

The Ketos Deep Learning Python Package

A decorative graphic on the left side of the slide. It features several circles of different sizes and colors: a large orange circle with a white border at the top left, a medium blue circle with a white border in the center containing binary code and the word 'MERIDIAN', a small orange circle to its right, a medium blue circle below it, a small orange circle below that, and a light blue circle at the bottom. A series of vertical orange bars of varying heights are positioned between the central blue circle and the medium blue circle to its right.

MERIDIAN

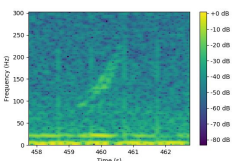
Oliver Kirsebom

MERIDIAN, Institute for Big Data Analytics,
Dalhousie University, Halifax, Canada

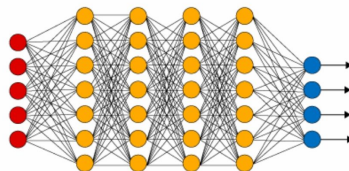
Ketos - at a glance



audio
processing



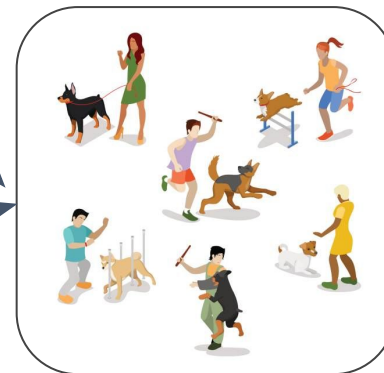
neural network
architectures



Training
Database

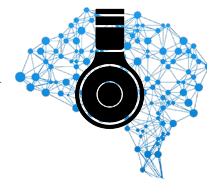
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3	IML-BA_Sample_2019-06-02_065235.wav	1	0	3
4	IML-BA_Sample_2019-06-08_012119.wav	1	0	3
5	IML-BA_Sample_2019-06-21_201729.wav	1	0	3
6	IML-BA_Sample_2019-06-29_124902.wav	1	0	3
7	VAS_Sample_2019-06-06_052058.wav	1	0	3
8	VAS_Sample_2019-06-06_052147.wav	1	0	3
9	VAS_Sample_2019-06-06_052545.wav	1	0	3

