Applications of Deep Learning to Predict OceanAtmospheric Characteristics

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Abstract

Oceanographic observations and models are imperfect, and therefore our simulations of the ocean are not completely realistic. Direct measurements of oceanic processes and properties are limited by sampling rates, while ocean models are limited by finite resolution, high viscosity and diffusion coefficients are needed in solving equations. This study instead evaluated deep learning methods, which focused on data as opposed to equations. There are used particular types of deep learning algorithms and hybrid models consists of artificial neural network (ANN), convolution neural network (CNN), long short-term memory network (LSTM) and etc., to make more accurate the prediction of ocean-atmospheric characteristics include; sea surface wind, sea surface temperature (SST), sea surface salinity (SSS) and sea surface height (SSH). Ocean time series data available in the databases preprocessed to achieve an appropriate pattern and predict factors for short-term in the oceanic area. The total framework of the simulation includes six main stages. At first, the data have been collected and prepared, and then trained the model. Moreover, the proposed hybrid model implemented and validated to predict the studied parameter for short-term (a period of several hours to several days) in several geographical points in a local Sea. Finally, the model performance evaluated and compared the accuracy through MAE, MSE and RMSE criteria. Results show high accuracy

Keywords: Deep Learning, Prediction, Sea Surface Temperature, CNN, BLSTM, Ocean Characteristics

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