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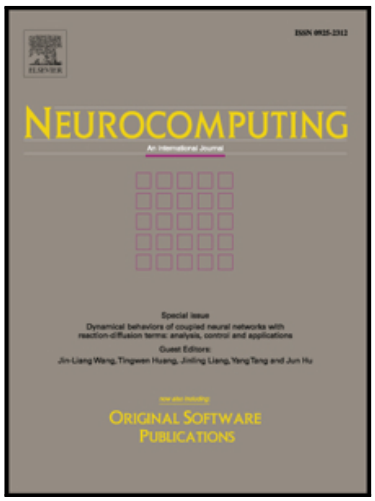

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Ocean Wave Height Prediction using Ensemble of Extreme Learning Machine

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Abstract

The intense increase in offshore operational activities warrants periodical and accurate prediction of the wave characteristics. Usually, complex numerical models that require high computational power are used in this prediction. To overcome these challenges of these numerical models, in this paper, we propose the use of an ensemble of Extreme Learning Machine (Ens-ELM) to predict the daily wave height. We exploit the randomness of initialization in ELM to obtain better generalization performance. This is done by constructing an Ensemble of ELM, with the parameters of each ELM initialized in distinct regions of the input space. For each sample in the data set, the output of the ELM with the least mean square for each sample in the data set is reported as its output. We study the performance of the Ens-ELM to predict the daily wave height in 10 stations of varying terrains from Gulf of Mexico, Brazil and Korean region. The Ens-ELM network is trained using the past wave data and the measured atmospheric conditions obtained in these stations between Jan 1, 2011 and Dec 31, 2014 and is tested with data in these stations between Jan 1, 2015 and Aug 30, 2015. In this study, the performance of Ens-ELM is evaluated in comparison with ELM, Online Sequential ELM (OS-ELM), and Support Vector Regression (SVR). From this study, we infer that the Ens-ELM out performs ELM, OS-ELM and SVR in the daily wave height prediction.

Keywords: Wave characteristics, SLFN, Extreme Learning Machine, SVR, OS-ELM.

1. Introduction

The intense increase in various offshore operations has spurred an interest in accurate prediction of wave characteristics [1]. There has been widespread

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