The Ketos Deep Learning Python Package

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Ketos - at a glance

Audio processing → neural network architectures → Training Database → Annotations

Training methods → AI-based acoustic detectors/classifiers

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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?

- Machine learning expert and software developer
- Marine bioacoustician
- Marine bioacoustician, who knows some Python and machine learning
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.

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

1. Audio data manipulation & processing
   - SciPy
   - NumPy
   - librosa

2. Data handling & storage
   - HDF5
   - PyTables

3. Machine Learning esp. Neural Networks
   - TensorFlow
Ketos - quick facts

- Written in Python
- GNU GPLv3 license - freely available to use and modify
- Fully documented code, including examples: [https://docs.meridian.cs.dal.ca/ketos/](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
Welcome to Keto’s documentation!

Introduction

Keto is a software package for acoustic data analysis with neural networks. It was developed with a particular eye to detection and clasification tasks in underwater acoustics. Keto 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 GitHub at https://github.com/meridian.cs.dal.ca/public_projects/keto.

Keto was developed by the MERIDIAN Data Analysis Team at the Institute for Big Data Analytics at Dalhousie University. We are grateful to Amalis Riera and Francis Jaanes at the University of Victoria, Kim Davies and Chris Taggart at Dalhousie University, and Kristen Eanes 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 Keto was released in April 2019.

The intended users of Keto are primarily researchers and data scientists working with (underwater) acoustics data. While Keto 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 Keto was chosen to highlight the package’s main intended application, underwater acoustics. In Ancient Greek, the word keto denotes a large fish, whale, shark, or sea monster. The word keto is also the origin of the scientific term for whales, cetacean.

Indices and tables

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- Search Page
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.