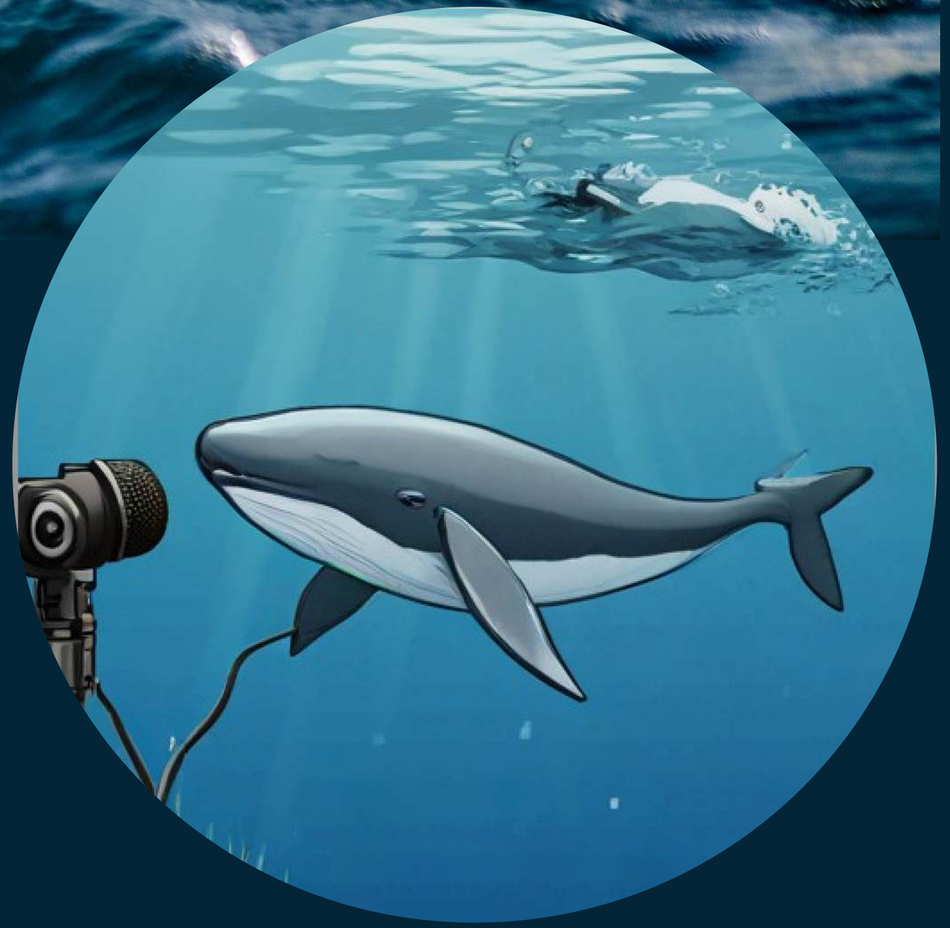


# Bioacoustics

Client: Professor Maddie Schroth-Glanz

# Team Members

Sophia Chung

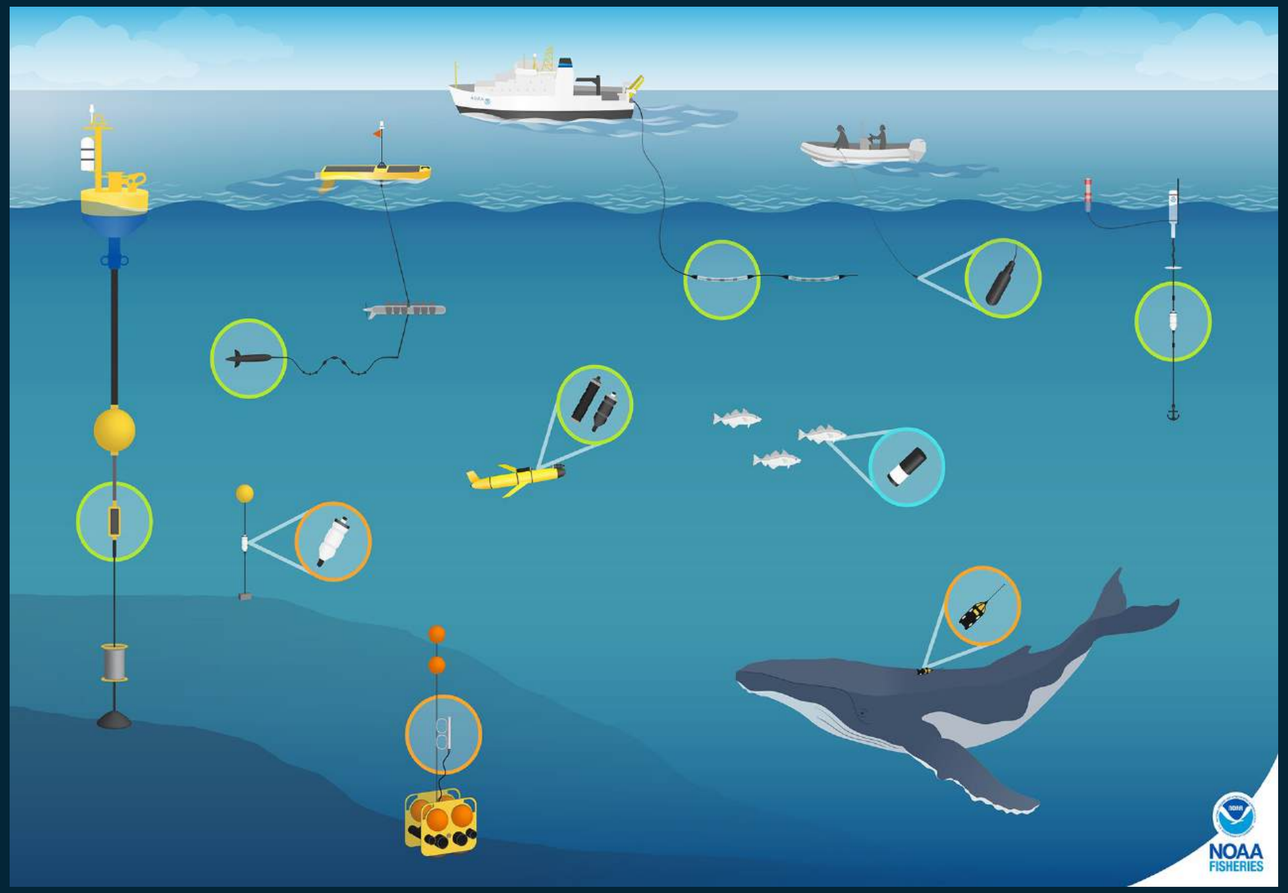
Anagha Sikha

Sucheen Sundaram

