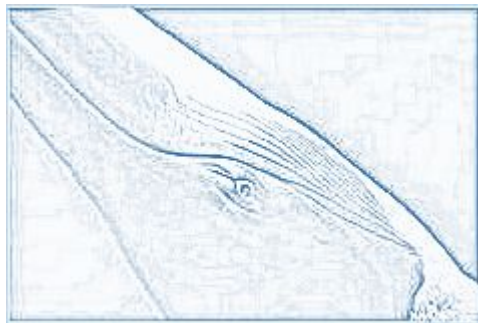


Have ye seen the Right Whale? A Classification Problem



March 11th, 2016

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Problem: Identifying the “Right Whale” Calls

▲ Goal

Identify audio clips containing sounds from the North Atlantic right whale.

▲ Application

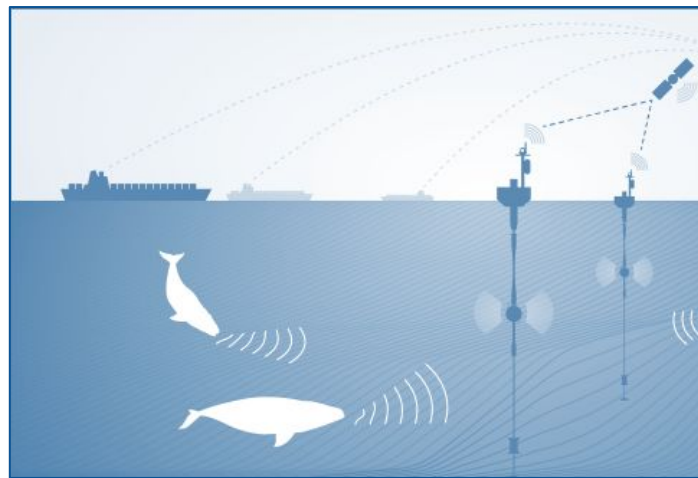
Collision avoidance in shipping lanes.

▲ Type

Binary classification

▲ Data

30,000 2-second audio clips

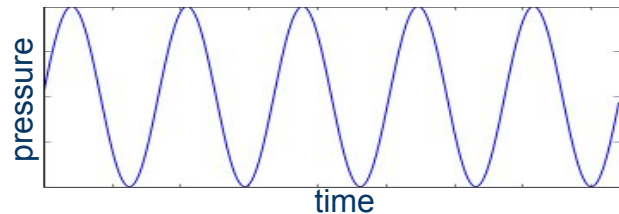


Audio Classification to Image Classification

▲ Audio Recording

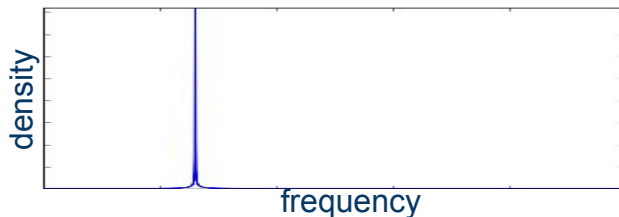
Pressure variation in time. We perceive these pressure variations as sound