Annotations



Training methods

AI-based acoustic
detectors/classifier
s

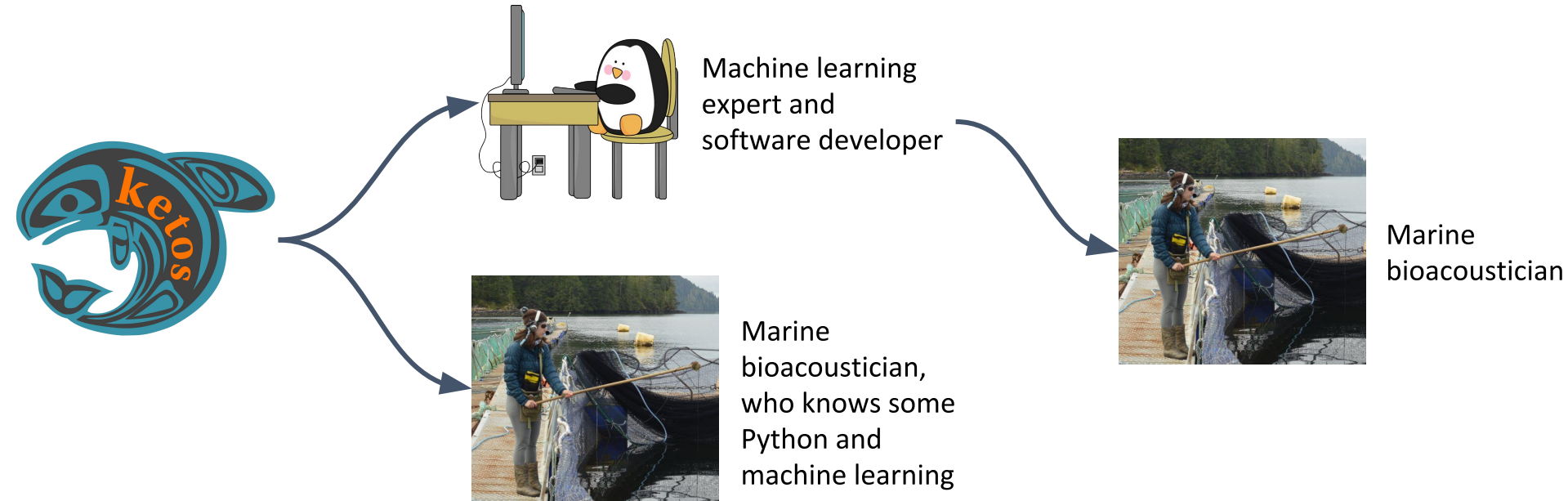


Why Ketos?



- In Ancient Greek, *ketos* denotes a large fish, whale, shark, or sea monster.
- *ketos* is also the origin of the scientific term for whales, cetacean.





Ketos - who is it for ?



The vision ...



Neural network adaptation to new data

-  **Pre-trained network**
The Deep Neural Network detects sounds and proposes classifications.
-  **Validation**
A human analyst validates the network's detections and classifications.
-  **Improved training data**
The new validated examples are added to the network's pool of training data.
-  **Enhanced performance**
The human analyst can now retrain the neural network to improve its performance.

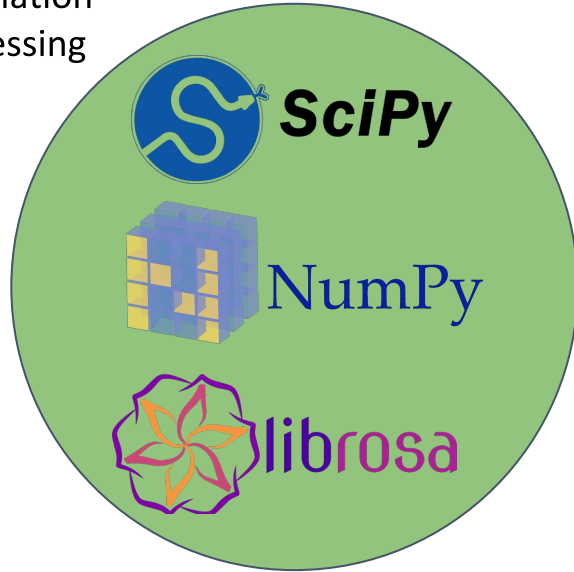


p. 144-145:
"Towards Versatile and Adaptive
Detection Algorithms in Underwater
Acoustics"

Main building blocks



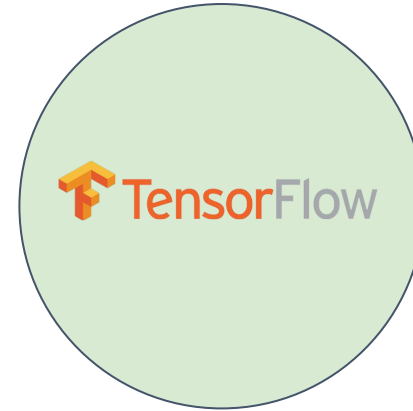
1. Audio data
manipulation
& processing



2. Data handling
& storage




3. Machine Learning
esp. Neural Networks






- Written in Python
- GNU GPLv3 license - freely available to use and modify
- Hosted on GitLab:
https://gitlab.meridian.cs.dal.ca/public_projects/ketos
- Fully documented code, including examples:
<https://docs.meridian.cs.dal.ca/ketos/>
- Tutorials, version history, and more ...
- Available on the Python Package Index (PyPi) - the official third-party software repository for Python

Documentation - <https://docs.meridian.cs.dal.ca/ketos/>



ketos

Underwater acoustic detection and classification with deep neural networks



1.1

- Introduction
- Installation
- Tutorials
- Modules
- How to contribute
- Versions

Does » Welcome to Ketos's documentation!

Welcome to Ketos's documentation!

Introduction

Ketos is a software package for acoustic data analysis with neural networks. It was developed with a particular eye to detection and classification tasks in underwater acoustics. Ketos is written in Python and utilizes a number of powerful software packages including NumPy, HDF5, and Tensorflow. It is licensed under the [GNU GPLv3 license](#) and hence freely available for anyone to use and modify. The project is hosted on GitLab at https://gitlab.meridian.cs.dal.ca/public_projects/ketos.