# 1. Introduction

# Bioacoustics research helps with the advancement of Passive Acoustic Monitoring along the Central Coast

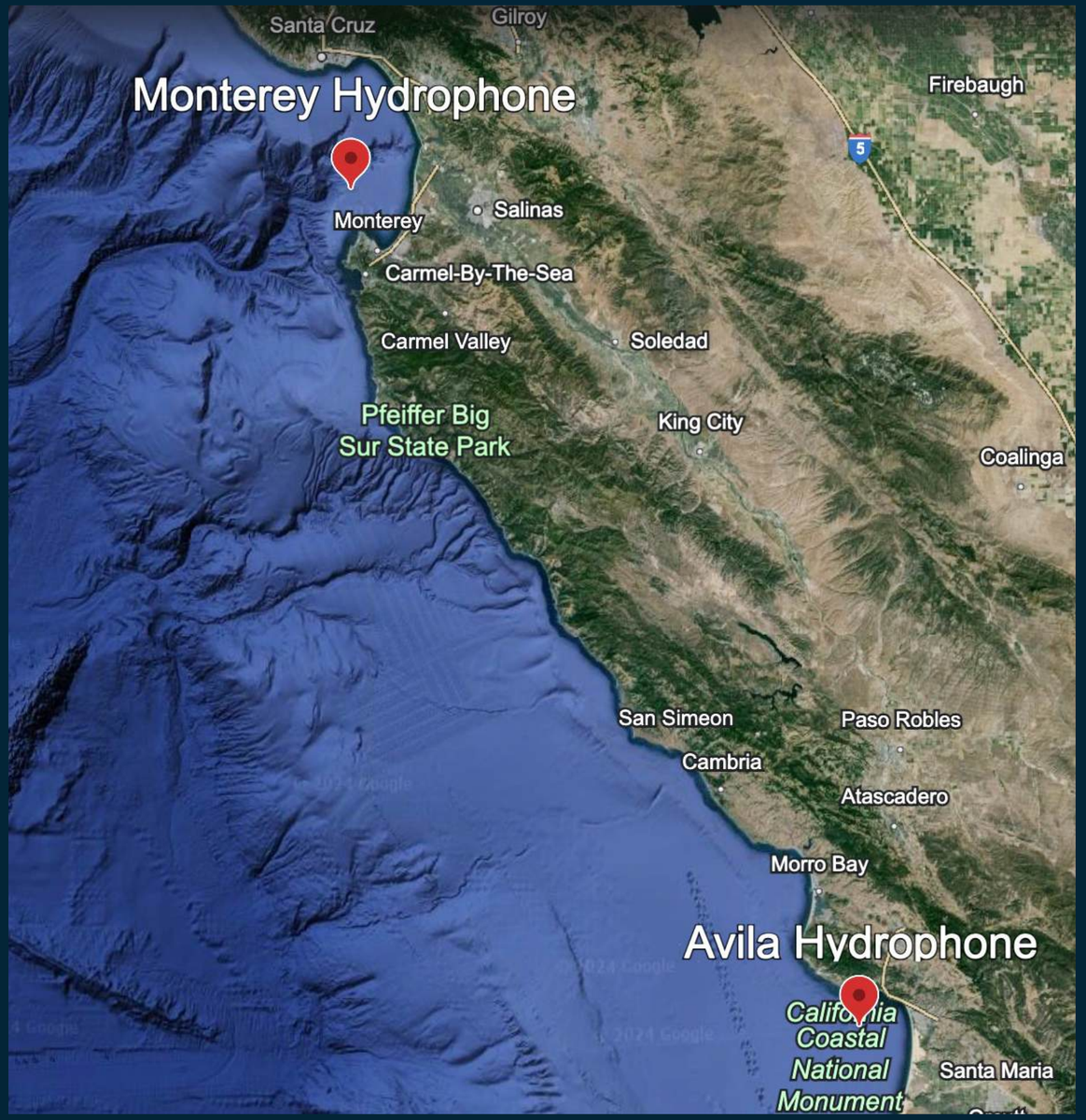
- Insights into animal behavior
- Environmental impact assessment



