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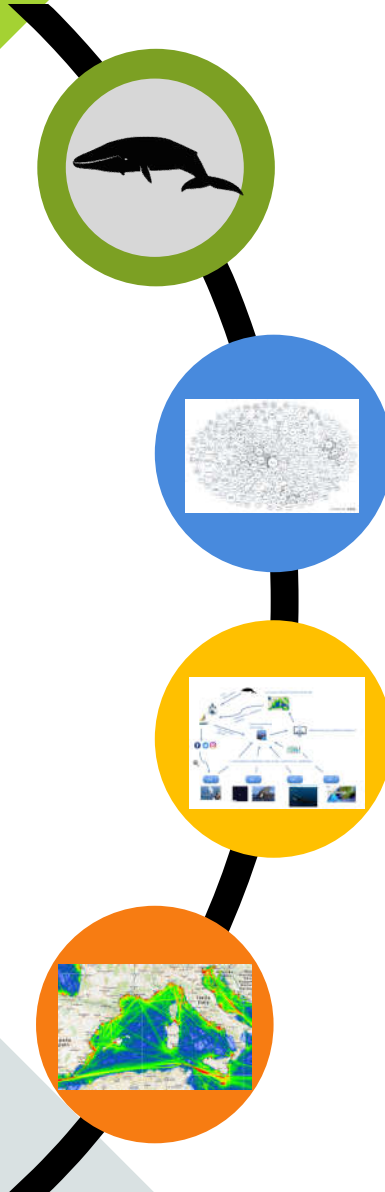


# STRIKE-ALERT: TOWARDS REAL-TIME, HIGH RESOLUTION NAVIGATIONAL SOFTWARE FOR WHALE AVOIDANCE

**BÉNÉDICTE MADON<sup>1</sup>,  
*RENÉ GARELLO<sup>2</sup>,  
ROMAIN DAVID<sup>3</sup>,  
LINWOOD PENDLETON<sup>1</sup>,  
RONAN FABLET<sup>1</sup>***

