

ABSTRACT

A more local approach is needed for wave forecasting in more complex sea areas, such as coastal areas. This approach is made so that the information about ocean wave conditions can be obtained in a high resolution and more accurate. Accurate wave forecasting information can prevent accidents when carrying out marine activities highly dependent on wave conditions, such as shipping, ocean engineering, and other maritime operations. Traditional local approach for local wave forecasting is usually obtained by performing simulation from global grid wave information into a high-resolution local grid using numerical simulation. This approach demands high computational cost. We propose a machine-learning approach for downscaling modeling that will use global wave height data and turn it into high-resolution local wave height data using the Transformer model. We use the local wave data from the result of SWAN numerical model simulation of the global dataset from ERA5 to train the model. We chose Jakarta Bay as a case study. Moreover, we also compare the results of the Transformer model with Bidirectional LSTM. Results of the experiments show promising results; we found that the Transformer has overall good performance with a CC of 0.971, RMSE of 0.043, and MAPE of 11.763, and we also find that the training process for Transformer is faster 5 times faster than Bi-LSTM.

Keywords: wave forecasting, downscaling, machine learning, Transformer