# Data

Hydrophone recordings (audio files)

- Monterey
  - 2– 3 hours each
- Cal Poly Pier at Avila
  - 30 minutes each



# Project Roadmap

1

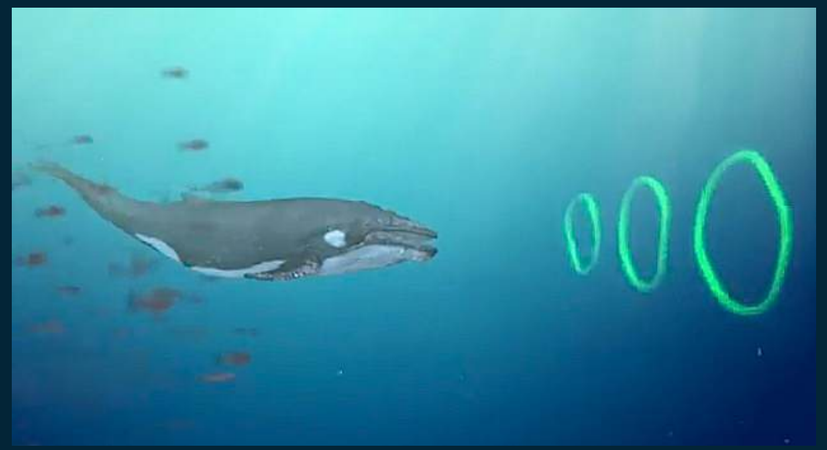
Understand past team’s work

2

Make changes to past model

3

Pivot to new framework

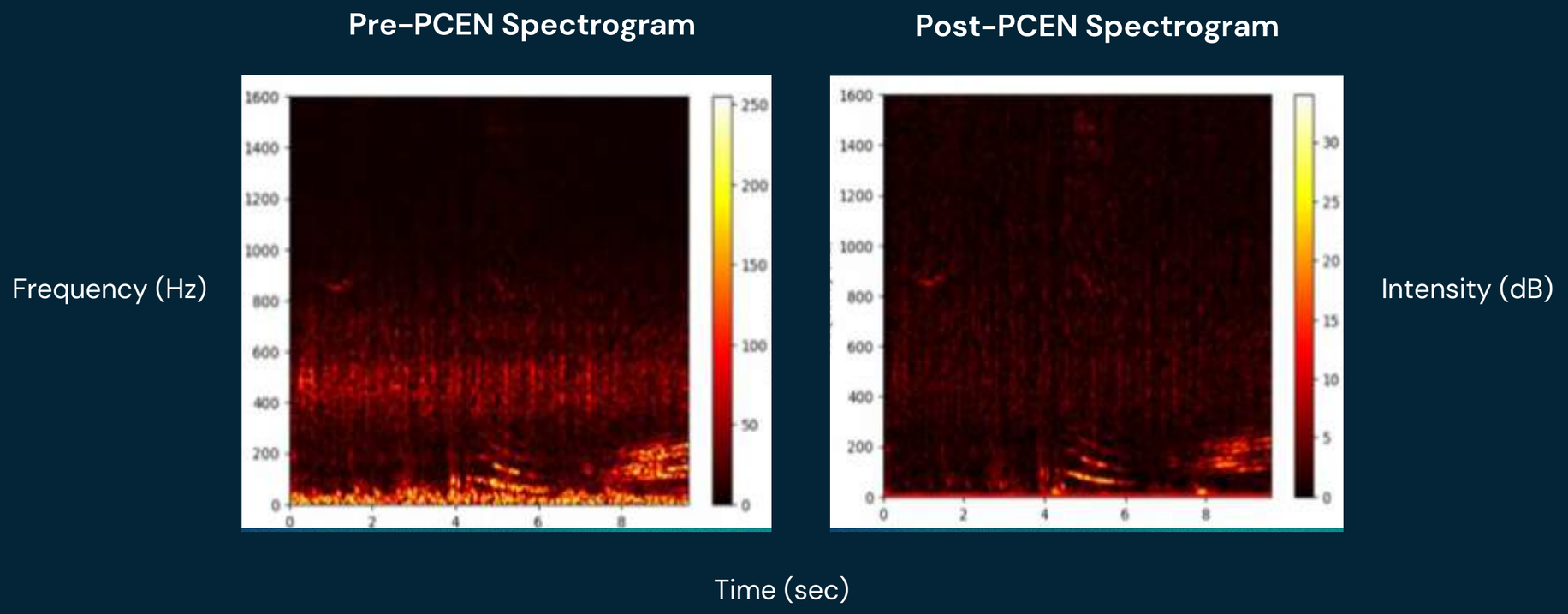


# 2. Preprocessing

# Short-Time Fourier Transform

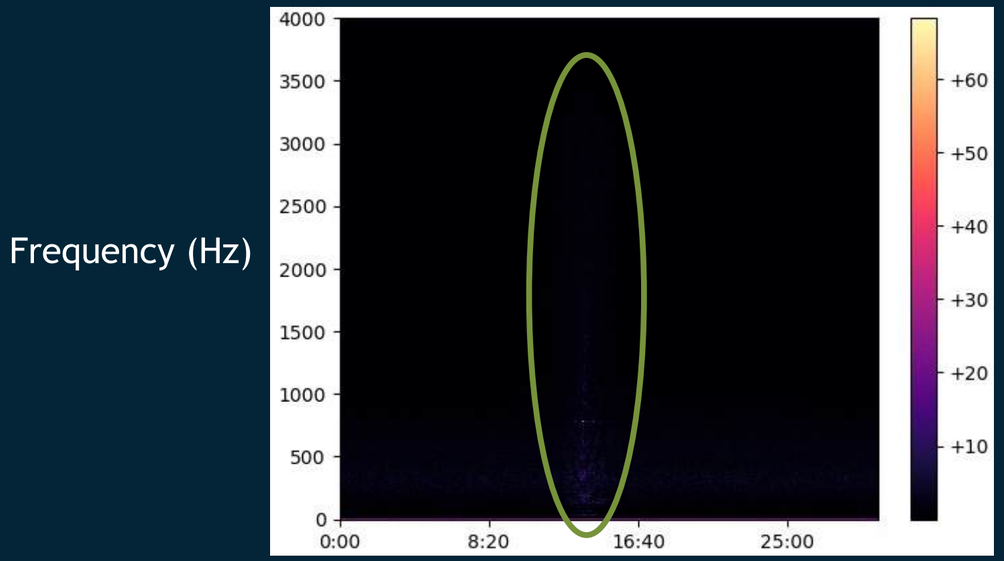