<sup>1</sup>UBO/IUEM, <sup>2</sup>IMT, <sup>3</sup>IMBE

# SUMMARY



## 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

- 3.1 Conclusions

# THE ISSUE



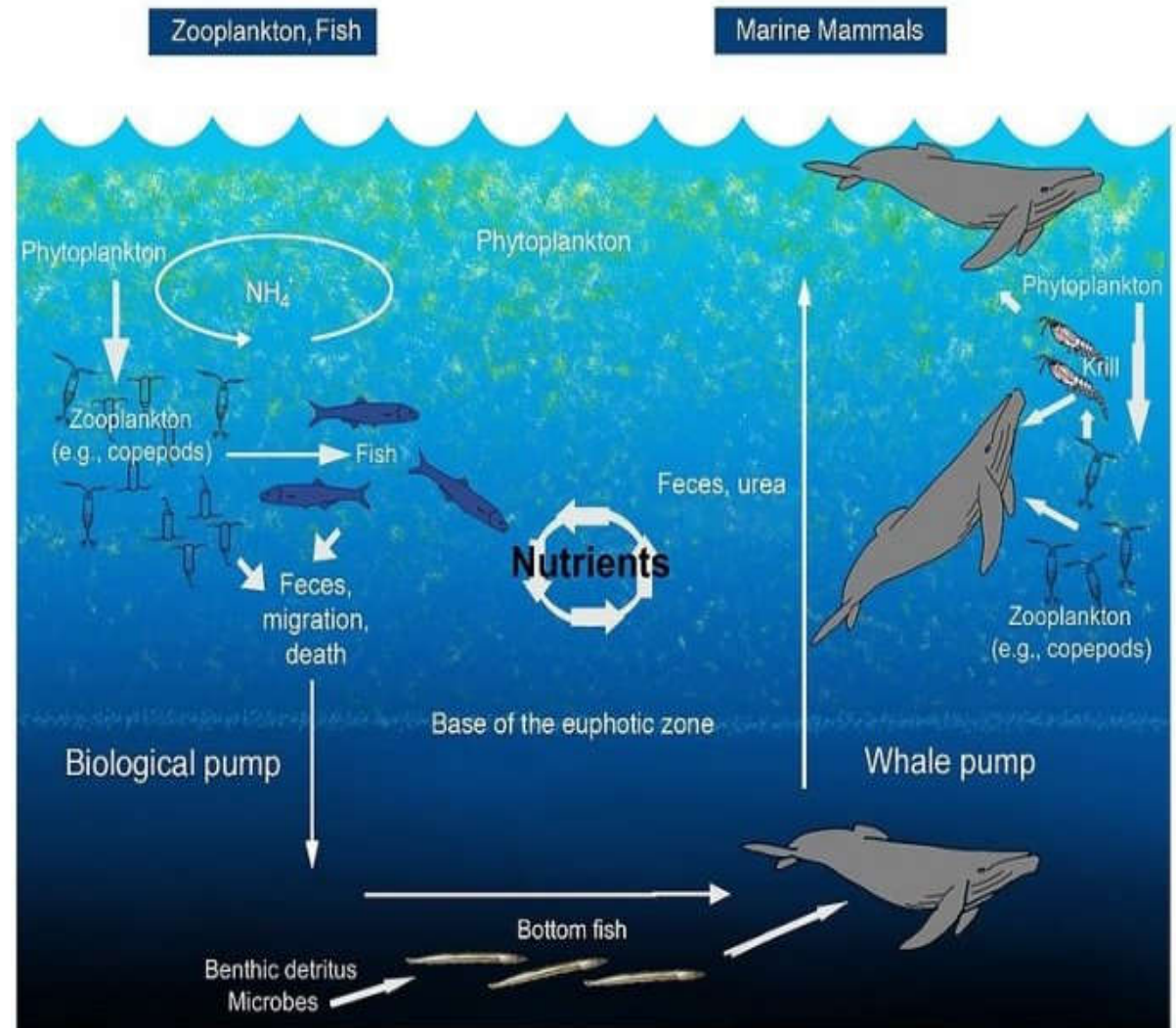
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# WHALES AS ECOSYSTEM ENGINEERS

