

Sea Surface Temperature Prediction Approach Based on 3D CNN and LSTM with Attention Mechanism

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Abstract—Sea Surface Temperature (SST) is an important physical quantity of the ocean system. Accurate prediction of SST is essential for studying physical ocean phenomena and forecasting the ocean environment information. In this paper, a SST prediction approach based on 3-Dimensional Convolutional Neural Network (3D CNN) and Long Short-Term Memory (LSTM) with attention mechanism is proposed, which considers the spatial correlation and temporal dependency of SST data, and has high prediction accuracy. Firstly, the machine learning algorithm XGBoost is used to extract the long period temporal feature of each SST data and as a new feature of the SST data. Then a 3D CNN is used to capture the spatial correlations among a SST field data composed of multiple observation points in a selected sea area, followed by the LSTM model to extract the time dependency features of the SST field time series data, and the attention mechanism is added to weight the output of each step of LSTM model to adjust the prediction results and improve the prediction accuracy of the model. A series of experimental results show that the proposed approach has lower complexity, higher training efficiency and prediction accuracy, which is significantly better than the existing prediction models.

Keyword— Sea surface temperature, XGBoost, 3D CNN, LSTM, Attention mechanism



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