IntelliChirp

Machine Learning Classification of Acoustic Data Components

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Team Lead Recorder Architect Testing Lead

Clients: Colin Quinn | Patrick Burns

Mentor: Fabio Santos

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"A report by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) found that about

1 million animal and plant species are now threatened with extinction"

Our Clients

Colin Quinn
PhD student NAU

Soundscapes2Landscapes

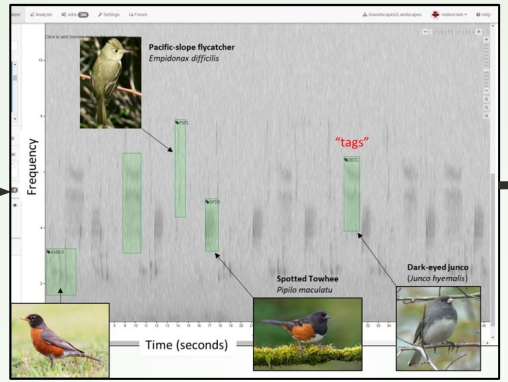
Current Value **$1.1 million**

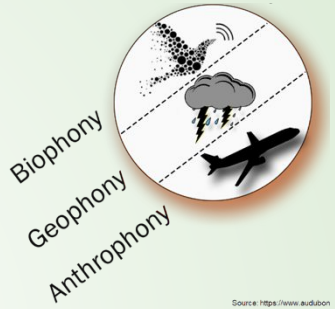
Patrick Burns
Research Associate

The Process

