IntelliChirp
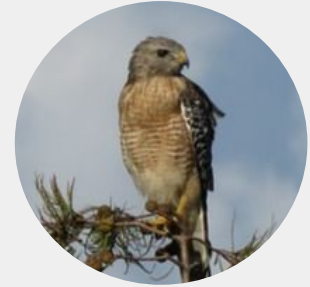
Machine Learning Classification of Acoustic Data Components

Steven Enriquez | Michael Ewers | Joshua Kruse | Zhenyu Lei
Team Lead   Recorder   Architect   Testing Lead

Mentor: Fabio Santos

1

Improve
Knowledge

Maintain
Biodiversity

Protected
Areas

Manage
Within Limits

"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"
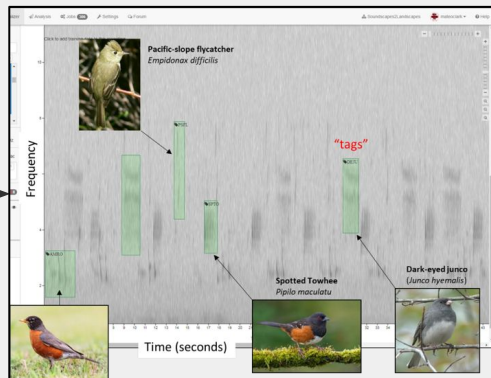
Our Clients

Soundscapes2Landscapes

Current Value **$1.1 million**

GLOBAL EARTH OBSERVATION & DYNAMICS OF ECOSYSTEMS LAB (GEODE)

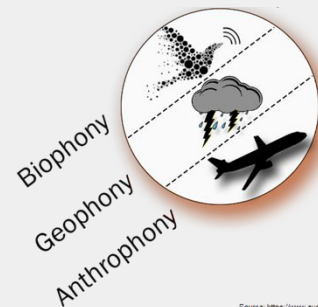Ecosystem Science – Environmental Change – Remote Sensing

The Process

Soundscape Recording Data
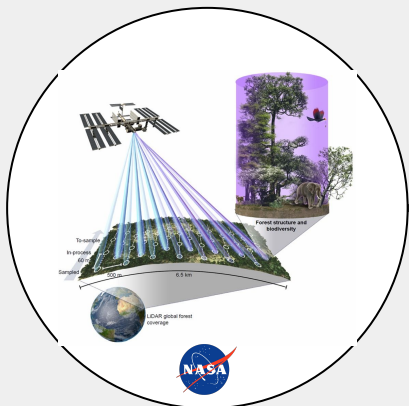

Sound Identification/Analysis

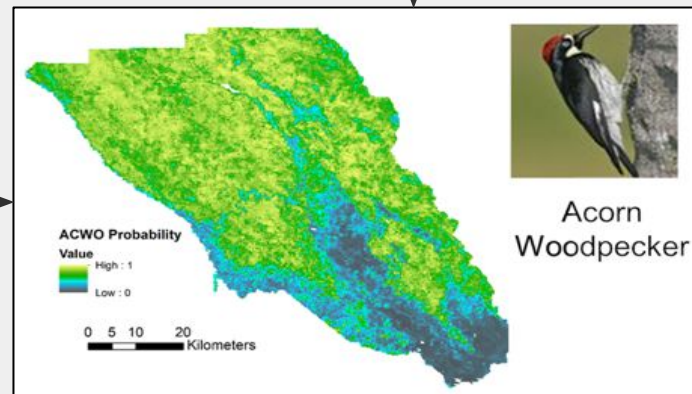Identify Layers

Satellite Imagery

Species Distribution Model

4

What's Wrong?

