STRIKE-ALERT: TOWARDS REAL-TIME, HIGH RESOLUTION NAVIGATIONAL SOFTWARE FOR WHALE AVOIDANCE

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1. **THE ISSUE**
   1.1 Whales vs Ships
   3.2 Eco-System

2. **AN OCEAN OF DATA**
   1.1 Whale watching
   1.2 In situ sensors
   1.3 Satellites

3. **CONCEPTUAL APPROACH**
   2.1 Machine learning
   2.2 Towards AI

4. **OUTCOME**
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THE ISSUE
WHALES AS ECOSYSTEM ENGINEERS

- Fundamental ecological role
  - Exert important regulating effect on other species
  - Promote biodiversity
  - Shuttle nutrients
  - Contribute to carbon storage

Copyright Roman and McCarthy (2010) The whale pump: Marine mammals enhance primary productivity in a coastal basin (Image from Wikipedia Commons)
WHALE-SHIP STRIKES

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AN OCEAN OF DATA
DATA SOURCES: ACOUSTICAL SURVEY

Acoustical Tracking of a sperm whale (Physeter macrocephalus)

Centro Interdisciplinare di Bioacustica dell'Università di Pavia - Italia
DATA SOURCES: CROWDSOURCING

**94 Whale watching companies**
CONCEPTUAL APPROACH
A MANUAL APPROACH


Goal: Deep Learning - Automatic Recognition

REaltime Plotting of CETacean (http://www.repcet.com/en), Example of end-users
METHOD: MACHINE LEARNING

- Deluge of available data, BUT in need of interoperability (unit, time & space, etc…), synergy and models,
- Systems too difficult/expensive to manage manually,
- Systems that can automatically adapt and customize,
- Towards AI, as a help.
After “Machine Learning”, Dr. Lior Rokach, Ben-Gurion University
Inputs

Direct detections

Sensor detections

Related Parameters: SST, Ocean color, etc.

Independent Variables

Hidden layers

Output

Dependent Variables

Probability of presence

Weights
TENTATIVE SCHEME

Team: ecologists, ICT, economists
Maritime activities relies on the sustainable use of oceanic ecosystem services,
- Benefits ranging from food production to climate regulation,
- Whales, large influence on their ecosystem by controlling the biomass at lower trophic levels, shuttling nutrients throughout the water and contributing to carbon storage.

Concerns
- underwater-noise-pollution
- rising ship strikes

Mitigation tools
- understanding through variety of data sources
- predicting, when, where and how ship strikes may occur
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