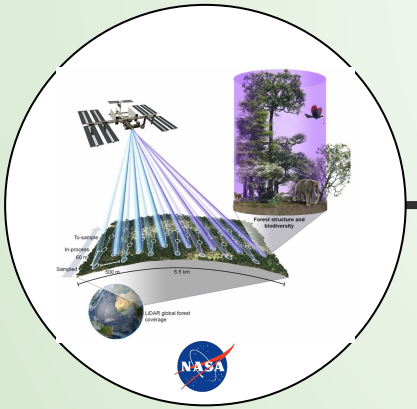
Soundscape Recording Data

Sound Identification/Analysis

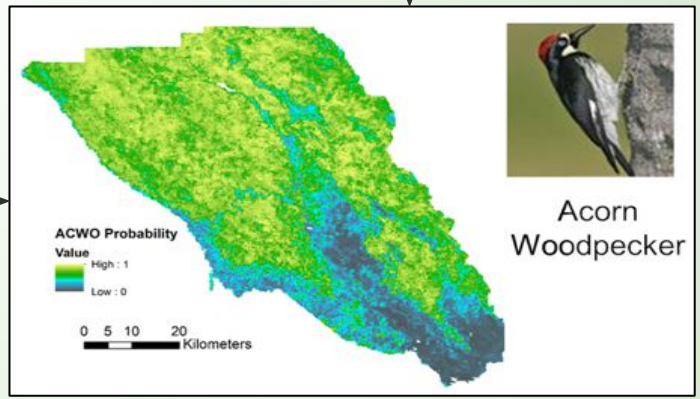




Identify Layers



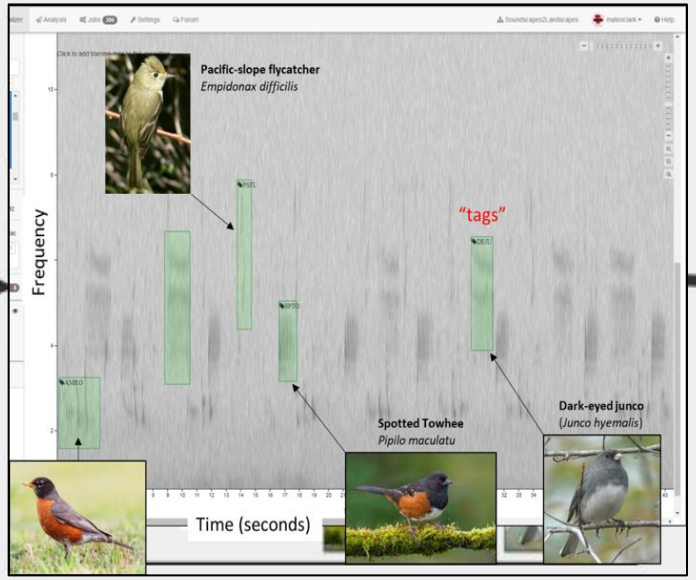
Satellite Imagery

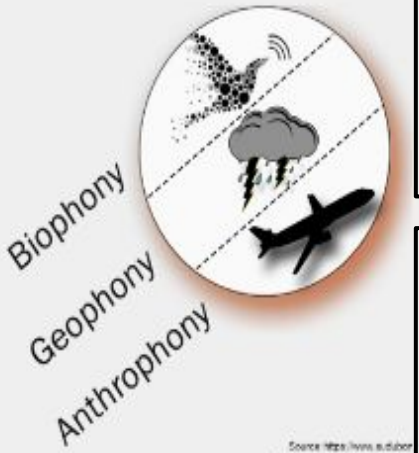


Species Distribution Model

What's Wrong?

Sound Identification/Analysis



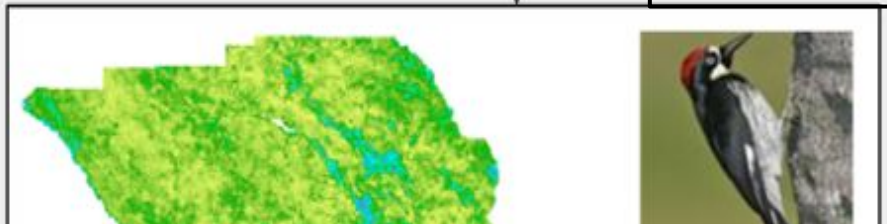


Time Consuming

Sound identification is done manually

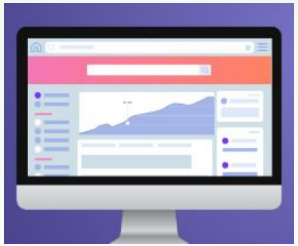
Not Volunteer Friendly

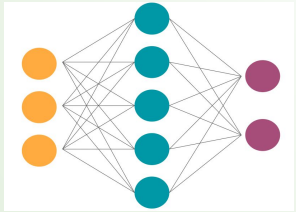
Volunteers are unable to use the current analysis tool

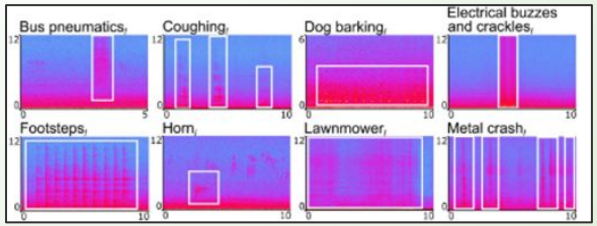


A Solution

Soundscape Noise Analysis Workbench (SNAW)