Sound Identification/Analysis
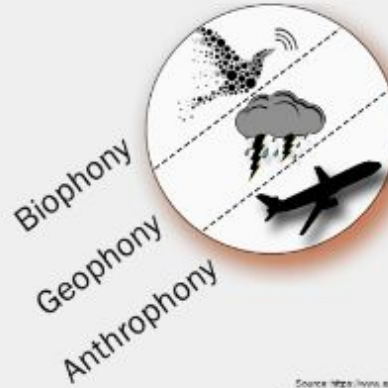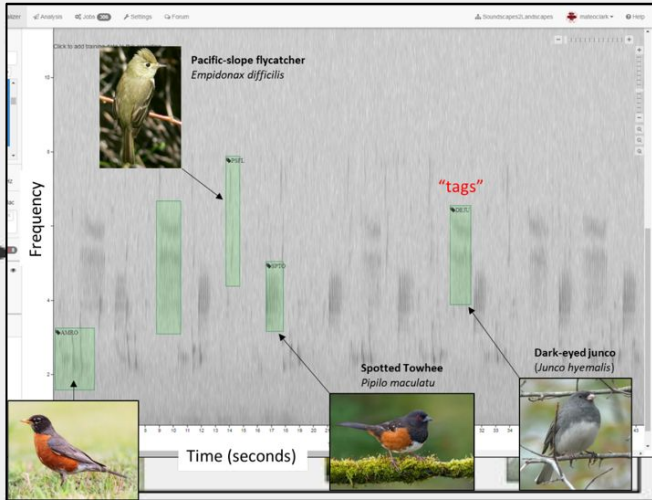
Time Consuming

Sound identification is done manually

Not Volunteer Friendly

Volunteers are unable to use the current analysis tool
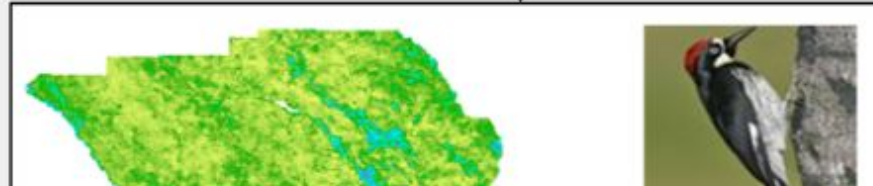
A Solution
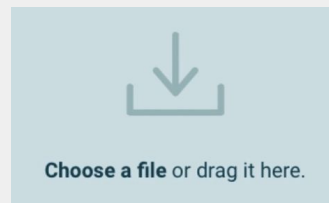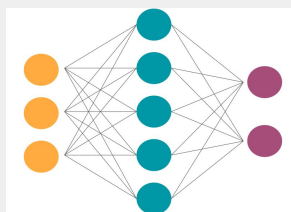
Upload → Machine Learning Model → Visualize Results → Export
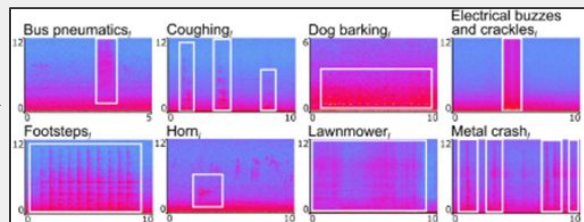
6

