Phytoplankton Detection Using Machine Learning and a Mobile Application

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Plankton are the world's largest oxygen producers and first level of all marine food chains, making quantification a measurement for Earth's health. Currently, manual microscopic plankton analysis is a laborious process, but with the rise of artificial intelligence and its implementations in the past decade, automated data collection for plankton has been attempted. This objective was to use machine learning to develop a model to identify basic shapes of phytoplankton and to deploy it onto a mobile application. This can put machine-aided plankton analysis in the hands of citizen scientists who previously would be using manual data collection. Two models were developed: image classification and object detection. Both were programmed using Python and the Tensorflow library. A dataset of 504 images was collected to use for training. Uses of both models were tested and performed as expected, however, there was a clear advantage with object detection as it could identify multiple plankton per frame, instead of being limited to a singular output. This research was able to accomplish to goal of creating a mobile application that uses an object detection model to identify the shape of plankton. It works by using a mobile device camera held at the microscope's eye piece, creating a bounding box around the plankton it is identifying and classifying it by shape. This can help pave the future for remote lab data collection. While acknowledging limitations, future research would seek to create species-specific classification and develop automated quantification, improving the practicality of the app.

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