**Abstract**

Wave height prediction is crucial in several sectors, including environmental monitoring and resource management in coastal areas. Traditional methods, such as statistical regression, fail to discern complex patterns in time series data, resulting in reduced predicted accuracy. This research highlights improved wave height forecasting using Temporal Convolutional Networks (TCN) for wave height prediction. The TCN is a deep learning architecture recognised for its efficacy in processing sequential data. We selected a case study on the coast of Pacitan, East Java, Indonesia, which confronts the Indian Ocean and is recognised for its significant wave activity. We utilise nine years of historical simulated time series wave data from high-resolution wave simulations. The data is segmented into training and testing sets across several circumstances to ascer- tain which configuration yields superior predictive outcomes. We employ the model for predicting over periods of 3, 7, 14, and 21 days. Hyperparameter optimisation is conducted using RandomSearch and KerasTuner algorithm to improve model performance. We evaluate the accuracy of the TCN model in comparison to various deep learning model, including CNN and Transformer, by analysing performance metrics such as Root Mean Squared Error (RMSE) and Coefficient of Determination ($R^2$). The results demonstrate that TCN improves forecasting accuracy, as shown by decreased RMSE with 0.0170 score and increased $R^2$ values of 0.9930 over the 3-day forecasting period.

***Index Terms***—wave height forecasting, TCN, CNN, trans- former, time series forecasting.