Requirements Acquisition

WEEKLY MEETINGS
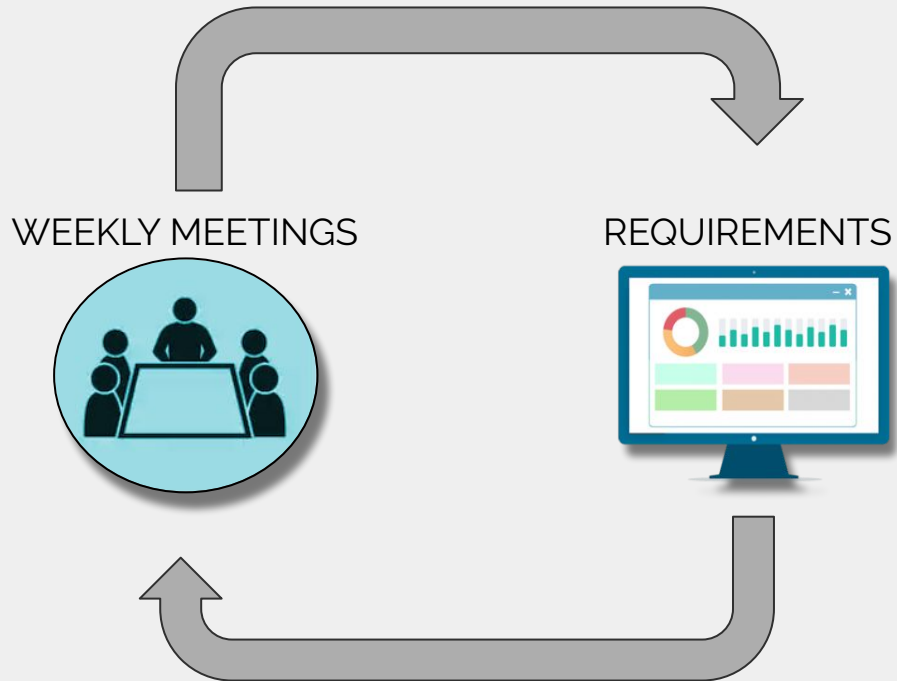
REQUIREMENTS

Key User Requirements

Able to Upload Audio FIles

Able to Analyze Audio Files
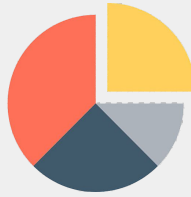
Able to See Results Visualized

Able to get Results In a Timely Manner

Able to Export Results

Functional 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.
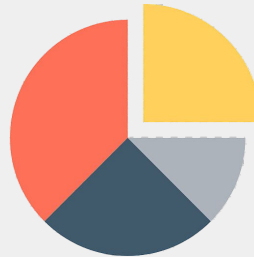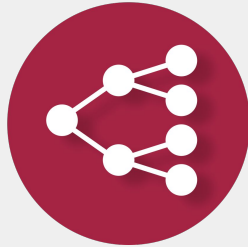
Non-Functional Requirements

- M.L. model must be able to classify sounds in 1 minute audio files within 3 seconds.
    - Must provide a quick and responsive analysis.
- M.L. model must be able to meet a minimum of 80% Accuracy on evident sound events.
    - Must provide accurate results.

Environmental Constraints

- Sonoma County, CA Data

The Requirements For *Analyzing and Classifying*

- Web app will be able to **analyze a soundscape** audio file

  - System will be able to **segment an audio file**

    - ML model will be able to **analyze audio clips**

      - ML model will be able to **identify individual sounds**

    - System will combine audio clips into a **fully identified soundscape file**

  - System will be able to use the identified file to classify **layers of anthrophony, biophony, and geophony**

  - System will use acoustic indices to identify **layers of anthrophony biophony and geophony**

11
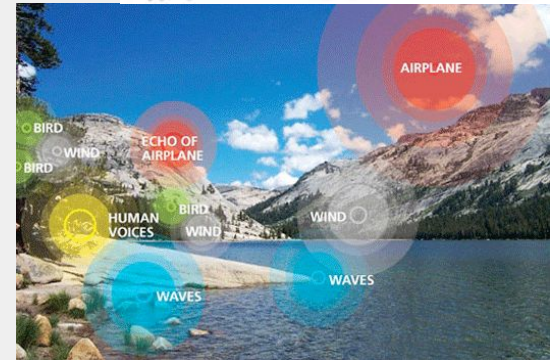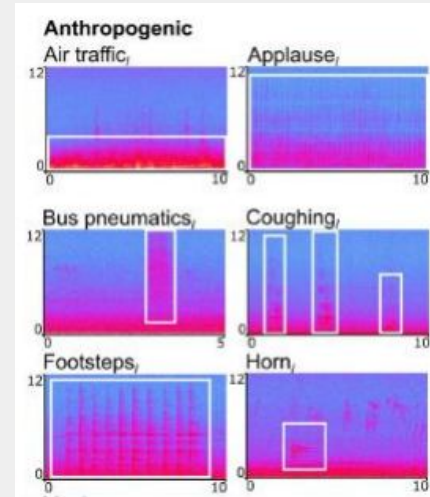
Challenges and Risks

