Paper outline:

Abstract

Intro:

* Passive acoustic monitoring for RW
* Existing automated solutions, problems with pitch trackers on our high mooring noise. Random forest compares positives and mitigate common error with pitch tracker
* Easy to review results in Raven pro, which many have familiarity with
* Adjustable Raven detectors, detection criteria, and classification method (num/type of features for random forest, possible to use different model). Flexible, lots of ways to customize to different recorders/regions.
* May be a solution for areas where local interference can confuse existing pitch tracking method.

Methods:

* Designed workflow roughly around flightcallr paper. Visualization 1: workflow flowchart
* Raven detector
* Algorithm to combine and filter detections
* Random forest model

Part about LFDCS comparison

Name ideas: RMDCS (raven mediated detection and classification system)

LFDCS: 1. Not optimized to reduce FPR, optimized to go fast

2. only on mac

3. interfaced through terminal, which makes it hard to look under the hood and tweak actual program

Mastor\_detecter

1. Optimized to reduce FPR, much slower computation
2. On PC, could probably port to mac
3. R script is interpretable and customizable by any researcher familiar with the language.

Autodetection tools are popular in passive acoustics to streamline manual analysis. Detector performance is commonly compared via TPR and FPR, but factors such as run time, ease of setup and use, and platform compatibility are also important considerations to performance. The LFDCS is a premier analysis tool in the field. It was designed to be compatible with near real-time detection on wave gliders so it is very computationally efficient. The trade off is that the learning method of the LFDCS (quadratic discriminant function analysis) only utilizes four features that do not contain information that allows for the discrimination of noise that can resemble positives for the target species. This can result in high FPR, particularly with environments and recorders that experience regular instrument noise, which is the case with AURAL recorders in the arctic. High FPR results in longer analysis time and more expensive analysis.

Despite not being optimized for this tradeoff from the perspective of acoustics labs working on archival data, the LFDCS is often used for this purpose. The LFCDS is also a Mac only implementation and interfaced through the command line, so ubiquity and customization for analysts is limited.

We submit an alternative approach for machine assisted analysis of low frequency sounds, optimized for efficient analysis time on archival data. This approach relies on a representative library of both the positives and negatives of a pitch tracker on ground truth reference data. It extracts measurements of each known and putative call to build and compare with random forest models. As you supply positive and negative detections, the models not only learn the identifying features of true positives, but also that of consistent types of false positives. In this way it ‘learns from its mistakes’. This is a flexible architecture that has been successfully applied to right whale upcalls and gunshots, as well as being able to discriminate from a variety of consistent sources of false positives due to noise. It is designed to be compatible with any stereotyped, distinct call type, and resilient in a variety of acoustic environments.