- Frequency analysis over time

# Per-Channel Energy Normalization

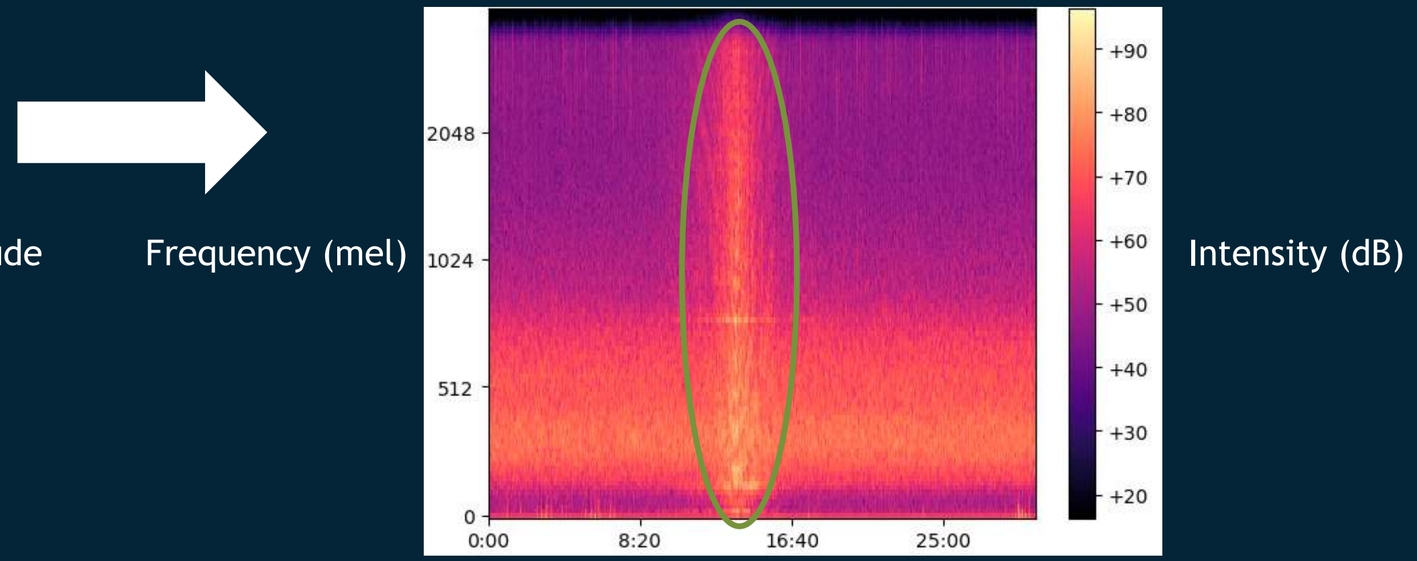


# Mel Conversion

Standard Spectrogram

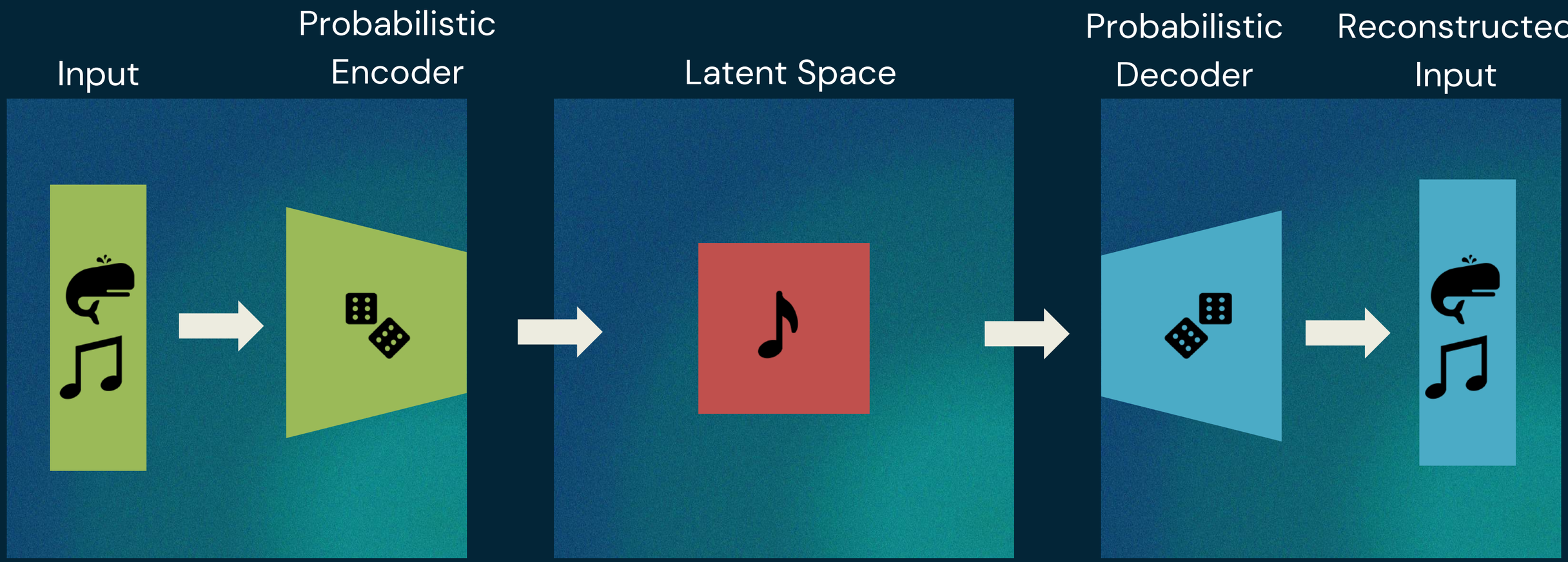



Mel Spectrogram

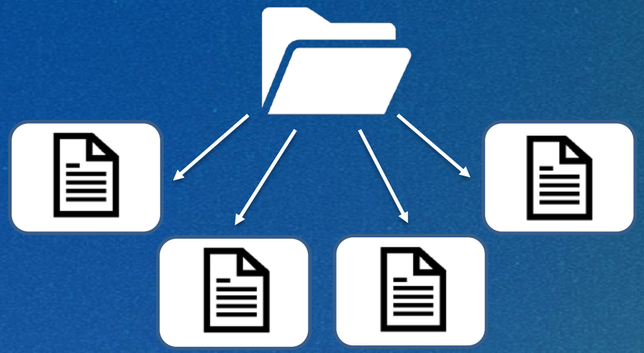


# 3. Model

# Variational Auto Encoder



# VAE Ensemble



## Structure

39 audio files →

10 VAE models

## Training

2 hours of data per model

## Deployment

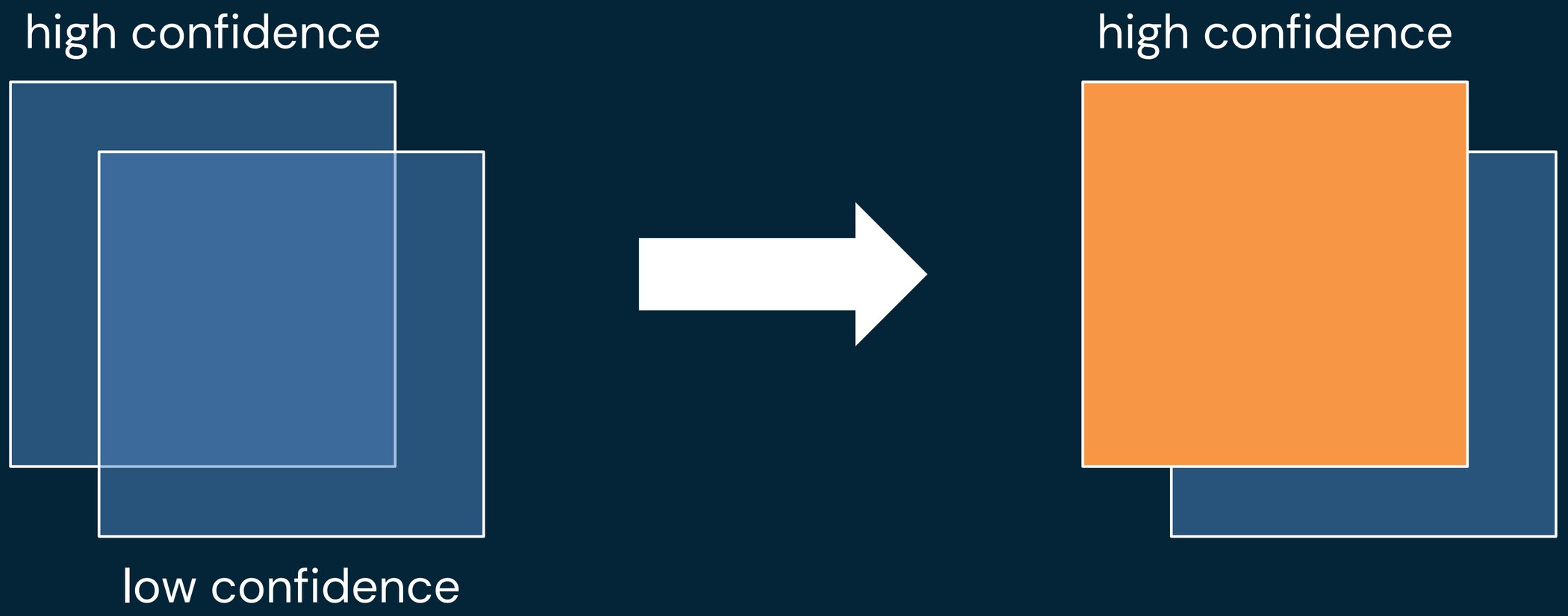
