

NSF Grant Number: IIS-0326395

PI: Mike Johnson, mike.johnson@mu.edu, Marquette University Speech and Signal Processing Lab

Title: *The Dr. Dolittle Project: A Framework for Classification and Understanding of Animal Vocalizations*

Collaborators: Marquette University, University of Central Florida, Disney's Animal Kingdom, University of Connecticut, FAUNA Communications Research Institute

Research Objectives

To develop a broadly useable framework for pattern analysis and classification of animal vocalizations, by integrating successful models and ideas from the field of speech processing and recognition into bioacoustics.

Project Components

Marquette University

- Automatic feature identification and extraction
- Hidden Markov Model (HMM) framework development
- Integration into existing bioacoustic software platforms

FAUNA Research Communications Institute:

- Species: African Elephants, Sumatran Rhinos, Indo-chinese tigers
- Language acquisition studies
- Simultaneous acoustic/seismic recording and playback studies

University of Central Florida / Disney's Animal Kingdom

- Species: African Elephants
- Simultaneous video/acoustic recordings in open habitat environment
- Caller identification and behavioral correlation studies

University of Connecticut / National Undersea Research Laboratory

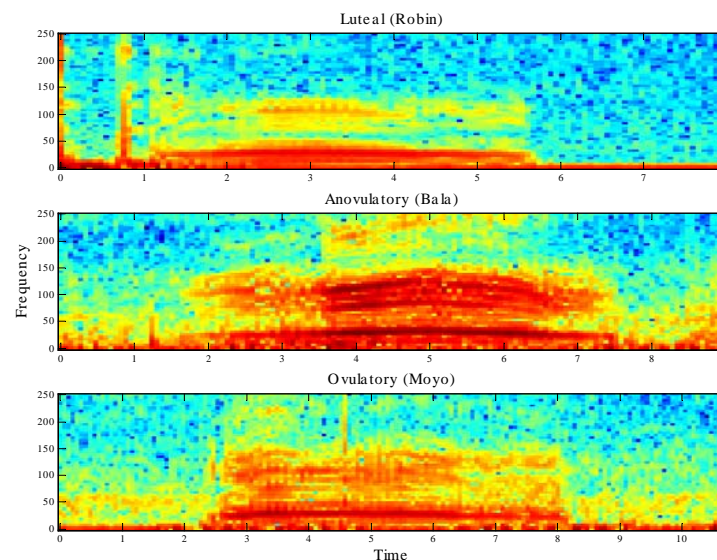
- Species: Beluga whales (St. Lawrence river estuary), agricultural
- Impact of environmental noise on Beluga vocalizations
- Vocalization stress analysis on captive agricultural species

Broader Impact

- Improve understanding of animal behavior
- Create better habitats and species survival programs
- Design new technologies for remote monitoring, censusing, and study in natural habitats.

Significant Results

- Development of generalized Perceptual Linear Prediction (PLP) vocalization analysis approach
- Initial individual ID on elephants 88.1% accuracy
- Identify estrous/non-estrous elephant rumbles 76%
- Initial bird song type classification 90-95% accuracy
- Successful unsupervised clustering of Beluga calls



Classified As

	Anovul.	Ovul.	Luteal
Actual Category	8	7	4
Anovul.	8	7	4
Ovul.	6	19	6
Luteal	3	3	12

Estrous vs. non-estrous rumbles

Classification

	Bala	Fiki	Mackie	Moyo	Robin	Thandi
Bala	9	0	0	1	1	0
Fiki	0	10	0	0	0	2
Mackie	0	0	7	0	0	1
Moyo	0	0	0	12	1	0
Robin	2	0	0	0	18	0
Thandi	0	1	0	1	0	18

Individual rumble ID