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Introduction

Citizen science is crucial to wildlife conservation in the Arctic. The ability of many citizen scientists to capture animals in imagery, thereby helping to track populations and species, is one particular manner in which this can be conducted. There are six species of seal that inhabit the Arctic: hooded (Cystophora cristata), harp (Pagophilus groenlandicus), ribbon (Histriophoca fasciata), ringed (Pusa hispida syn. Phoca hispida), beared (Erignathus barbatus), and spotted (Phoca largha). The survival of populations is largely linked to sea ice, which is melting in many areas due to the progression of climate change. Therefore, some of these seal species are increasingly under threat as the Arctic warms. For example, as the sea ice extent decreases, ringed seals are especially threatened because they do not migrate to open water in the winter. Given the differences in behavior and strategies needed to conserve each species, automated mechanisms to facilitate rapid classification need to be in place.

Methodology

We propose the creation of a comprehensive seal imagery dataset by scraping images from Google, Instagram, Twitter, and Flickr. We remove duplicates by running an image hashing algorithm and further split the dataset into a 80:10:10 ratio for training, validation, and testing data, respectively. The images are labeled through an online crowdsourcing platform. The deep learning architecture we employ to segment and classify imagery is the convolutional neural network architecture called ResNet18. In this preliminary work, we expect to compare the efficacies of various models through ablation studies.

This work represents the first comprehensive deep learning-based ecological remote sensing approach for ground-based seal imagery in the Arctic. By deploying these models as functionable technologies in the wild, we enable conservationists to gain insights into population-level and species-level trends, which leads to more accurate and targeted conservation mechanisms.