9th Meeting

30 MAY 2024 / 1:00 - 1:30 PM / 180-262 / https://calpoly.zoom.us/j/84351858132

Attendees

Dr. Schroth-Glanz, Sophia Chung, Anagha Sikha, Sucheen Sundaram, Dr. Glanz, Dr. Ventura

Agenda (1:00 - 1:30 pm)

Housekeeping (1:00 pm)

1. Update on CNN using past team's code (2022)
    a. Create training, testing, and validation sets on the 39 audio files
    b. Read in annotation files using the past team's framework
        i. We will implement their CNN
2. Update on huggingface object detection tutorial
    a. Formatting data for the model to take as input

Q & A (1:20 pm)

Team Questions

1. Are there specific aspects you want us to include in the final report?
    a. This report discusses the work from the past 2 quarters
2. From the past presentation, are there any changes you suggest, since we will be adding on to it?
3. Any final deliverables?
    a. Document to keep track of the resources we referenced
4. How to organize all of our files (codebooks, reports, presentations, notes, agenda)

Meeting Notes

- Final deliverables

    - What would be most useful for the next students to continue?
    - What have we done and why?
    - What changes did we make from the past teams?
- Presentation and report
    - Incorporate the new things we worked on
- Organization
    - Github
        - Code and documents
- Our presentation will be on Zoom
    - Thursday 6/6, 1:20-40 pm

8th Meeting

16 MAY 2024 / 1:00 - 1:30 PM / 180-262 / https://calpoly.zoom.us/j/84351858132

Attendees

Dr. Schroth-Glanz, Sophia Chung, Anagha Sikha, Sucheen Sundaram, Dr. Glanz, Dr. Ventura

Agenda (1:00 - 1:30 pm)

Housekeeping (1:00 pm)

1. Confirm May 30th at 1-1:30 pm on Zoom for next/last meeting
2. Presenting poster at BCSM research conference (today and tomorrow!)
3. Update on CNN
    a. Past Team (Summer 2022 - page 67 in Google Doc) used CNN - do you know which notebook they used to run this?
        i. CalPoly-Bioacoustics folder on AWS
            1. ConvertWavToSpec.ipynb
            2. Develop&Train.ipynb
            3. ModelEvaluation.ipynb
    b. Wrote our own skeletal CNN that is trained on the decimated .wav files
    c. Results update
4. Update on huggingface object detection guide
    a. https://huggingface.co/docs/transformers/en/tasks/object_detection
    b. DETR model = encoder-decoder transformer with a convolutional backbone
    c. Annotations were made in terms of hertz, so we will not implement mel scale transformation here
    d. Implementing an 80/10/10 train/validation/test split
    e. Formatting data for the model to take as input

i.

```
{'image_id': 15,
 'image': <PIL.Image.Image image mode=RGB size=943x663>,
 'width': 943,
 'height': 663,
 'objects': {'id': [114, 115, 116, 117],
  'area': [3796, 1596, 152768, 81002],
  'bbox': [[302.0, 109.0, 73.0, 52.0],
   [810.0, 100.0, 57.0, 28.0],
   [160.0, 31.0, 248.0, 616.0],
   [741.0, 68.0, 202.0, 401.0]],
  'category': [4, 4, 0, 0]}}
```

Q & A (1:20 pm)

Team Questions

1. Updates on Deployment 1 data? For classification

Meeting Notes

- Where is the 2022 team's CNN code:
    - Use oregon region
    - Recognition stuff = black-box model in the training notebook
- Sucheen's own CNN results:
    - Trained on the decimated audio files
    - The output displays points rather than actual bounding boxes
- Huggingface alternative:
    - Object detection guide
    - Combination of VAE (with encoder-decoder) and CNN
    - Focused on getting the data into the inputs but without the mel conversion
- Updates on Deployment 1 data for classification
    - Annotated text from Adelle should be ready soon
    - Two letters after audio id are the initials of students who annotated the file