	air	bre	car	cat	cha	chi	chu	cla	cou	cow	cra	cri	crov	cry
air	64	0	4	0	0	1	0	0	0	0	0	0	0	0
bre	0	64	3	3	1	2	0	4	11	2	0	0	0	0
car	10	3	61	0	0	1	3	0	2	0	0	3	1	0
cat	0	2	4	50	4	0	0	0	6	2	0	0	0	12
cha	8	0	0	0	62	2	0	0	2	0	0	2	0	
chi	0	0	0	0	0	75	3	2	0	0	0	2	0	0
chu	13	5	2	0	0	0	60	0	0	3	0	0	2	0
cla	0	5	0	0	1	0	1	88	1	0	0	0	0	0
cou	0	6	2	3	0	2	0	0	59	2	0	0	0	1
cow	0	0	0	2	0	0	1	2	5	82	0	0	0	0
cra	0	0	0	0	0	0	0	0	0	0	97	0	0	0
cri	0	0	3	0	3	12	0	3	0	0	4	64	0	1
crov	0	7	5	2	0	0	5	2	1	0	0	0	76	0
cry	0	0	0	2	0	0	0	0	0	0	0	0	0	96

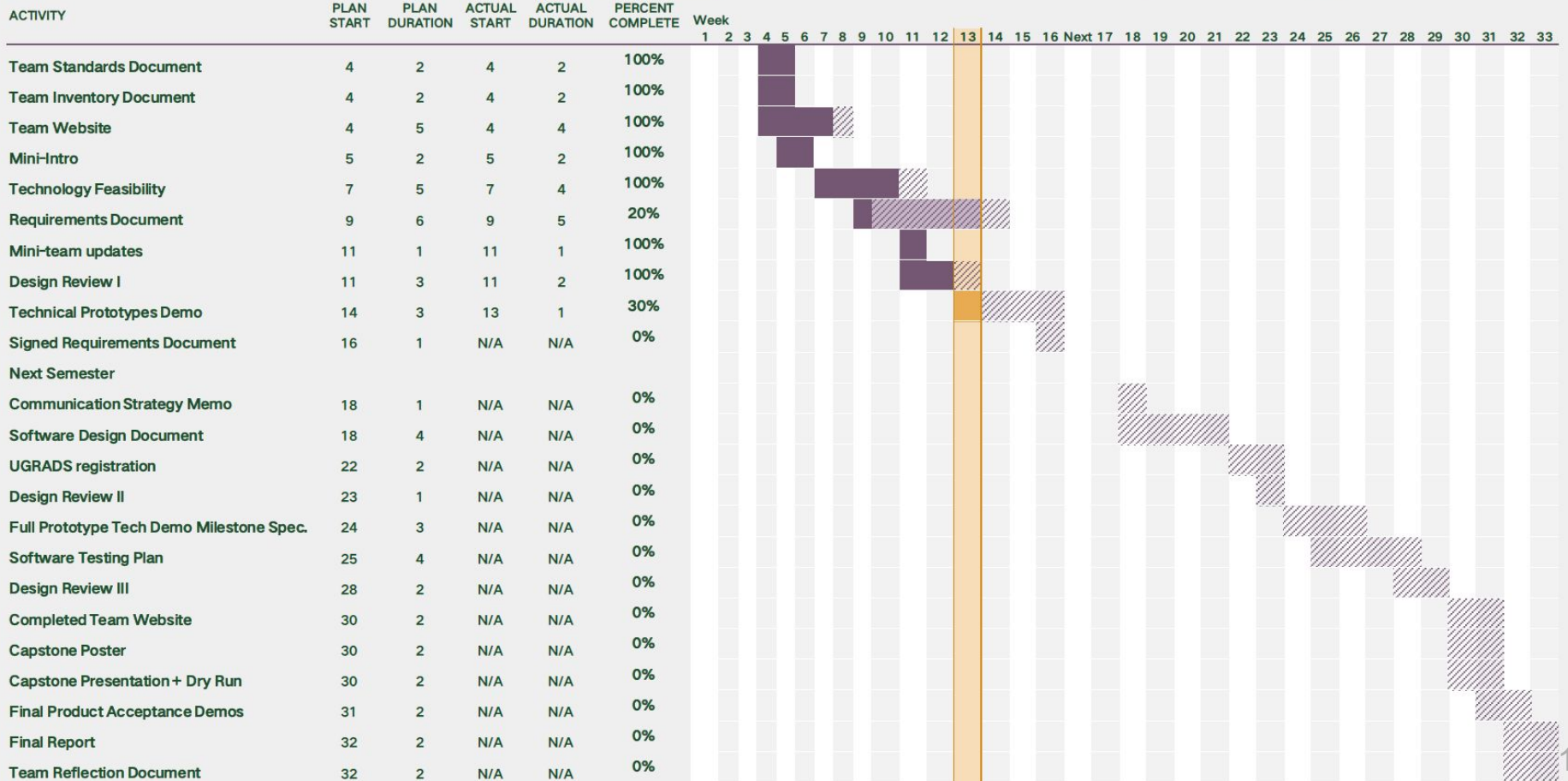| Risk	Likelihood	Severity	Mitigation Plan
Inaccuracies	High	High	Try different models that have higher accuracy for smaller training data sets
Privacy	Medium	Low	Users will Opt-In to data storage

