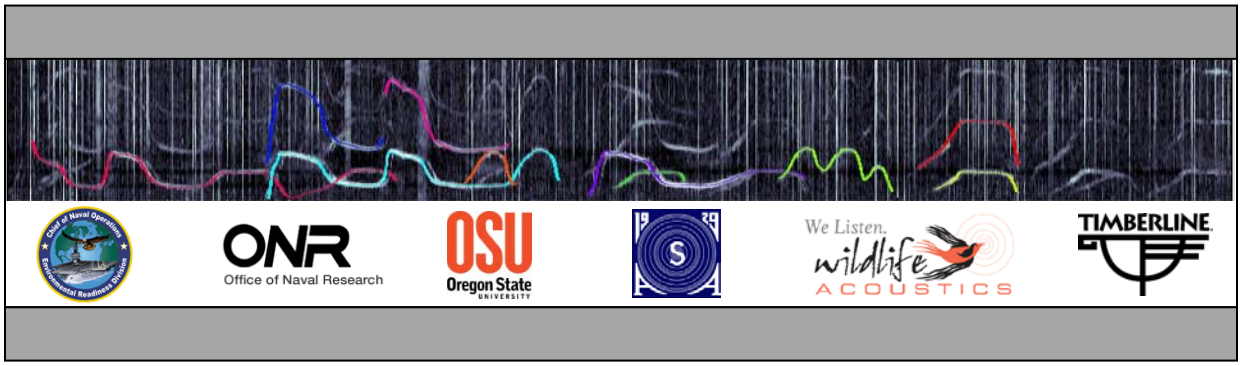

Fifth International Workshop on Detection, Classification, Localization, and Density Estimation of Marine Mammals using Passive Acoustics

21 -25 August, 2011

Timberline Lodge, Mount Hood, Oregon, USA

TUTORIALS: UPDATES

01 AUG 2011

The carrying capacity for tutorials has been limited to 40 participants for each tutorial.

An introduction to detection, classification and localization (Mellinger, Klinck, Roch and Nosal). **is now FULL**. We are starting a wait list for this tutorial. You will see this noted on the registration site for the workshop at https://secure.oregonstate.edu/ocs/register.php?event=467

To get on the wait llist, contact Oregon State University either through the above registration page or by email to conferences[at]oregonstate.edu
You may also send a request to info[@] bioacoustics.us

Half the places in **An introduction to density estimation from passive acoustic data (**Thomas, Marques, Harris) remain open and can be reserved through the registration page https://secure.oregonstate.edu/ocs/register.php?event=467

TUTORIAL DESCRIPTIONS

I. An introduction to Detection, Classification and Localization
21st August 2011, 8.30am-6pm. .

David K. Mellinger, Holger Klinck (OSU Cooperative Institute for Marine Resources Studies)
Marie Roch (San Diego State University & Scripps)
Eva-Marie Nosal (University of Hawaii)

Passive acoustic monitoring is often used to detect, locate and classify marine mammals in real time, as well as analyzing vocalizations in recorded acoustic data sets. This day-long tutorial will give insight into methods to successfully achieve these goals.

We will begin with an overview of concepts and common concerns. We will then examine the detection function and various techniques for creating detectors, including matched filtering, energy summation, frequency contour tracking, spectrogram correlation, and edge detection. This will be followed by an overview of various classification techniques, with introduction to broad concepts such as the differences between generative and discriminative classifiers and parametric versus non-parametric classifiers. The classification portion of the tutorial will also include high level introductions to a variety of classifiers such as template matching, nearest-neighbor search, tree-based classifiers, neural networks, Gaussian mixture models, hidden Markov models; techniques for performance evaluation will be discussed. An emphasis will be placed on experimental design methods for classifiers that are more likely to produce good field performance. The last portion of the tutorial will cover localization methods and concerns, including the use of directional hydrophones, time-of-arrival differences, bearing estimation, hyperbolic localization, beamforming, reflection methods, propagation models and error estimation.

Outline:

- Filtering (Mellinger)
  - Anti-alias filtering
  - Down- and up-sampling
  - Frequency response
- Detection and classification, common concerns (Mellinger, Klinck, Roch)
  - Features
  - Measurement
  - Decision criteria
  - Degree of automation
  - Level of specificity
  - Conditioning:
    - In the time series
    - In the spectrogram
  - Time series and time-frequency representations
  - Bias and variance
- Detection (Mellinger, Klinck,)
  - The detection function:
    - Peak-picking
    - Regular calls
  - Matched filtering
  - Energy summation
  - Frequency contour tracking
  - Spectrogram correlation
  - Edge detection
- Classification (Roch)
  - Generative vs. discriminative classifiers
  - Parametric vs. non-parametric classifiers
  - Template matching
  - Nearest-neighbor search
  - Tree-based classifiers
  - Neural networks
  - Gaussian mixture models
  - Hidden Markov models
  - Performance evaluation
- Localization (Nosal)
  - Directional hydrophones
  - Time-of-arrival differences:
    - Manual
    - Cross-correlation
  - Bearing estimation
  - Hyperbolic localization
  - Beamforming
  - Reflection methods
  - Propagation models
  - Error estimation

II. An introduction to density estimation from passive acoustic data
21st August 2011, 8.30am-6pm.

Len Thomas, Tiago Marques, Danielle Harris (University of St Andrews, Scotland)

Passive acoustic monitoring is often used to obtain indices of relative abundance, such as number of detections per unit time. However, for many applications, the quantity we really want to estimate is absolute population abundance (i.e., the number of animals in the population) or density (number of animals per unit area). This day-long tutorial will give an insight into methods to achieve this.

We will begin with an overview of the concepts and available methods. These are largely based on adaptations of standard animal abundance methods (like distance sampling and mark recapture). A key requirement is to estimate the area effectively sampled by the hydrophones, and we will discuss various approaches to achieve this.

We will then examine some of the potential methods in more detail, motivating each with a case study, and having short hands-on exercises. Please bring a laptop along if you want to participate in these practical sessions (all data and software will be provided). The case studies will include density estimation of North Pacific right whales using conventional distance sampling, Bahamian beaked whales using a regression-based approach to estimate the area effectively sampled, Hawaiian minke whales using spatially explicit capture recapture and Indian Ocean blue whales using a sound propagation model.

Time allowing, the tutorial will close with discussions of a short selection of themes chosen by the participants.