7th Meeting

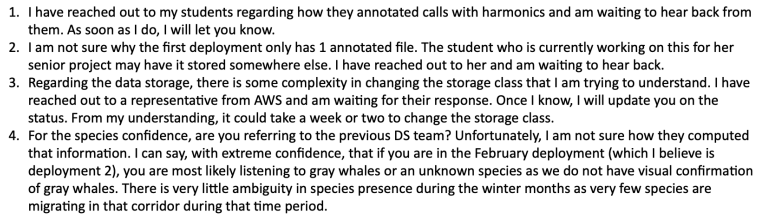
2 MAY 2024 / 1:00 - 1:30 PM / 180-262 / https://calpoly.zoom.us/j/84351858132

Attendees

Dr. Schroth-Glanz, Sophia Chung, Anagha Sikha, Sucheen Sundaram, Dr. Glanz, Dr. Ventura

Agenda (1:00 - 1:30 pm)

Housekeeping (1:00 pm)

1. Confirm May 16th at 1-1:30 pm on Zoom for next meeting
2. Discuss if there are any updates on harmonics annotation calls, deployment 1 annotation files, storage class
    a. 
    1. I have reached out to my students regarding how they annotated calls with harmonics and am waiting to hear back from them. As soon as I do, I will let you know.
    2. I am not sure why the first deployment only has 1 annotated file. The student who is currently working on this for her senior project may have it stored somewhere else. I have reached out to her and am waiting to hear back.
    3. Regarding the data storage, there is some complexity in changing the storage class that I am trying to understand. I have reached out to a representative from AWS and am waiting for their response. Once I know, I will update you on the status. From my understanding, it could take a week or two to change the storage class.
    4. For the species confidence, are you referring to the previous DS team? Unfortunately, I am not sure how they computed that information. I can say, with extreme confidence, that if you are in the February deployment (which I believe is deployment 2), you are most likely listening to gray whales or an unknown species as we do not have visual confirmation of gray whales. There is very little ambiguity in species presence during the winter months as very few species are migrating in that corridor during that time period.
3. Update on our question about species confidence
    a. We decided that we do not need it in the creation of our prediction files
4. Update on combining boxes using hierarchical clustering (union and intersection)
5. Update training model and generating predictions on SageMaker, will repeat with mel preprocessing
    a. Is it okay to run 64 GB costwise?
        i. Update: We generated predictions over 2-3 hours, and it is forecasted to cost ~$30
    b. Can we train our ensemble using the mel preprocessing?
6. Update on potential plan for this quarter
    a. Implemented box combination method - Week 4
    b. Train new models with mel spectrograms - Week 5/6
    c. Run metrics on all prediction files model - Week 5

d. Finish poster - Week 5 (**due Mon, May 6)**

e. Start classification - Week 6

f. Present at BCSM Conference - Week 7 (**May 17)**

Q & A (1:20 pm)

Team Questions

1. Feedback on BCSM poster

Meeting Notes

- Update on the harmonics
    - Fundamental frequencies Only
    - No harmonics
- Annotation files
    - Upload more files (12 total)
        - Not estimated to arrive but hopeful
- Glacier storage removal
    - Estimate 1-2 weeks to exit Glacier storage class
    - Do we want to skip this?
- Species confidence
    - Related to the amplitude of signals
    - Do not really need it
- Box combination update
    - Using an Intersection method
        - Union would include things you don't want
        - So that we have a specific time and frequency range
    - Intersection is better because we want fewer bounding boxes total
- Cost on SageMaker
    - Limit of $500
    - Important to stop the notebook

- Poster feedback
    - Cal Poly color preferred
    - Use bullet points to improve readability for audience

6th Meeting

18 APRIL 2024 / 1:00 - 1:30 PM / 180-262 / https://calpoly.zoom.us/j/84351858132

Attendees

Dr. Schroth-Glanz, Sophia Chung, Anagha Sikha, Sucheen Sundaram, Dr. Glanz, Dr. Ventura

Agenda (1:00 - 1:30 pm)