Schedule

Today: Week 13 | ▨ Plan Duration | ▨ Actual Start | ■ % Complete | ▨ Actual (beyond plan) | ■ % Complete (beyond plan)

ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Team Standards Document	4	2	4	2	100%
Team Inventory Document	4	2	4	2	100%
Team Website	4	5	4	4	100%
Mini-Intro	5	2	5	2	100%
Technology Feasibility	7	5	7	4	100%
Requirements Document	9	6	9	5	20%
Mini-team updates	11	1	11	1	100%
Design Review I	11	3	11	2	100%
Technical Prototypes Demo	14	3	13	1	30%
Signed Requirements Document	16	1	N/A	N/A	0%
Next Semester					
Communication Strategy Memo	18	1	N/A	N/A	0%
Software Design Document	18	4	N/A	N/A	0%
UGRADS registration	22	2	N/A	N/A	0%
Design Review II	23	1	N/A	N/A	0%
Full Prototype Tech Demo Milestone Spec.	24	3	N/A	N/A	0%
Software Testing Plan	25	4	N/A	N/A	0%
Design Review III	28	2	N/A	N/A	0%
Completed Team Website	30	2	N/A	N/A	0%
Capstone Poster	30	2	N/A	N/A	0%
Capstone Presentation + Dry Run	30	2	N/A	N/A	0%
Final Product Acceptance Demos	31	2	N/A	N/A	0%
Final Report	32	2	N/A	N/A	0%
Team Reflection Document	32	2	N/A	N/A	0%

In Conclusion

Problem

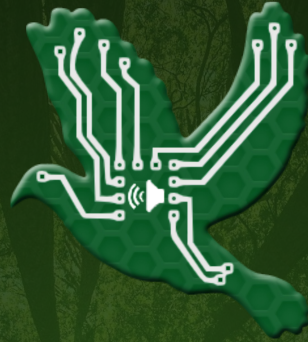An application that determines biodiversity through manual identification

Tech Demo

Coming Soon

Final Solution

An application that uses machine learning to automatically identify the biodiversity

IntelliChirp

Steven Enriquez | Michael Ewers | Joshua Kruse | Zhenyu Lei