## ➤ 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



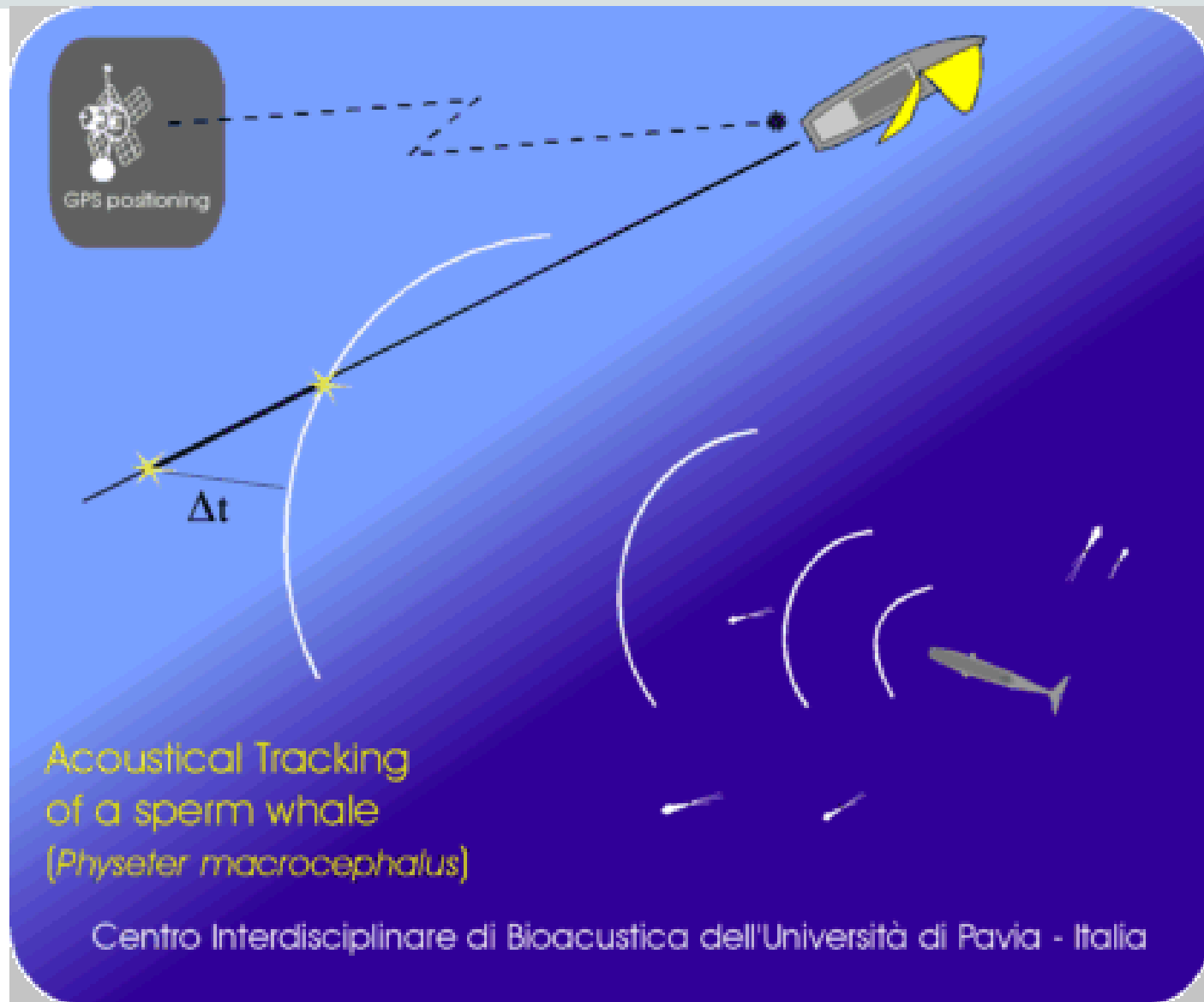
# AN OCEAN OF DATA



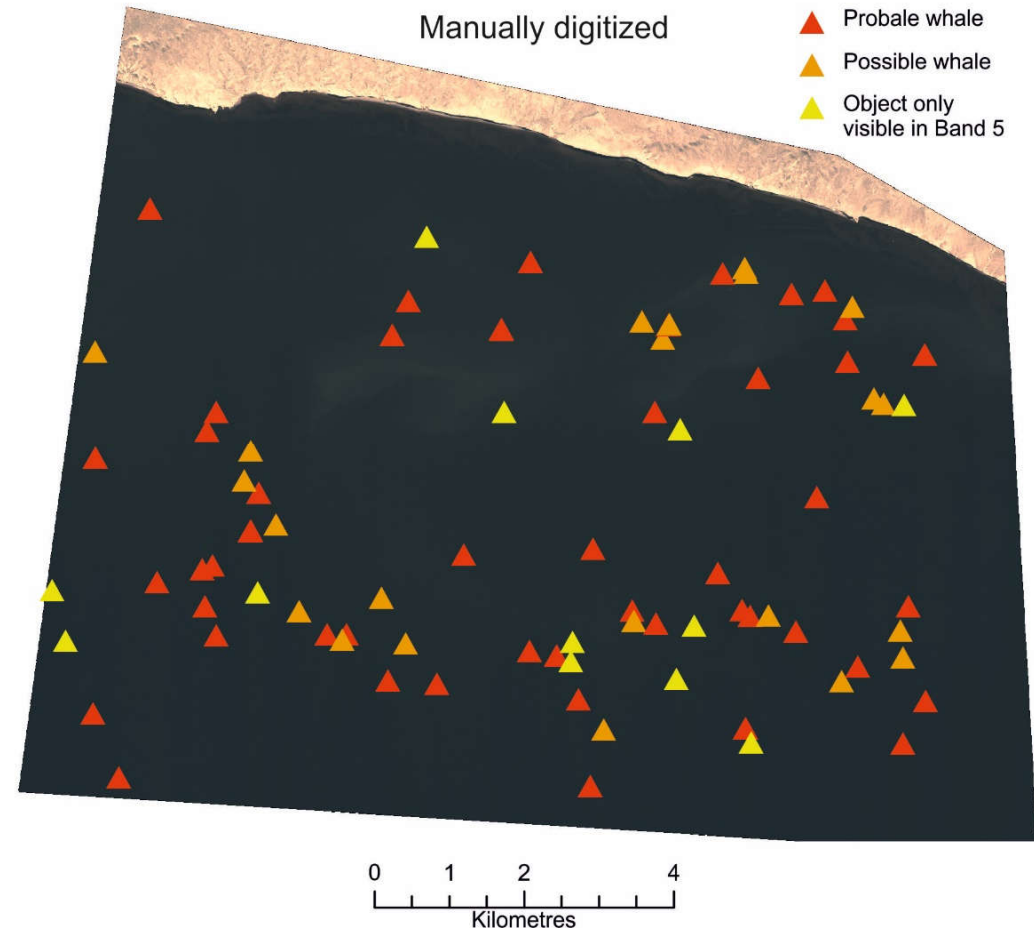
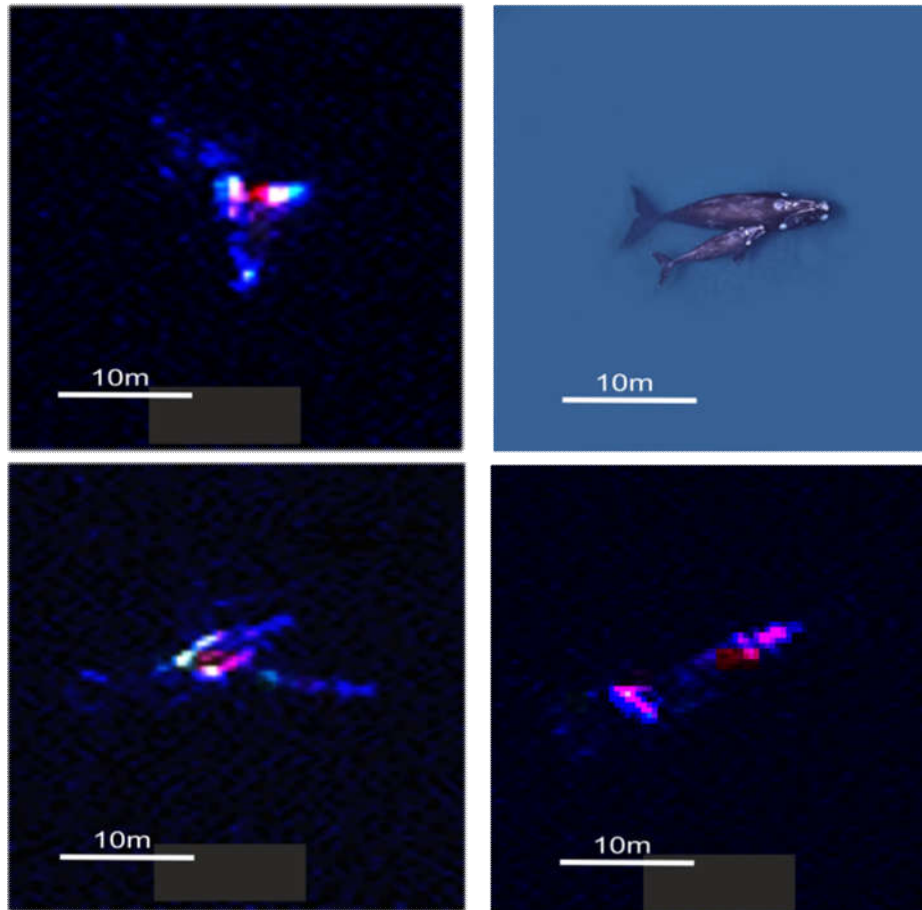
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# DATA SOURCES: ACOUSTICAL SURVEY



# DATA SOURCES: REMOTE SENSING



*Fretwell et al (2014) Whales from space: Counting Southern right whales by satellite. PlosOne e88655*