Bounding box predictions

# *4.* Postprocessing

# Our model produces too many predictions!

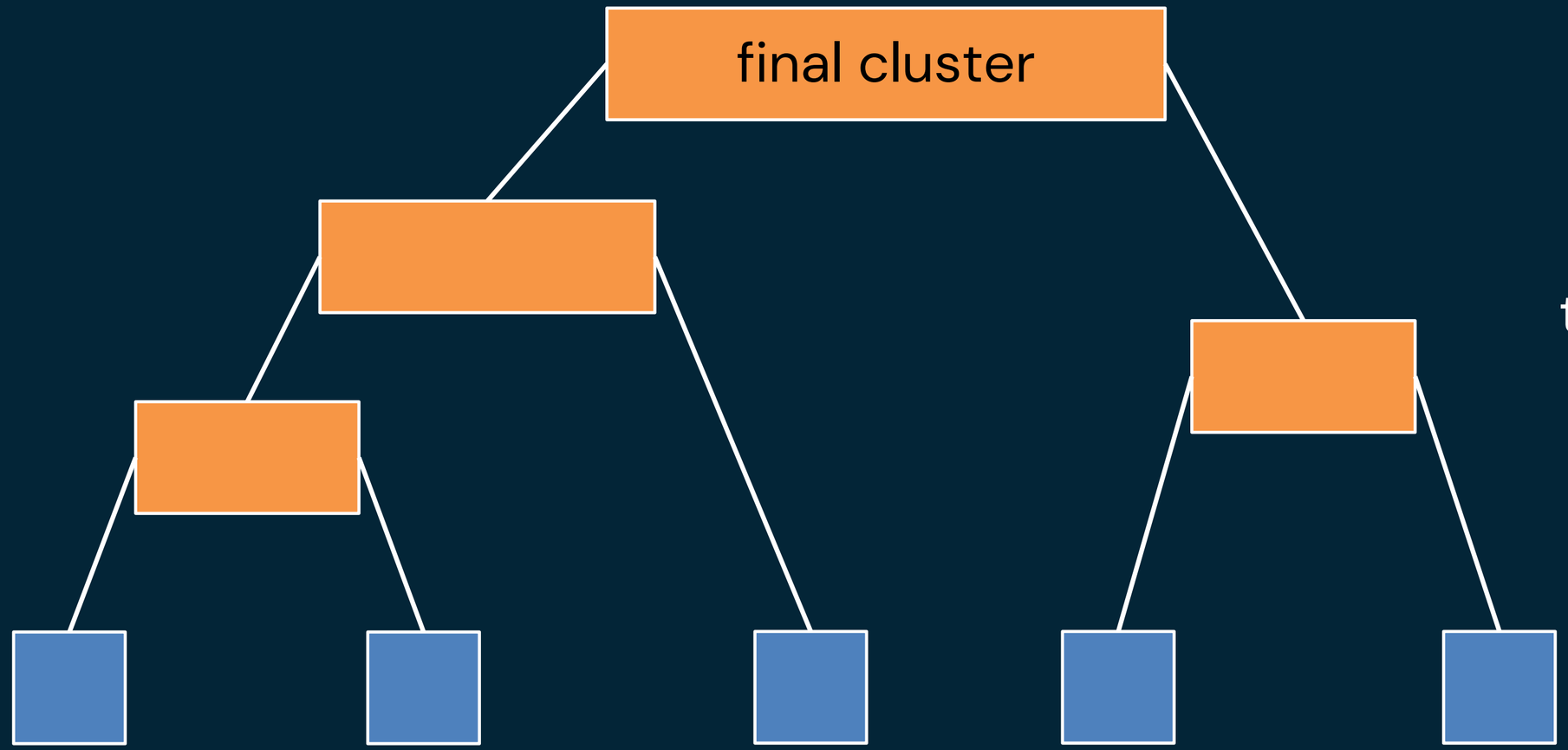
predicted = 20 * annotated

# Non-Maximum Suppression



# Box Combination

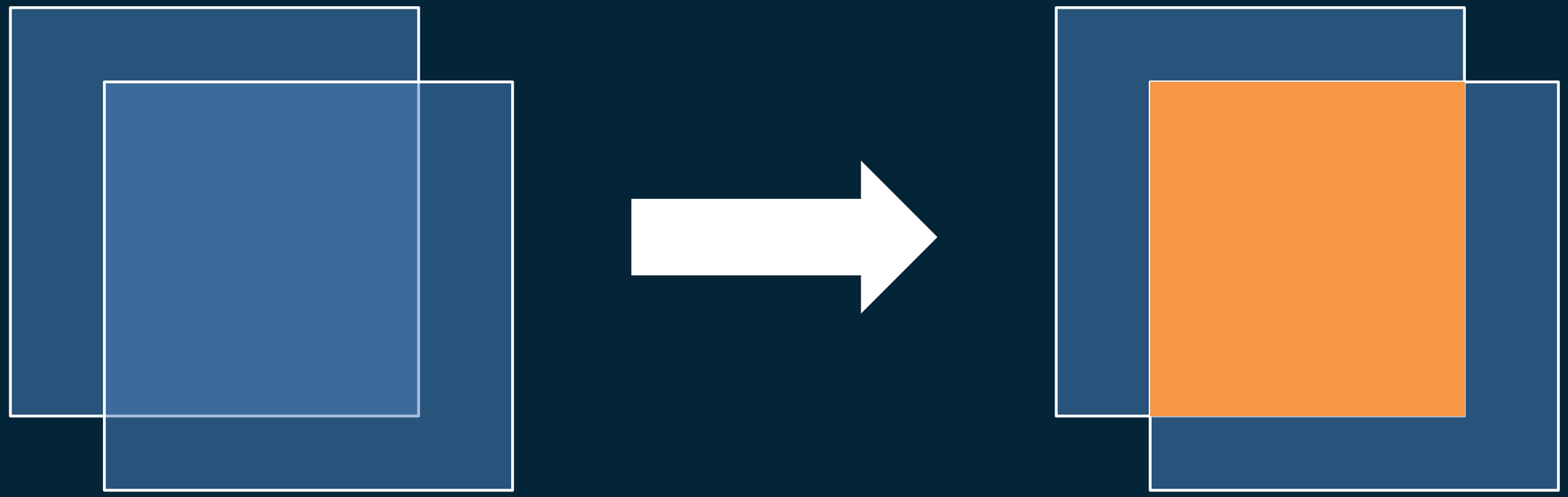
Agglomerative Hierarchical Clustering




distance threshold = 0.3

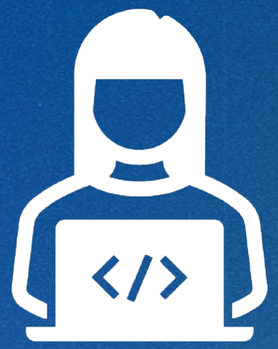
