IntelliChirp - Soundscape Noise Analysis Workbench

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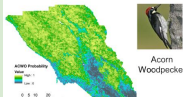
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Motivation

"Recent work incorporating long-term surveys and radar remote sensing suggests a **drastic decline of 2.9 billion birds in North America** since 1970 (Rosenberg et al. 2019)"


Soundscape Recording Data

Species Distribution Model

Acorn Woodpecker

Soundscapes to Landscapes (S2L) is a science-based project that seeks to advance the **monitoring of biodiversity across large areas** using data from new Earth-observing sensors and advanced modeling.
Teams of citizen scientists **use inexpensive portable sound recorders to collect sounds** for a few days in natural woodlands, grasslands, agricultural areas and urban areas throughout Sonoma County. **Currently there is not a way to automatically classify the individual sounds from these soundscape recorders.**

Architecture

Solution
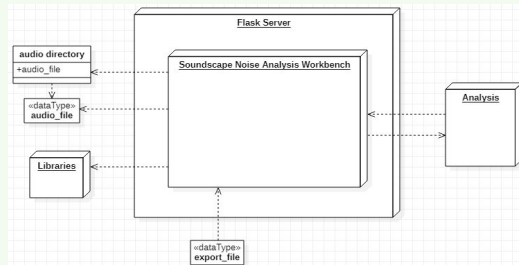
View results of neural network classification

Select from list of all uploaded files

Select one of three sound types to view results of

Play the uploaded audio file

An **automatic** way to classify individual sounds from soundscape recorders

Key Features

Upload Audio Files → **Machine Learning Analysis** → **Visualize Results** → **Export**

Technologies

Front-End   NodeJS   React

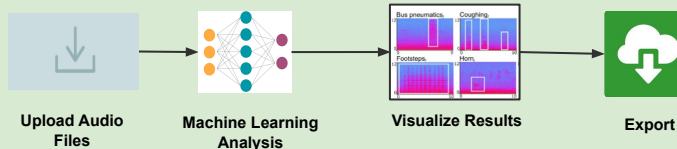**Back-End**   Python   Keras   Flask   Tensorflow   Matplotlib

Outcome

Species populations and habitats are in decline, and low cost recording devices are offering promising results for monitoring these changes. We have implemented an web application that uses machine learning to ingest and automatically analyze audio files.

The Soundscape Noise Analysis Workbench will be a **major step forward in efficiently classifying acoustic data as a way to identify and conserve biodiversity across the world.**

Testing

Unit Testing → Integration Testing → Usability Testing

Challenges

Neural Network Accuracy - Improving the accuracy has involved gathering more training data and adjusting the architecture of the models.

Gathering Training Data - Soundscapes2Landscapes was not providing enough data to train on in a timely way. We used open source data from various sources to solve this challenge.

Future Work

1. Further improve the machine learning algorithms

2. Can analyze sound more detailedly, such as identifying bird species