Housekeeping (1:00pm)

1. Confirm May 2nd at 1-1:30 pm on Zoom for next meeting
2. Discuss the results we sent
3. Update on box combination implementation
    a. Confirm union versus intersection
4. Discuss implementing mel spectrograms in the preprocessing
    a. What a mel spectrogram is and why it increases performance
    b. Human perception?
5. Update on potential plan for this quarter
    a. Implement box combination - Week 3
    b. Train new models with mel spectrograms - Week 3 (potentially)
    c. Run metrics on all prediction files model - Week 4
    d. Improve the detection method potentially - Week 4
    e. Start classification method - Week 5

Q & A (1:15 pm)

Team Questions

1. Labels for classification
    a. Find additional categories?

Meeting Notes

- May 2nd meeting time works
- Results:
    - Tested on 6805.230206163827 prediction files
        - Achieved an 82% accuracy
    - Refining our predictions method
    - Intersection > union, more certainty
        - Certain animals create harmonics where sounds are repeated
            - Are they annotated as separate calls?
            - Calls have multiple elements
            - How did the students handle the harmonics (included the fundamental call and all the harmonics or ignored the harmonics?)
    - Past team's box combination
        - Picked up 1000 boxes that had parts of a call, so decided to merge boxes into 1 larger box to make sure they get all the components of the call
        - They tried to minimize the overcount
- Thinking about implementing a clustering algorithm
    - To create clusters of the original boxes before combining
    - Non-maximum suppression (NMS) - Dr. Ventura's suggestion
        - Threshold for determining if boxes overlap, and take the one with the higher confidence
- Mel spectrograms:
    - Were they boxing sounds that they could hear or just visually see?
        - They were doing both, there's a parameter that they can change the visual enhancement of the call
        - FFT value - select that parameter, students watch the spectrogram and box anything they heard that they could also see
    - Mel scale for the frequency instead of just Hz
        - We are interested in whales that we can hear
        - So yes we can use mel spectrograms

- Client questions:
    - Explaining the metrics:
        - Non-binary accuracy vs accuracy
    - Keep a list of the papers that we read so new teams do not repeat past things that are done
    - Have documentation about what we did and looked into
- Team questions:
    - Categories for classifications:
        - Found in the annotated docs
        - Want a challenge: look at databases for well-known established calls
        - Recommendation: to use labels in the documents
        - Found in the fall documents for the labels
        - Deployment 2 - February data only has gray whales (so only one label)
        - Deployment 1 has species labels (use for classification)

5th Meeting

4 APRIL 2024 / 1:00 - 1:30 PM / 180-262 / https://calpoly.zoom.us/j/84351858132

Attendees

Dr. Schroth-Glanz, Sophia Chung, Anagha Sikha, Sucheen Sundaram, Dr. Glanz, Dr. Ventura

Agenda (1:00 - 1:30 pm)

Housekeeping (1:00 pm)

1. Confirm that April 18th 1-1:30 on Zoom works
2. Running/stopping notebooks in AWS SageMaker
3. Discuss the presentation & feedback
4. Recap from the past quarter
    a. Running the past team's code on Avila data
    b. Using ensemble method to run VAE model on Avila data
5. Potential plan for this quarter
    a. Run metrics on VAE model - Week 1/2
    b. Improve the detection method potentially - Week 3/4
    c. Start classification method - Week 4

Q & A (1:15 pm)

Team Questions

1. Alternative detection methods
    a. Convolutional neural networks
2. Potential classification methods
    a. Long short-term memory networks
    b. SVM
    c. Hidden Markov models

d. Gaussian mixture models

Action Items (1:25 pm)

Person(s)	Item	Deadline
All	Results from metrics from both methods (ovr vs iou) and compare → email	04/12

Meeting Notes

- AWS Sagemaker
    - make sure it says Oregon
    - when you're done with a program, click notebook → Actions → Stop → confirm
- VAE model
    - Based on our metrics, we will potentially explore new detection methods
        - Run both methods (ovr and iou)
    - Researching classification methods