Ketos was developed by the **MERIDIAN** Data Analytics Team at the **Institute for Big Data Analytics** at Dalhousie University. We are grateful to Amalis Riera and Francis Juanes at the University of Victoria, Kim Davies and Chris Taggart at Dalhousie University, and Kristen Kanes at Ocean Networks Canada for providing us with annotated acoustic data sets, which played a key role in the development work. The first version of Ketos was released in April 2019.

The intended users of Ketos are primarily researchers and data scientists working with (underwater) acoustics data. While Ketos comes with complete documentation and comprehensive step-by-step tutorials, some familiarity with Python and especially the NumPy package would be beneficial. A basic understanding of the fundamentals of machine learning and neural networks would also be an advantage.

The name Ketos was chosen to highlight the package's main intended application, underwater acoustics. In Ancient Greek, the word ketos denotes a large fish, whale, shark, or sea monster. The word ketos is also the origin of the scientific term for whales, cetacean.

Indices and tables

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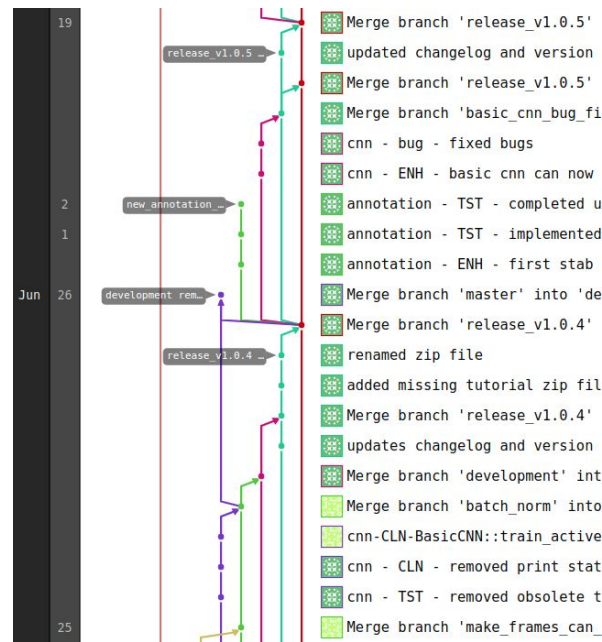
Collaborative coding on GitLab



Key features

- Version control and backup
- Branches, merge requests, etc.
- Unit tests & Continuous Integration (CI)
- Issue list
- Wiki pages
- and more ...

https://gitlab.meridian.cs.dal.ca/public_projects/ketos



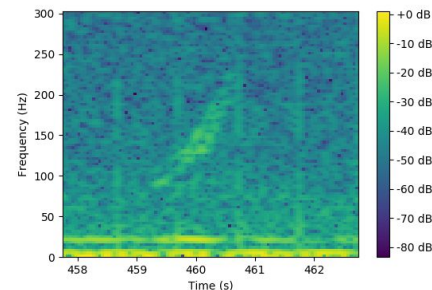
Hands-on tutorial



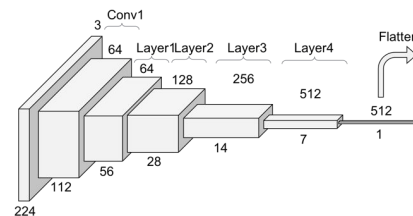
- Friday morning 8.30 - 10.00
- Optional
- Detect North Atlantic right whale (NARW) upcalls using tools from MERIDIAN's Deep Learning Python package, Ketos.
- Acoustic recordings from the Gulf of St. Lawrence, made available by Yvan Simard's research group at University of Québec at Rimouski.
- Familiarity with basic programming concepts such as functions, loops, if statements, etc. would be an advantage.
- If you wish to participate, please go to:

https://gitlab.meridian.cs.dal.ca/workshops/victoria_nov2019

and try to install the necessary software.



NARW upcall recorded by DFO scientists in the Emerald Basin off the coast of Nova Scotia



ResNet deep neural network