Upload

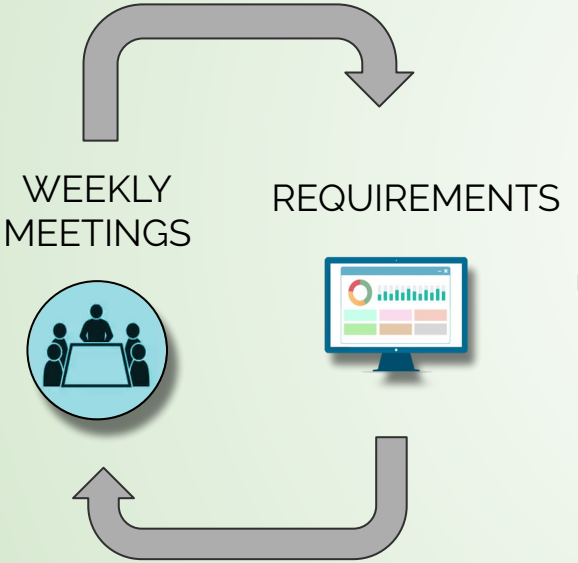
Machine Learning Model

Visualize Results

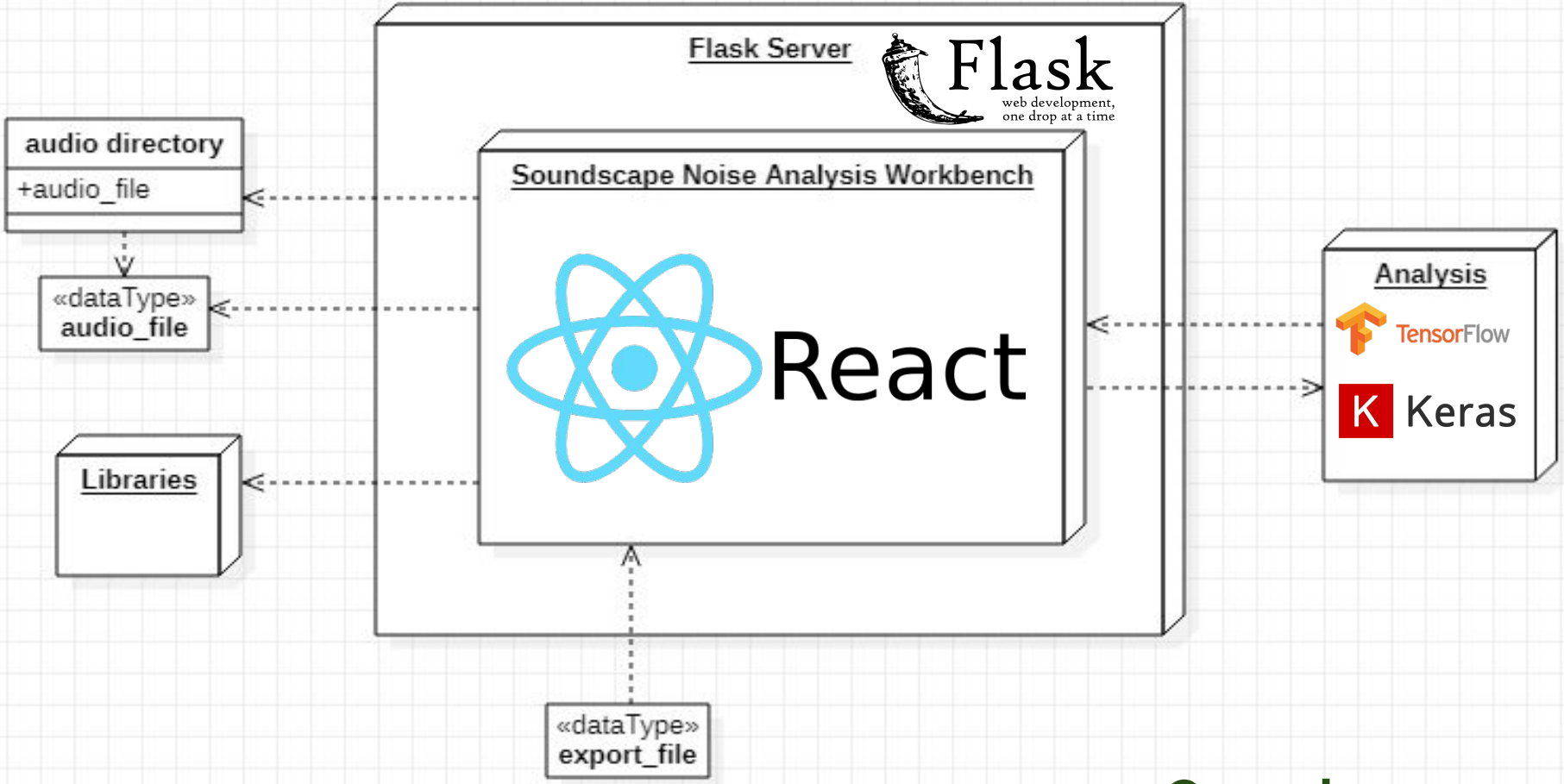
Export

Implementation Overview

Acquisition → Key Requirements

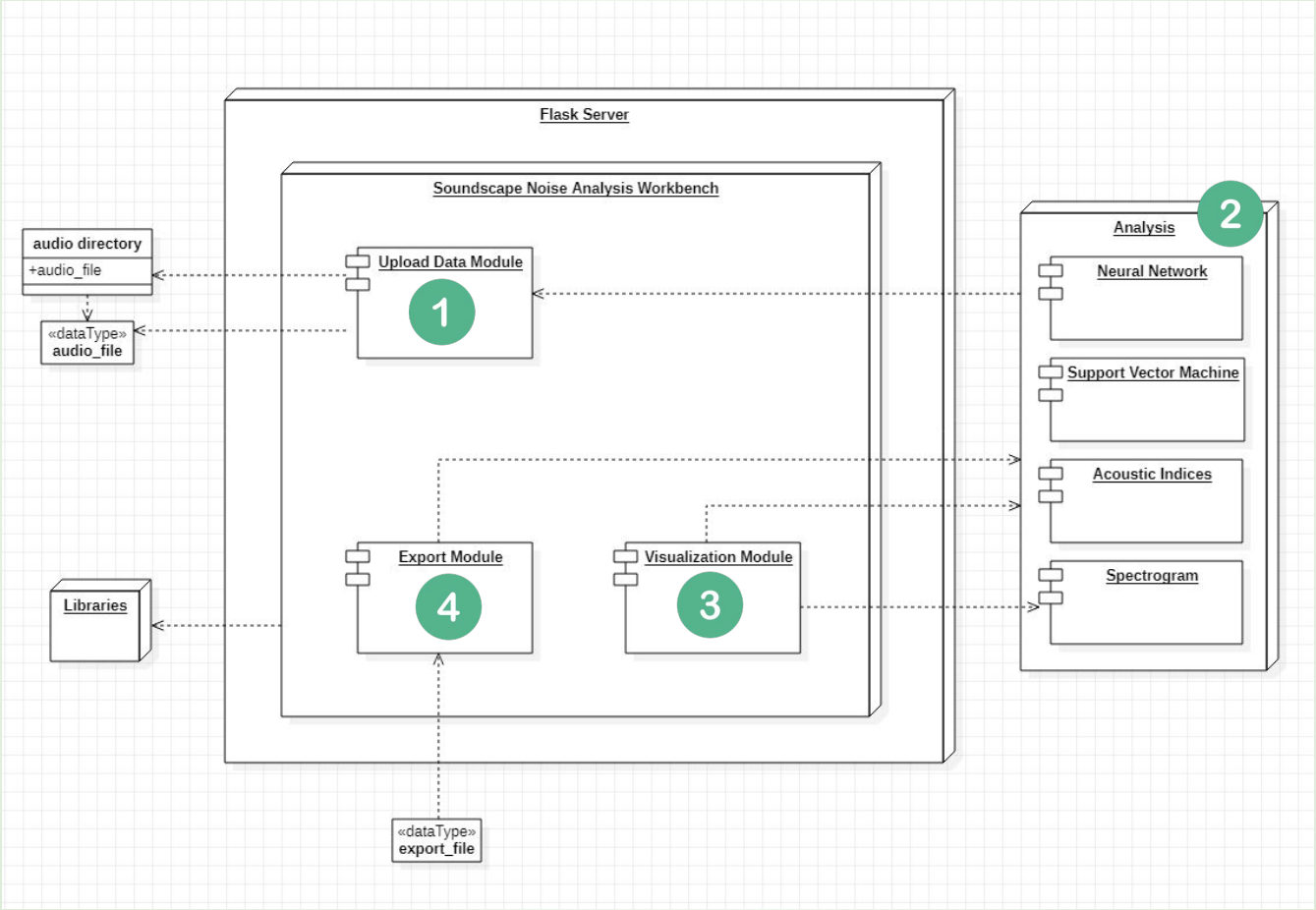


- Application will be able to **upload audio file/s** in **WAV** format.
- M.L. algorithm will **classify individual sounds** in user uploaded audio file/s.
- Application will **display the results** of the completed M.L. analysis.
- Application will be able to **export the results** of the analysis.
- The application will be able to be used **offline** in the field.


Flask Server
Flask
web development,
one drop at a time
audio directory
+audio_file
«dataType»
audio_file
Soundscape Noise Analysis Workbench
React
Analysis
TensorFlow
K
Keras
Libraries
«dataType»
export_file