4th Meeting

28 FEBRUARY 2024 / 3:15 - 3:45 PM / 38 - 123

Attendees

Dr. Schroth-Glanz, Sophia Chung, Anagha Sikha, Sucheen Sundaram, Dr. Glanz, Dr. Ventura

Agenda (3:15 - 3:45 pm)

Housekeeping (3:15 pm)

1. Recap on the past two weeks
    a. Successfully ran through the past team's notebooks
    b. Working on improving training background file
2. Thoughts on progress

Q & A (3:20 pm)

Team Questions

1. Clarify the past team's works: 2023 vs 2022 and before
2. Has the past team's work been run through the AWS and do they already have notebooks on the AWS?
3. Do you know why the models switched from training on annotated files vs the background file?

Action Items (3:40 pm)

Person(s)	Item	Deadline
All	VAE Model Running	03/08/2024
All	Send the updated metrics file to Professor Schrotz-Glanz	3/08/2024
All	Message old team to compare metrics	03/01/2024

Meeting Notes

- Thoughts on our recap?:
    - May run into errors just because a student did not annotate something. There may actually be a sound there
- 2023 vs 2022
    - 2023 team wanted to try to train on background noise instead of training on annotated files to start a new way
    - No personal preference between either methods
- AWS notebooks
    - 2023 not on AWS right now
    - That team did not utilize a lot of the AWS resources
- Future Plans
    - Try different model architectures

3rd Meeting

12 FEBRUARY 2024 / 3:10 - 3:40 PM / 38 - 123

Attendees

Dr. Schroth-Glanz, Sophia Chung, Anagha Sikha, Sucheen Sundaram, Dr. Glanz, Dr. Ventura

Agenda (3:15 - 3:45 pm)

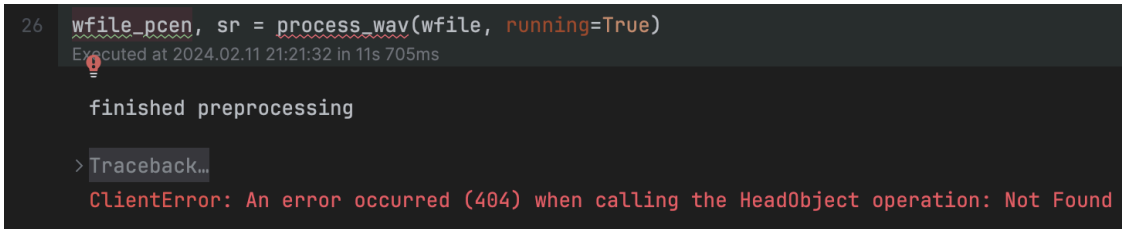
Housekeeping (3:15 pm)

1. Recap on what we have been working on
2. What to accomplish in today's meeting

Q & A (3:20 pm)

Team Questions

1. What are some short-term goals and deadlines for this project?
2. Anything to improve from past student's work?
3. Address the error:



Action Items (3:40 pm) - refer to 2nd meeting action items

Meeting Notes

- Short-term goals to work on?:
    - Previous team worked on Monterey Bay files → compare to the Cal Poly Avila data
    - Monterey Bay data is longer so may have already truncated the data
- Anything to improve from past students' work?:

    - Currently running the last students' notebook and have been improving the code
    - Want more calls to be detected without having a vast amount of false positives
        - Accounted for through various methods and check those out
    - Don't want students to have to manually get rid of false positives
    - Background noise might just be an hour-long clip of Monterey whales
- Decimation:
    - Nice to do
    - Getting model is more of a priority

2nd Meeting

31 JANUARY 2024 / 3:15 - 3:45 PM / 38 - 123

Attendees

Dr. Schroth-Glanz, Sophia Chung, Anagha Sikha, Sucheen Sundaram, Dr. Glanz, Dr. Ventura

Agenda (3:15 - 3:45 pm)

Housekeeping (3:15 pm)

