

# 1. Introduction

Due to its stochastic behavior, the wind speed and its direction are relatively challenging to be predicted. On the other hand, there are needs for a wind prediction system, such as for the operational work for ship navigation, offshore platform, as well as the structural design and construction process of coastal and offshore structures. Besides that, wind is also a popular renewable energy nowadays. For the design, operational, optimization of the performance of wind turbines, it is very important to have an accurate wind prediction system, see [10, 11].

Wind prediction system in general can be classified into two approaches, i.e. the physical approach and the statistical approach, see [10]. The physical approach is based on the Numerical Weather Prediction (NWP) that takes into account physical input such as pressure, temperature, topography, etc [13]. To operate such prediction system, require high computing facility and expensive maintenance. The second approach is the statistical approach, that uses no information related to the physical quantities, as in the physical approach. Here, it uses only historical data. The approach finds patterns in the historical data to be used for calculating prediction values. Within this approach there are Kalman filter [1], Auto Regressive, Artificial Neural Network, Support Vector Machine [8, 9] etc, see [3, 6]. The statistical approach usually requires less computational effort compared to the physical approach.

In this paper, we use a deep learning method for wind prediction, i.e. the so-called Long Short Term Memory (LSTM) method, that is firstly introduced by Hochreiter & Schmidhuber in 1997 [5]. The LSTM is a variant of Artificial Neural Network (ANN) uses feed forward method. In this paper, we use historical wind data from the reanalysis ERA-Interim by ECMWF, see [2]. Instead of investigating the wind characteristic during arbitrary time, we apply the LSTM method for predicting each month during 2015. It is aimed to investigate the accuracy of the prediction each month. To quantify the results of prediction, we calculate Root Mean Square Error (RMSE) and Coefficient of Determination (CD) for monthly wind prediction.

The content of this paper is as follows. In Section 2, the Long Short Term Memory (LSTM) method is described. It is then followed by description of wind data that is used for the prediction system,

and the LSTM approach for the wind prediction in Section 3. Section 4 describes results and discussion the application of LSTM method for wind prediction. The paper is concluded in the last section.