Overview

Architecture Overview

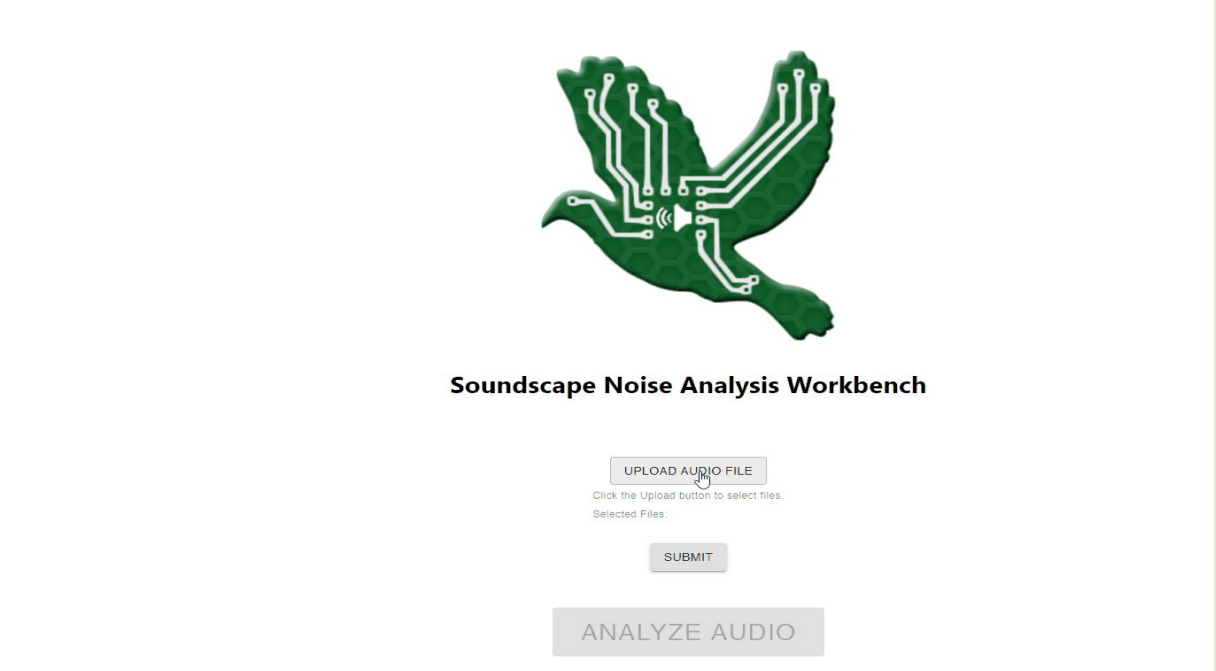


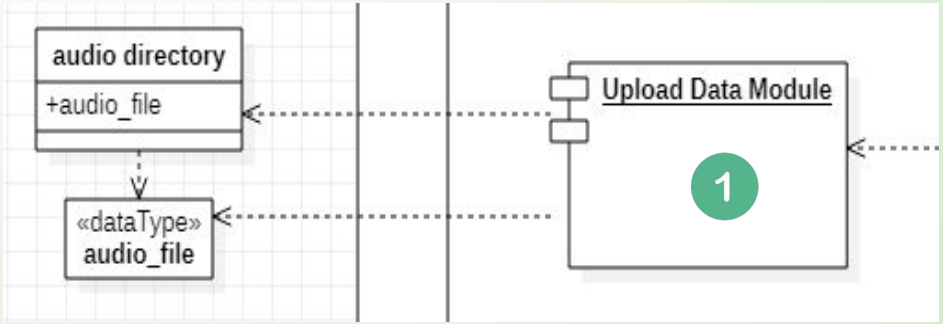
Upload Data Module

Input

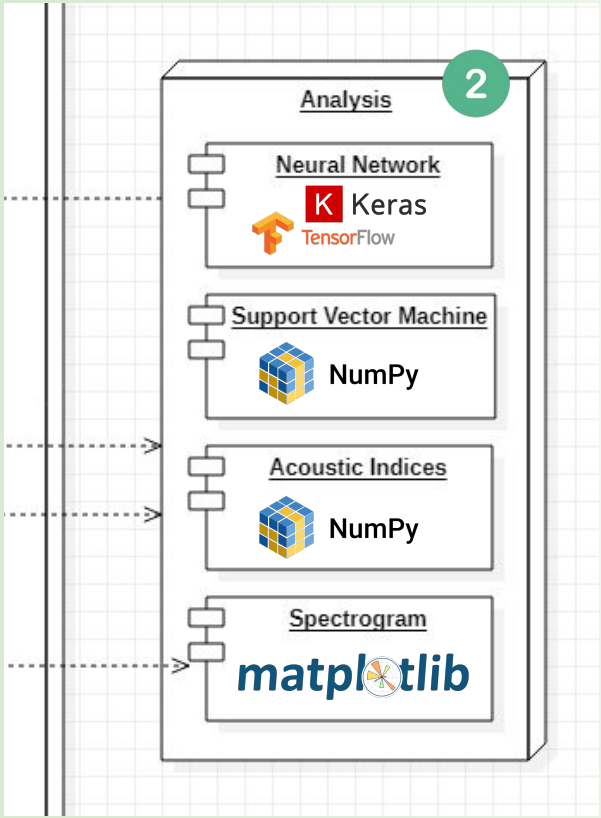
Single audio file or multiple audio files

Saves audio files to the **server file directory**





Analysis Module



Input: audio file locations from **Upload Data Module**

- **Neural Network Module**
- **Support Vector Machine Module**
  - Calculates a prediction for each sound component present at 1 second intervals
- **Acoustic Indices Module**
  - Calculates audio statistics used by researchers
- **Spectrogram Module**
  - Creates a spectrogram image for the audio file

