EDANSA-2019: The Ecoacoustic Dataset from Arctic North Slope Alaska

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Problems

- Arctic-Boreal forests are warming at twice the global average

- Bird migrations and reproductive success are impacted

Problems

- Oil and Gas Extraction

- Frequency of vehicle usage is increasing

Credit: M. Mandel, Source: NNA soundscape project camera traps

Motivation

Ecoacoustic monitoring data

+

Sound event detection

= quantitative data

Contribution

- A new dataset consisting of **27 hours of labeled data** according to **28 tags**
- A baseline system for **9 important environmental classes** with enough instances to train convolutional recognizers
- First recordings collected in both developed and undeveloped regions across the Arctic Coastal Plain
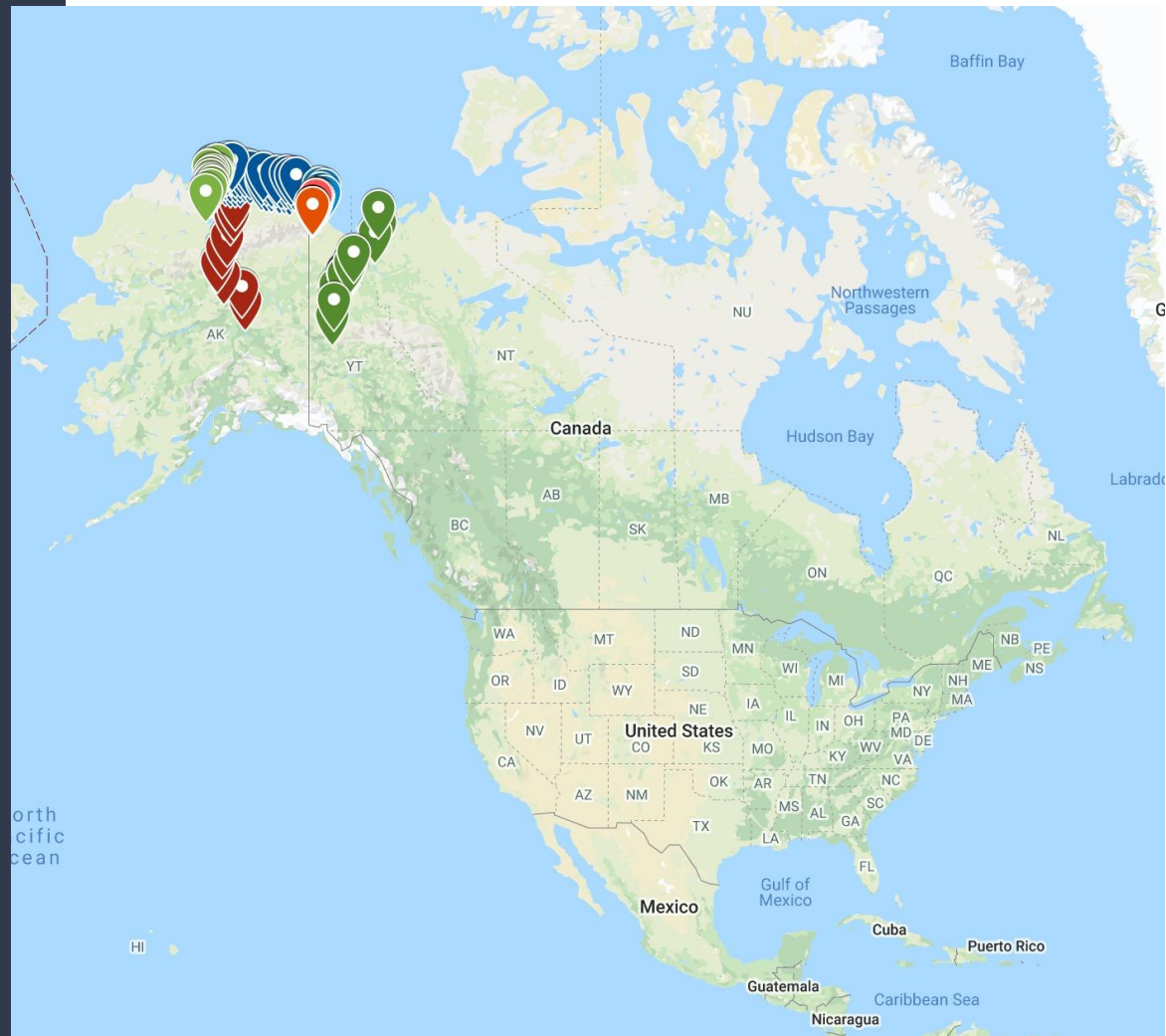

