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Exploring the Relationship Between Chlorophyll-a and Other Water Quality Parameters by Using Machine Learning Methods:A Case Study of Lake Erie

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Chlorophyll a (CHLA) is a key water quality indicator for the eutrophication of Lake Erie. In order to better predict the concentration of CHLA, this study divided Lake Erie into the United States and Canada according to national boundaries, and found the input variables most relevant to CHLA. It is concluded that the United States is total phosphorus (TP), and Canada is total nitrogen (TN), and it is analyzed that industrial and agricultural pollution around Lake Erie has caused excessive TP and TN content. The study used machine learning methods to model the water quality of the two parts respectively. The data used in the modelling was obtained from the Canadian Environment and Climate Change Agency for Lake Erie between 2000 and 2018. Several neural network (NN) models and other machine learning methods are used for data analysis, including standard neural network (NN) models, simple recurrent neural network (SRN) models, backpropagation neural network (BPNN) models, jump connections neural network (JCNN) model, random forest (RF) and support vector machine (SVM). At the same time, the most suitable combinations of input variables for CHLA prediction was found. The United States was TP, TN, DO, and T, and Canada was TP, TN, PH, and DO. Combining this result with the environmental protection policies of the United States and Canada, recommendations for improving the pollutant content of Lake Erie were proposed. This will help reduce the risk of eutrophication in Lake Erie.