Idealized example - a tuning fork



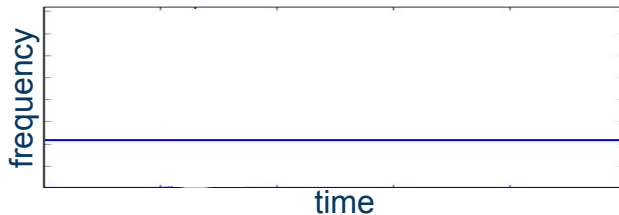
▲ Fourier Transformation

Frequency domain representation of a time varying signal

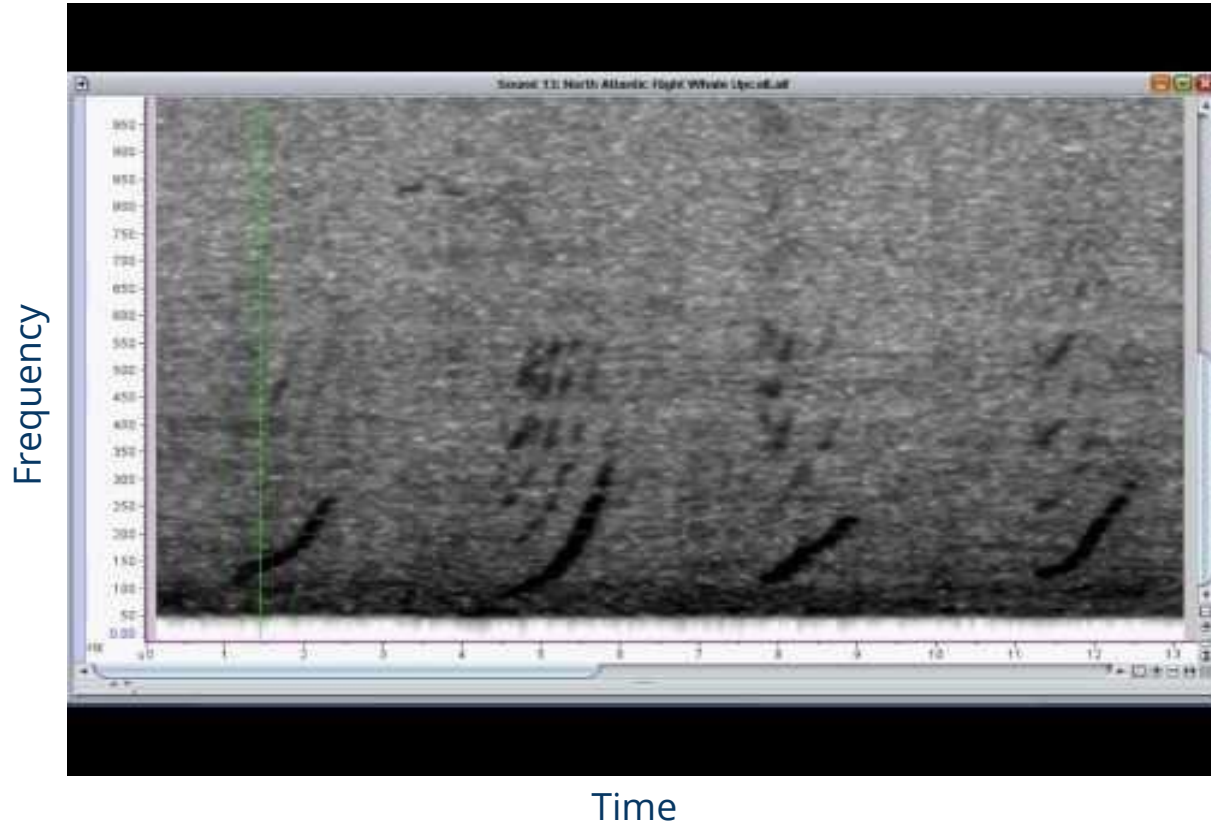


▲ Spectrogram

Frequency characteristics of a signal over time

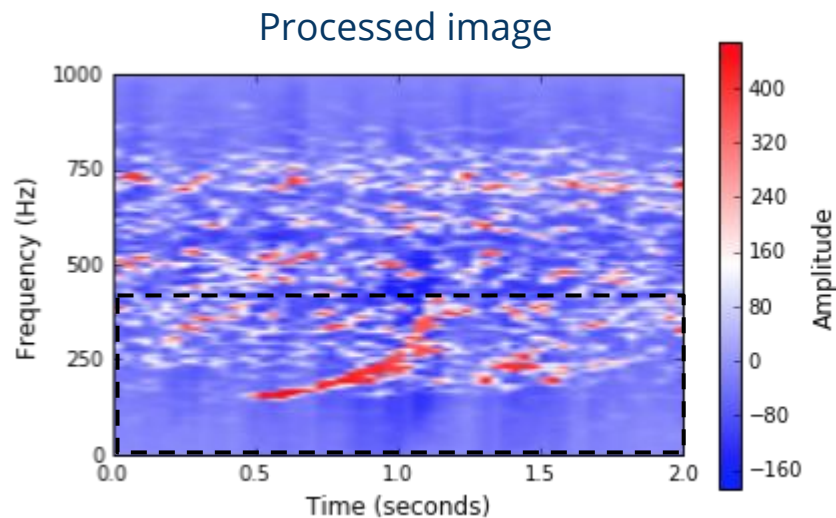
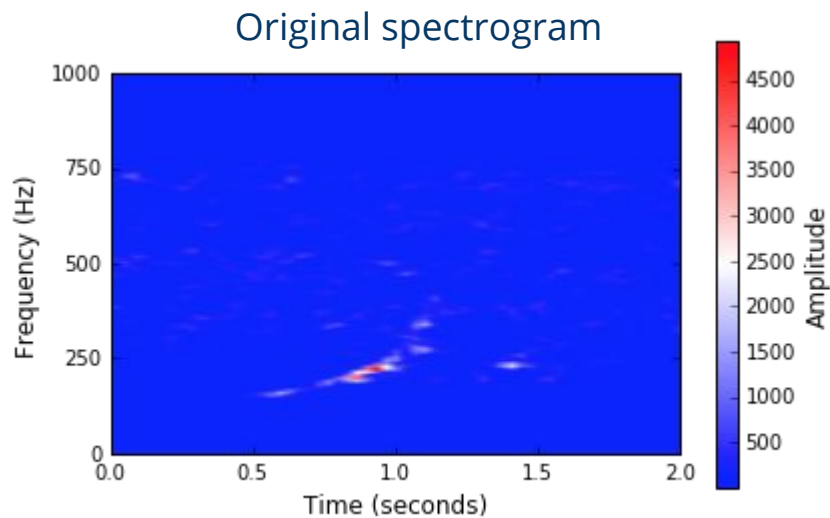


Whale Call Spectrogram



Feature Engineering (I)

Processing images: Contrast-enhancement



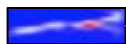
Time and frequency metrics (300 features)

Feature Engineering (II)

▲ **Template matching** (150 features)

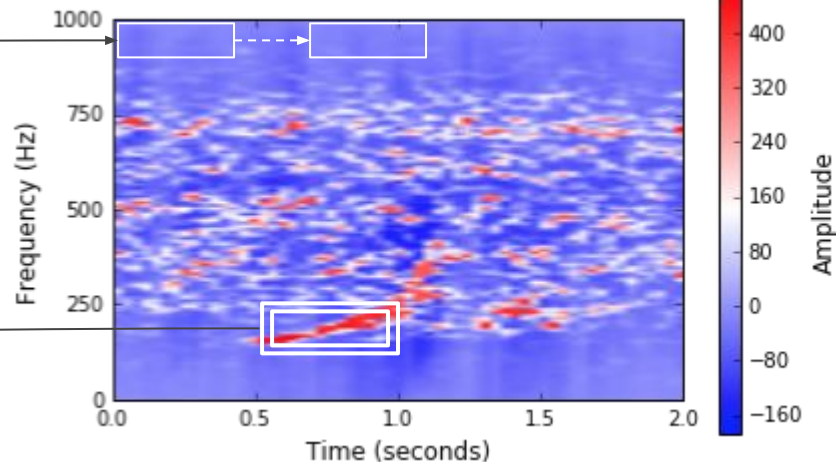
Search for template over spectrogram and find the area of the image that best matches the template

Whale call
template example



Best match
(Correlation, x, y)

Original Image and match



Modeling and results (I)

Model selection

- ☐ Random Forests
- ☐ Gradient Boosting

Hyper-parameter tuning

- ☐ Learning rate
- ☐ Sampling rate
- ☐ Number of trees

Scoring on the test set

- ☐ Using all variables (450 features)
- ☐ Using only template matching variables (150 features)
- ☐ Using non-template matching variables (300 features)

Modeling and results (II)

AUC Summary

FEATURE SELECTION	TRAIN AUC (24k obs.)	TEST AUC (6k obs.)
All features (450 features)	.9992	.9965
Only template matching features (150 features)	.9982	.9951
Only non-template matching features (300 features)	.9796	.9499

Thank you

“Have ye seen the Right Whale? A Classification Problem”

Kaggle 2013 Marinexplore Whale Detection Challenge



Project available at **Github**



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