Credit: Megan Perra

# Monitoring Sites

Locations, Timeline, Data

Locations

- Recordings from the **Prudhoe Bay Oil Fields**, **Arctic National Wildlife Refuge** (ANWR), and **Ivvavik National Park** were able to capture wildlife activity on the **Arctic Coastal Plain**
- The primary breeding ground for many **migratory species**

Locations

- Sites along the **Dempster** and **Dalton Highways** captured the arrival and departure of those **migratory birds** that use the north-south flyways that converge on the Coastal Plain
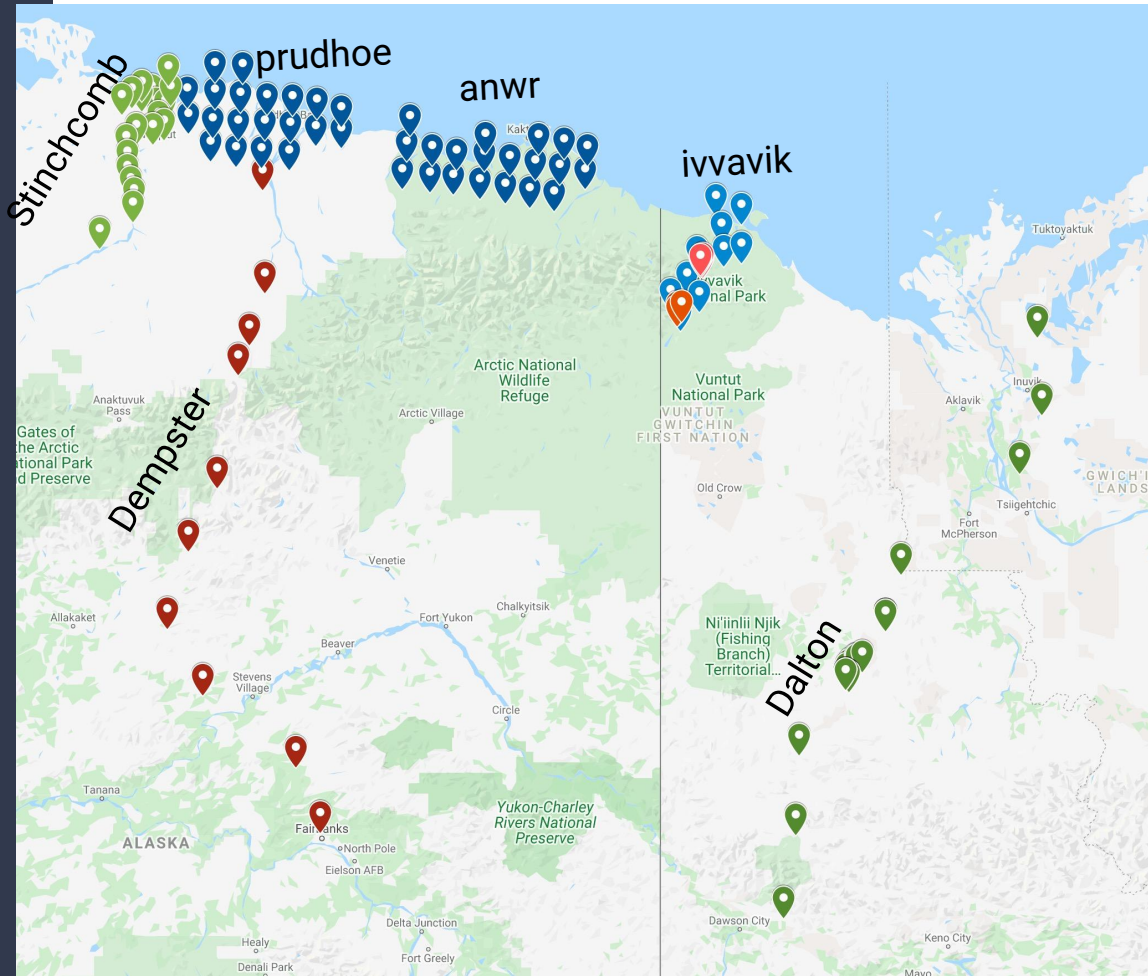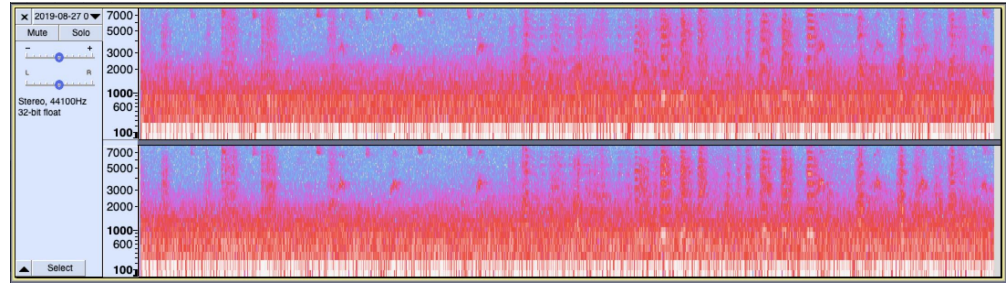
Timeline

