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## A Deep Learning Approach of Artificial Neural Network with Attention Mechanism to Predicting Marine Biogeochemistry data

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Marine biogeochemistry data is helpful for researchers to have a more comprehensive understanding of elemental changes in the marine environment. Some important marine biogeochemistry data are not available directly or in a short time due to technical and cost constraints. Therefore, the supplementation of marine biogeochemistry data is essential. Machine learning method is one of the effective methods to supplement marine biogeochemistry data. However, current machine learning methods based on RF and ANN often struggle to effectively capture the intricate features of ocean data, resulting in suboptimal prediction accuracy. To solve this problem, we develop a novel deep learning method called Artificial Neural Network with attention mechanism (ANN-att) for predicting marine biogeochemistry data. We compare and evaluate the performance of RF, ANN, and ANN-att based on two widely-used ocean datasets in marine biogeochemistry: GLODAP v2.2022 and MOSAIC 2.0. Our results show that the prediction accuracy of the ANN-att method is higher than other methods by 6% for GLODAP v2.2022 and 30% for MOSAIC v.2.0. Additionally, the prediction maps of surface ocean dissolved O<sub>2</sub> in global marine and  $\Delta^{14}\text{C}$  in the West Pacific demonstrate that ANN-att has a significant advantage in predicting marine biogeochemistry data with stronger nonlinear characteristics.

### Student Submission

Yes

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