# DATA SOURCES: CROWDSOURCING

## 94 Whale watching companies



A screenshot of a Flickr photo page. The main image shows a close-up of a striped dolphin's head and dorsal fin as it breaks the surface of the water, creating a splash. The photo is taken from a low angle, looking down at the dolphin. The Flickr interface is visible, including the search bar, navigation links (You, Explore, Create), and the photo's metadata. The photo is titled 'Hammer Head' and is a 'Striped Dolphin II'. It has 802 views, 3 faves, and 3 comments. It was taken on July 29, 2009, in Ceuta Province, Spain, using a Canon EOS 40D camera with a 100mm lens at f/6.3. The user 'Turmares' is credited with the photo.

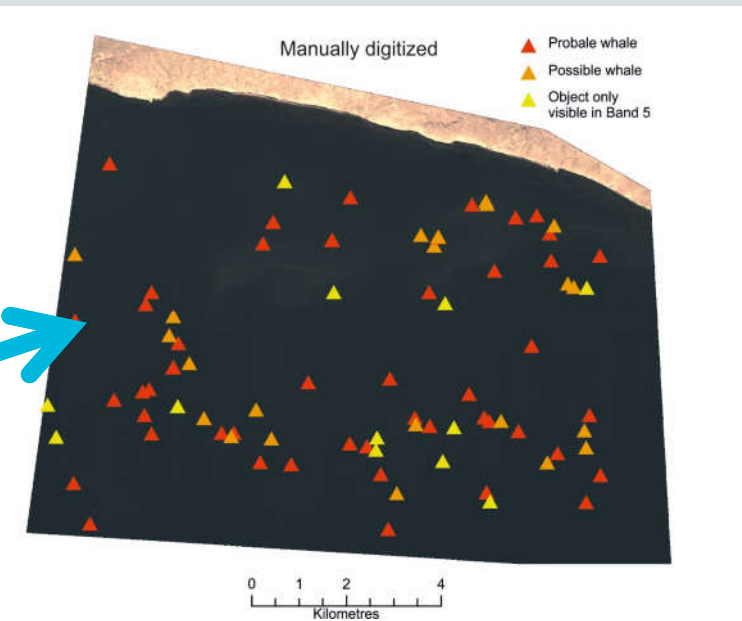
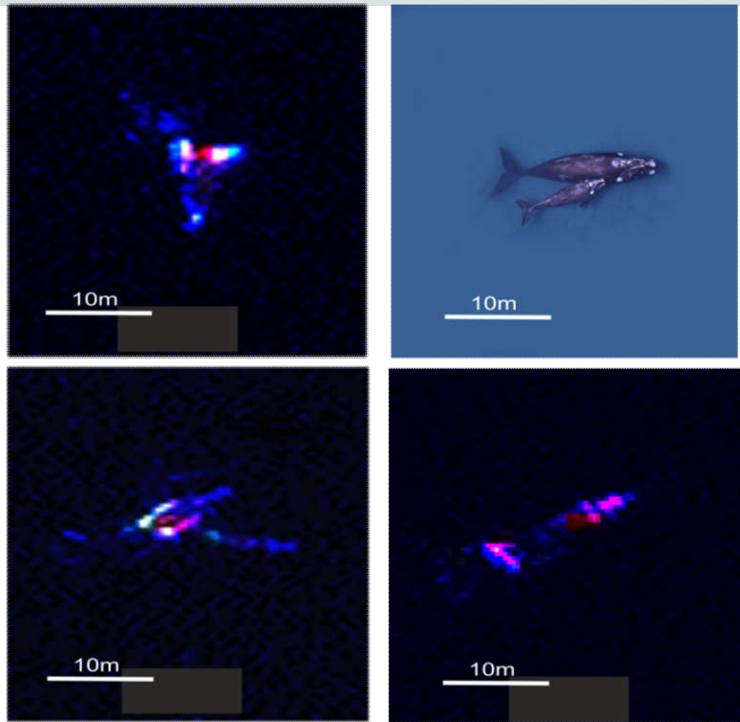
# CONCEPTUAL APPROACH