Output: JSON object with results from each analysis module

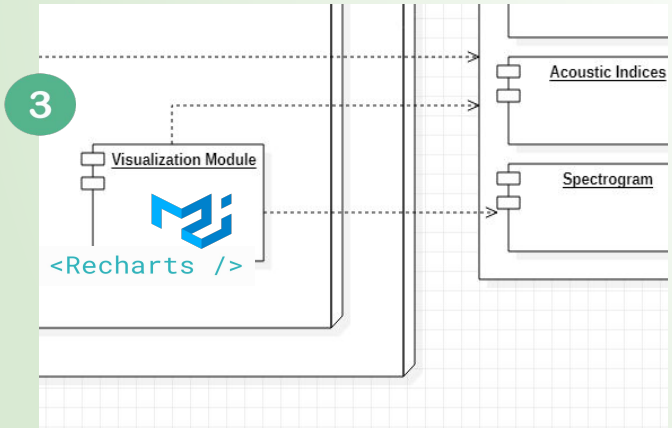
Visualization Module

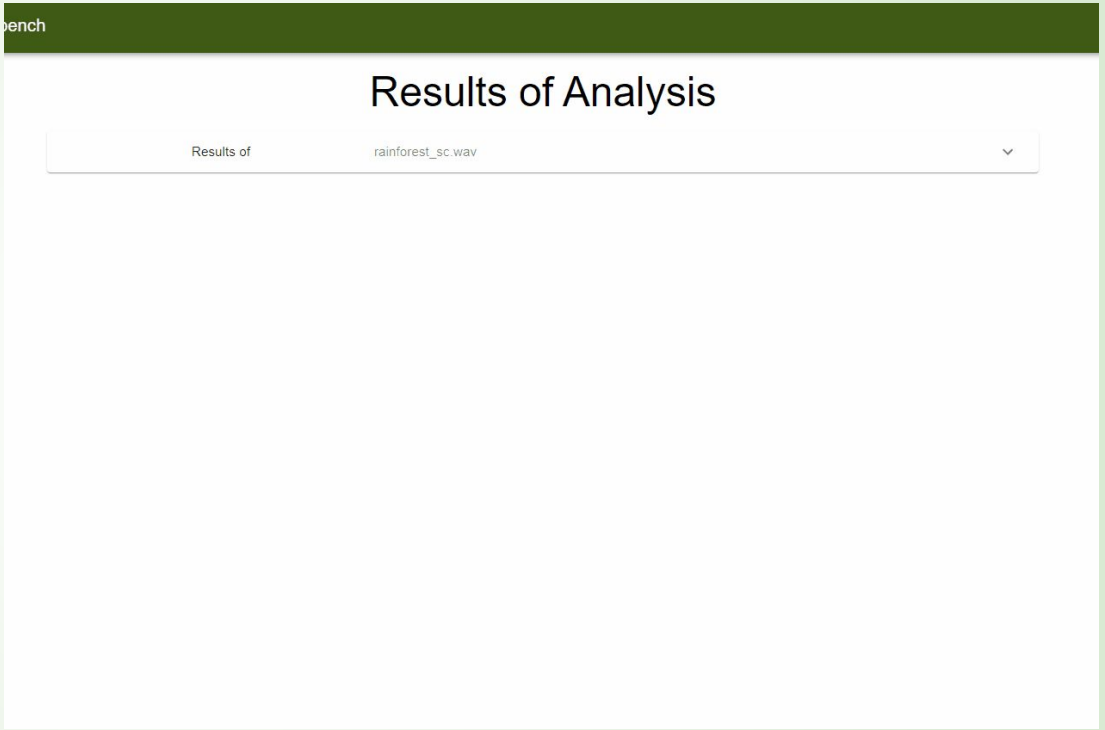
Input:

JSON Results from the **Analysis Module**

Output:

- Labelled Spectrogram
- Pie Chart
- Acoustic Indices Table

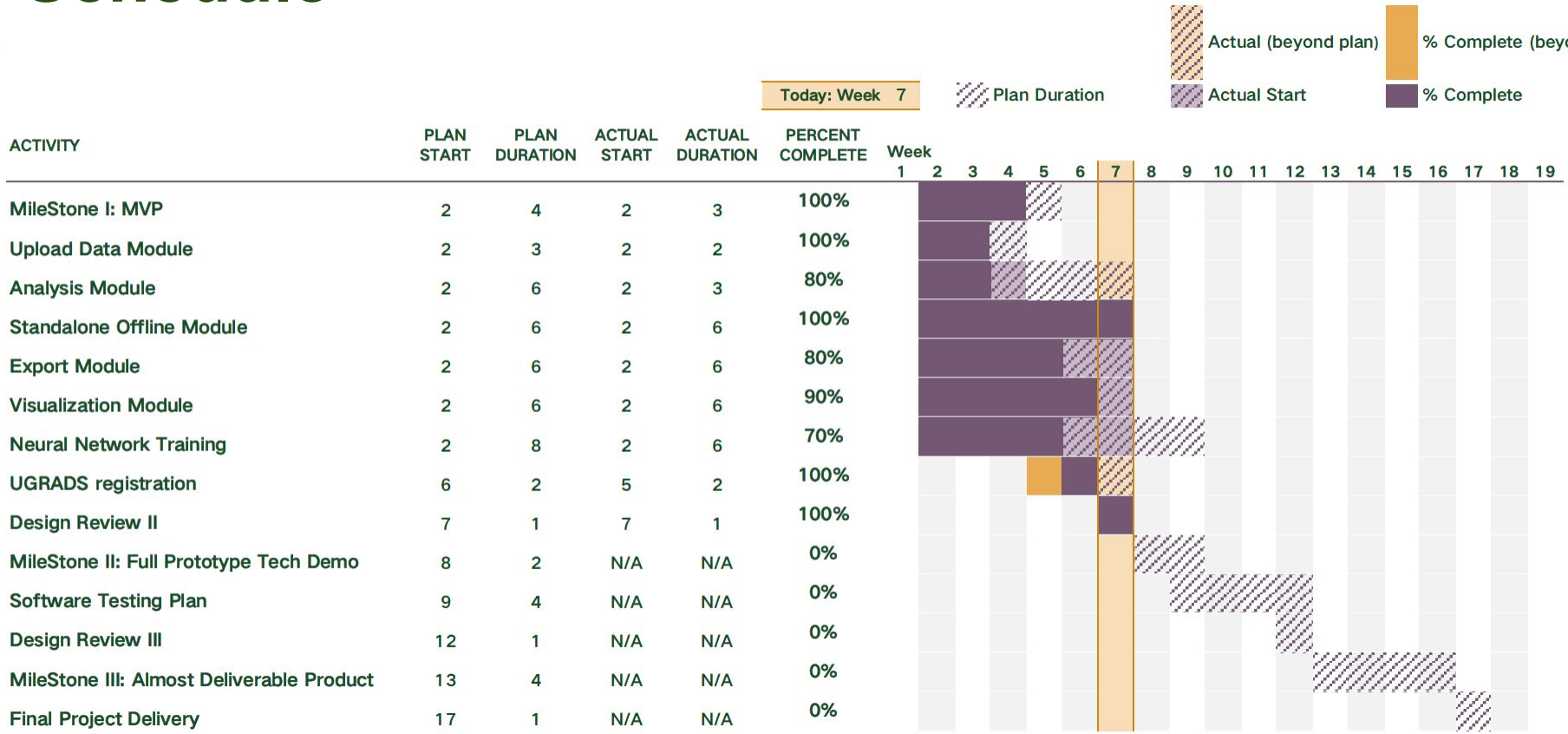




Challenges → Resolutions

- **Improving** Neural Network Implementation → - **Training the Neural Network** with a solid set of training data from onsite recorders and open source datasets.
- **Gathering** more training data → - **Manual** audio **classification sessions** with clients.
- Create an offline version that can be run on a **HPC cluster** → - Gradually **adapting web application code base** to have the same execution, all in **one command line script.**

Schedule



ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
MileStone I: MVP	2	4	2	3	100%
Upload Data Module	2	3	2	2	100%
Analysis Module	2	6	2	3	80%
Standalone Offline Module	2	6	2	6	100%
Export Module	2	6	2	6	80%
Visualization Module	2	6	2	6	90%
Neural Network Training	2	8	2	6	70%
UGRADS registration	6	2	5	2	100%
Design Review II	7	1	7	1	100%
MileStone II: Full Prototype Tech Demo	8	2	N/A	N/A	0%
Software Testing Plan	9	4	N/A	N/A	0%
Design Review III	12	1	N/A	N/A	0%
MileStone III: Almost Deliverable Product	13	4	N/A	N/A	0%
Final Project Delivery	17	1	N/A	N/A	0%

In Conclusion

Problem	Alpha Prototype	Final Solution
An application that determines biodiversity through manual identification	Coming Soon	An application that uses machine learning to automatically identify the biodiversity

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