CorAI: Predicting Coral Bleaching Using Artificial Intelligence and Machine Learning

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Coral reefs are the world's most vital marine ecosystems, producing 50% of the world's oxygen and sustaining the livelihoods of 1 billion people globally. However, coral bleaching, a phenomenon stemming from global warming, has killed 50% of the world's reefs, with 90% estimated to be dead by 2050, threatening the lives of billions globally. Conservation efforts are underway in many reefs. However, such efforts are only highly effective when proactively applied before bleaching events. Thus, knowing when and where bleaching will occur is paramount to conservation efforts. This study experimented with three neural networks for 12-month sea surface temperature forecasting and tested 14 regression and classification models for predicting bleaching under specified conditions. Future predictions occur by first predicting the conditions in the coral reef (SST error of 0.14 degrees Celsius) for the next 12 months and then predicting the percentage of the reef that will bleach under those conditions (error of 5.5%). When validated using data augmentation, the predictor was able to predict bleaching 1 year in advance (52x temporal improvement over existing models) across the globe (4x spatial improvement over existing models) with an absolute error of just 6.00%, a 5x improvement over the current state-of-the-art. Thus, this study developed a novel coral bleaching prediction mechanism that can predict reef-scale coral bleaching across the globe up to a year in advance, enabling proactive, targeted conservation efforts and enhancing reef survival rates globally.

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