# Box Combination

## Intersection



# 5. Running & Results

# AWS SageMaker



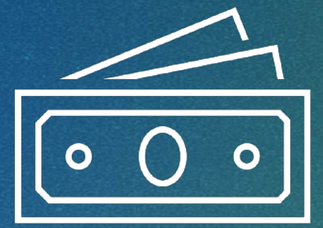
## Code

39 audio files →

10 VAE models

## Computational Power

Used fastest kernel



## Cost

$450 → majority of our budget

# Metrics

- Intersection over Union

| | Number of Predicted Boxes | Accuracy | Precision | Recall | F1 |
|---|---|---|---|---|---|
| Before Box Combination | 503.64103 | 0.00076 | 0.00077 | 0.00675 | 0.00137 |
| After Box Combination | 177.64103 | 0.00214 | 0.00216 | 0.00651 | 0.00302 |

*averages

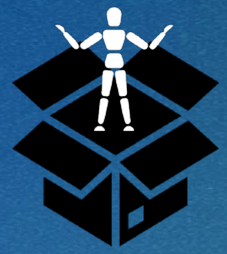
# 6. New Frameworks

# Convolutional Neural Network

## Object Detection

Better for image-related tasks

## Past Implementation



Blackbox model

# huggingface 🤗

## DETR

Aspects of CNN & VAE

## Split

Training, Validation, Test

## Input

COCO format: [x_min, y_min, width, height]