1. Recap on what we did

Q & A (3:20 pm)

Team Questions

1. How to navigate AWS?
2. Should we follow the suggestions from the previous capstone team's report as a starting point?
    a. Optimizing PCEN parameters
    b. Training VAE on different/new background noise data
    c. Tuning sensitivity of VAE
    d. Finishing cleanup method for box combination
3. Do we have more data than the last capstone team?
    a. 77 raw WAV files
    b. 30 annotation TXT files
4. Which 30-minute background noise WAV file did they train the VAE with?
5. With what data were metrics like precision, accuracy, and recall computed
    a. What are the ground truth files from researchers?
6. Are there additional tasks besides this that you want us to complete?

Action Items (3:40 pm)

Person(s)	Item	Deadline
Phase 1: All	Run pre-processing on CP full-size files to convert to decimated, upload to AWS	2/7
Phase 1: All	Get main.ipynb running with a few files, time, and ask MSG for permission to run with all data	2/7
Phase 2: TBD	Train VAE on all background noise data	TBD
Phase 2: TBD	Tune sensitivity of VAE	TBD
Phase 2: TBD	Optimize PCEN parameters	TBD
Phase 2: TBD	Finish cleanup method for box combination	TBD

Meeting Notes

Answer's to Team Questions

- Accessing AWS:
    - Look at S3 Bucket > whale-recording > CPhydrophone > Avila > Deployments > wav-files
        - Different deployments with wav files
            - Sud&Log files: products of the hydrophones (we won't be using)
            - Selection-table: the ground truth files with students' bounding boxes
            - wav-files
                - ~30 min each, more files
                - decimated with downsampled data

        - full size with the original data
    - Previous team used Monterey Bay data with 2 gigs each, 3 hrs long
    - Avila is relevant to us
- Follow suggestions from previous team, and establish contact with members
- We have maybe a little bit more data than the previous group
- The previous team probably used an Avila file to train the VAE
- The ground truth files the previous team used were the selection-table files found on AWS
- No additional tasks for now
- AWS costs:
    - Downloading and uploading files costs pennies
    - Running notebooks that take hours cost a lot of money
        - Contact Professor Schroth-Glanz prior to running large jobs
    - Professor Schroth-Glanz may be out of town on February 14th - we will confirm the details of our next meeting shortly

1st Meeting

17 JANUARY 2024 / 3:15 - 3:45 PM / 38 - 123

Attendees

Dr. Schroth-Glanz, Sophia Chung, Anagha Sikha, Sucheen Sundaram, Dr. Glanz, Dr. Ventura

Agenda (3:15 - 3:45 pm)

Housekeeping (3:15 pm)

1. Introductions
2. Recap of project background
3. Setting up AWS, Github, any other data or resources for the project

Q & A (3:30 pm)

Team Questions

1. Which of the research questions should we focus on?
2. Is detection or classification a higher priority?
3. What previous work has already been done/will we have access to?
4. Would it be possible to extend current meeting times? Or, what other times could we meet?
5. How would you suggest we split up the work?

Action Items (3:40 pm)

Person(s)	Item	Deadline
Sophia, Anagha, Sucheen	Go through AWS, Github, report	1/31
Sophia, Anagha, Sucheen	Create deadlines	1/31

Meeting Notes

- Professor Schroth-Glanz will share (this weekend)
    - Report
    - Massive document from previous capstone teams, material from summer researchers
    - Access to GitHub
    - AWS (Zoom meeting on Friday 1/19 at 4:30 pm with Anagha and Sucheen)
- Ultimate objectives: detection and classification
    - Detection is a challenge (top priority), classification is a bonus
        - Input = sound, output = bounding boxes
- From past teams: have split up work (preprocessing, model training) by person but disjointed, and all work on project together but burnt out
- Past work has included training a model on some amount of data and getting some results but not a lot
- Currently we don't know how well models perform
- Professor Schroth-Glanz has blocked off Wednesdays 3-4 pm, if necessary