**Master's thesis project in the Stoop Group:**

# Unsupervised classification of whale sounds

Social whales such as pilot and killer whales (Figure 1, left) are known to live in groups and to produce vocalizations for communication and navigation. The first step in understanding the meaning of the vocalization signals and in learning more about the way how whales communicate with each other is the identification and classification of the different sounds made by the animals. This is commonly done manually, through hearing and visual comparison of spectrograms (Figure 1, right). This, however, leads to a process that is highly time consuming and is influenced by the possible uncontrolled biases of the observer who made the classification.

In the Master's thesis project the student would explore the potential of unsupervised Hebbian-learning clustering [1], as developed in the Stoop Group of the Institute of Neuroinformatics, to classify whale sounds. Datasets acquired from biology usually have high variability and noise, and finding the best feature representation of the data will be one of the main challenges of the project. After having identified a successful classification pathway, the project can be extended to also analyze the structure of the whale communication, i.e., the relationships between the whale sounds, using graph theoretical approaches.

The student will work together with researchers from the Stoop Group of the Institute of Neuroinformatics, ETH and University of Zurich, and from the Network Dynamics group of the Max Planck Institute for Dynamics and Self-Organization in Göttingen, Germany.

If you are interested in this project, please contact Karlis Kanders, kkanders@ini.phys.ethz.ch
For more information about the research in the Stoop Group: http://stoop.ini.uzh.ch/


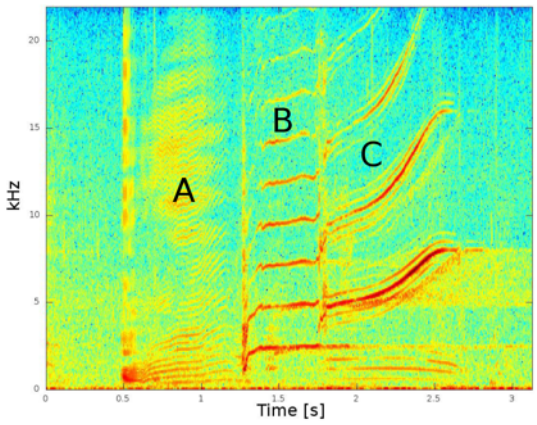


Figure 1. **Left:** Killer whales observed and recorded in Northern Norway. **Right:** Spectrogram of a sequence of three different orca-calls (labeled A,B,C).

[1] F. Landis, T. Ott, R. Stoop. Hebbian Self-Organizing Integrate-and-Fire Networks for Data Clustering. Neural Computation 22, 273-288 (2010).