daylight (h)	4	6	10	13	17	22	17	13	10	6	4	5
month	1	2	3	4	5	6	7	8	9	10	11	12
ivvavik				▓	▓	▓	▓	▓				
dempster			▓	▓	▓	▓	▓	▓	▓	▓	▓	▓
anwr					▓	▓	▓	▓	▓			
dalton			▓	▓	▓	▓	▓	▓	▓	▓		
prudhoe					▓	▓	▓	▓	▓			

Months data recorded in each location in 2019

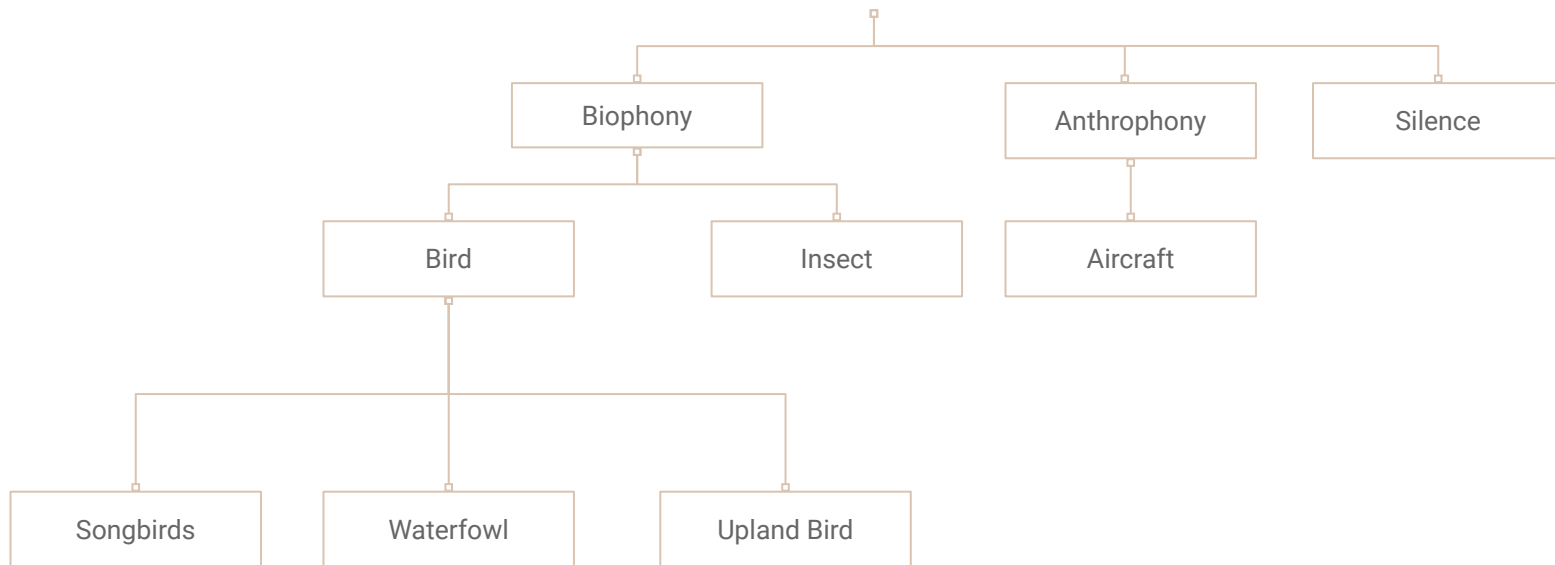* ivvavik also has recordings at 5,6,7,8 / 2018.

