CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
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Project Number
38365

Project Title
Characterizing North Atlantic Whale Calls Using Acoustic Data

Abstract

Objectives/Goals
Whales are the sentinels of the health of marine environments. Because whales are at the top of the food pyramid, they have a vast impact on marine health. My research is focused on North Atlantic right whales, the most endangered species of large whales with only around 450 remaining. The goal of this project is to study the specific vocal characteristics of these whale species to contribute to effective conservation efforts. I am focusing on the up-call of the right whale, which is the vocal sound they make when they are about to surface. By analyzing acoustic sounds signaling surfacing behavior, I hope to help animal scientists better understand the social behaviors of this whale species, track whale counts when they surface, and correlate surfacing patterns with shipping routes to prevent unnecessary whale deaths.

Methods/Materials
I used an online public dataset from the Marinexplore institute containing 84,503 samples of oceanic acoustic sounds. Each 2-second sample was tagged as positive (a right whale up-call) or negative (not a right whale up-call). I converted each acoustic data sample into a spectrogram which is an image representing the whale sound. Using the Sci-Kit learn library, I input each image with an associated tag (positive or negative) into a random forest classifier; Furthermore, I also visually inspected each spectrogram and compared my visual findings to known research in whale animal behavior.

Results
The accuracies are 87% on a training set of 40,000 samples and 81% on a testing set of 44,503 samples, indicating correlation in up-call acoustic samples to North Atlantic whale behavior. Potentials for decreased performance include difficulty differentiating other marine sounds that are similar to the up-call. In the future, collecting longer samples may encode more information for better results and analysis.

Conclusions/Discussion
I combined my interested in understanding animal behavior with software research to visualize and better model vocal acoustic patterns in North Atlantic whales. Future applications of this research include developing enhanced detection software to prevent ships from colliding with North Atlantic whales.

Summary Statement
I synthesized my understanding of animal behavior with software tools to visualize and better understand North Atlantic Right whale communication for conservation efforts.

Help Received
I designed and completed the project by myself.