# 7. Future Work

# Continue Detection

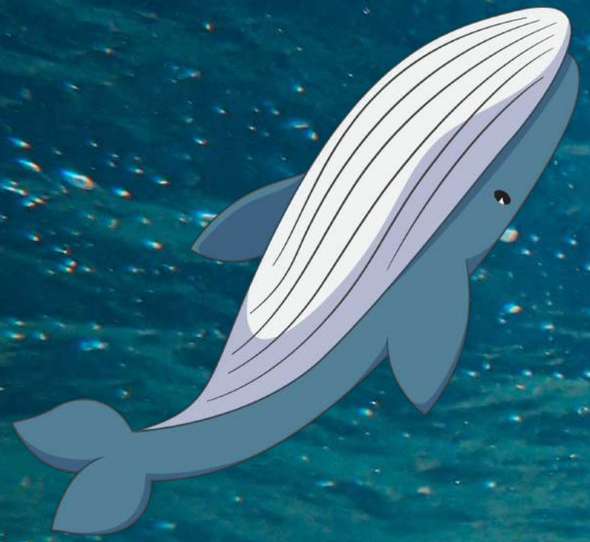
- Continue huggingface adaptation
- Continue 2022 team's CNN model

# Implement Classification

- Whale 
- Human 
- Other • • •

# Thank you to


- Professor Schroth-Glanz for her guidance throughout this project
- Dr. Ventura and Dr. Glanz for their support
- Our classmates for working hard these past two quarters



# Thank you!

Any questions?