Data – Raw

- Stereo
- Recorded **150** minutes of audio at a time with rotating breaks of 120 to 150
- In total, devices recorded **2,161** days of audio data throughout 2019

Baseline and Taxonomy

Taxonomy

- taxonomic ranks: **coarse, medium, and fine**
- 9 categories with more than 100 examples were used to train our baseline model

Baseline

- Each sample is a **10-second** clip, pre-processed into a **mel-spectrogram**

- Convolutional neural network together with **global temporal pooling** and **data augmentations**

Label	Validation	Test
Biophony	0.95	0.96
Bird	0.96	0.98
Songbird	0.90	0.96
Waterfowl	0.87	0.90
Upland bird	0.87	0.93
Insect	0.90	0.83
Anthrophony	0.88	0.88
Aircraft	0.96	0.88
Silence	0.96	0.93
Average	0.92	0.92

Table 2: AUC per label of the baseline on validation and test sets.

Sampling and Labeling

- 4 batches differentiated by the sampling and labeling methods used.

- **Batch-1:** Random sampling
- **Batch-2:** Model trained on the training set of batch-1
- **Batch-3:** Model trained on batches 1 and 2 (only training)
- **Batch-4:** Ensemble of 7 different iterations of the model

Label	b-1	b-2	b-3	b-4	Total
Biophony	4107	500	776	886	6269
Bird	3821	493	78	52	4444
Songbird	2210	238	5	6	2459
Waterfowl	573	126	2	3	704
Upland Bird	386	44	2	2	434
Insect	372	36	734	846	1988
Anthrophony	328	217	1367	1165	3077
Aircraft	100	93	731	769	1693
Silence	1146	325	32	19	1522
Total	5566	1045	2133	2038	10782

Table 1: Number of samples per label in each of the four batches, batch-1 (b-1) through batch-4 (b-4). The last row shows the total number of samples in each batch.
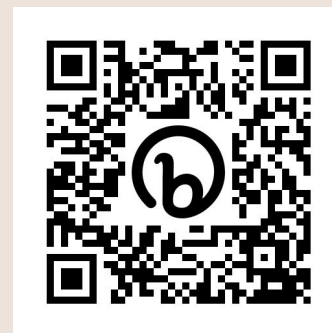
Thank You!

For questions please see
Poster 7

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Dataset: (CC by 4.0 license) zenodo.org/record/6824272

Code: (MIT license) github.com/speechLabBcCuny/EDANSA-2019