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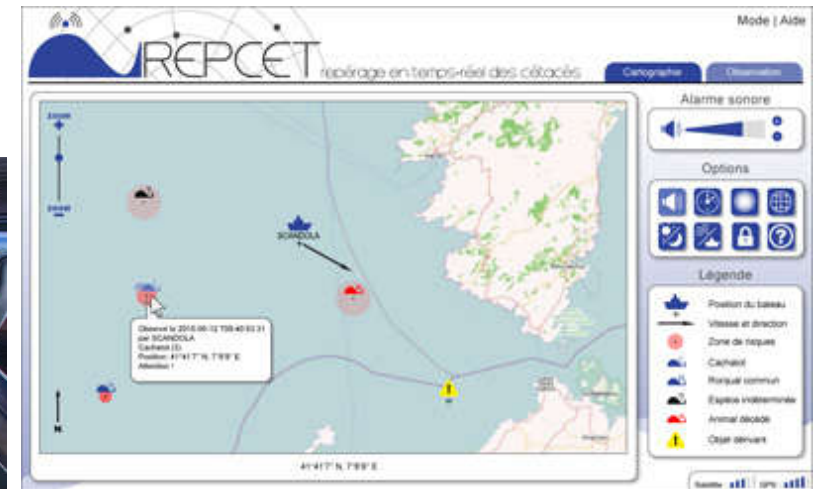


# A MANUAL APPROACH



*Fretwell et al (2014) Whales from space: Counting Southern right whales by satellite. PlosOne e88655*

*Goal: Deep Learning - Automatic Recognition*

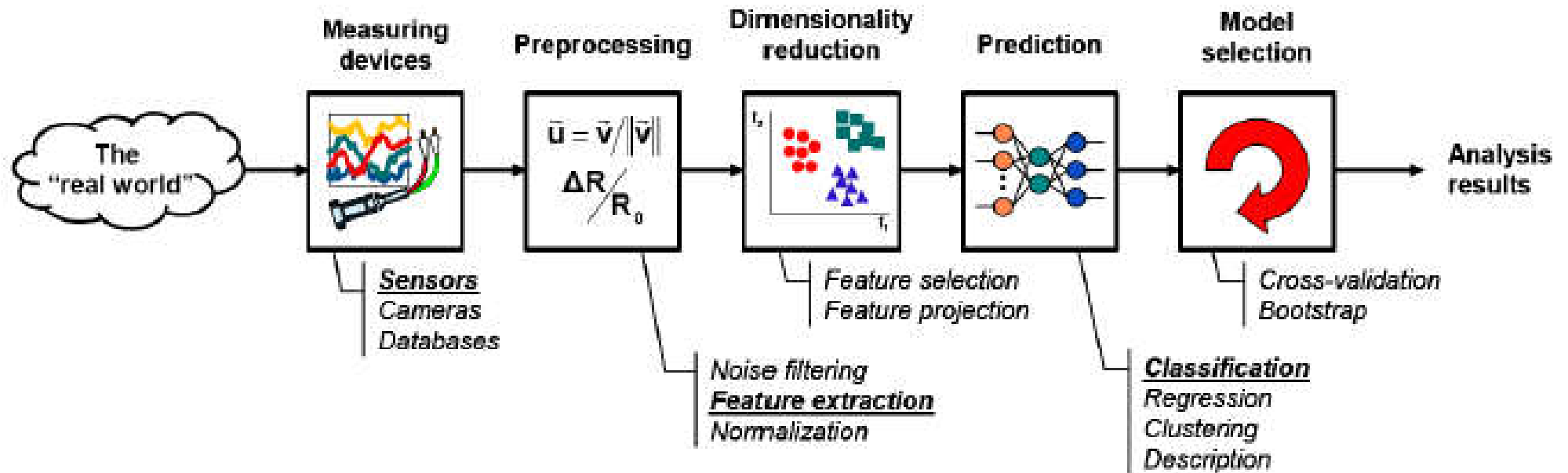


REaltime Plotting of CETacean (<http://www.repcet.com/> en), Example of end-users

# METHOD: MACHINE LEARNING

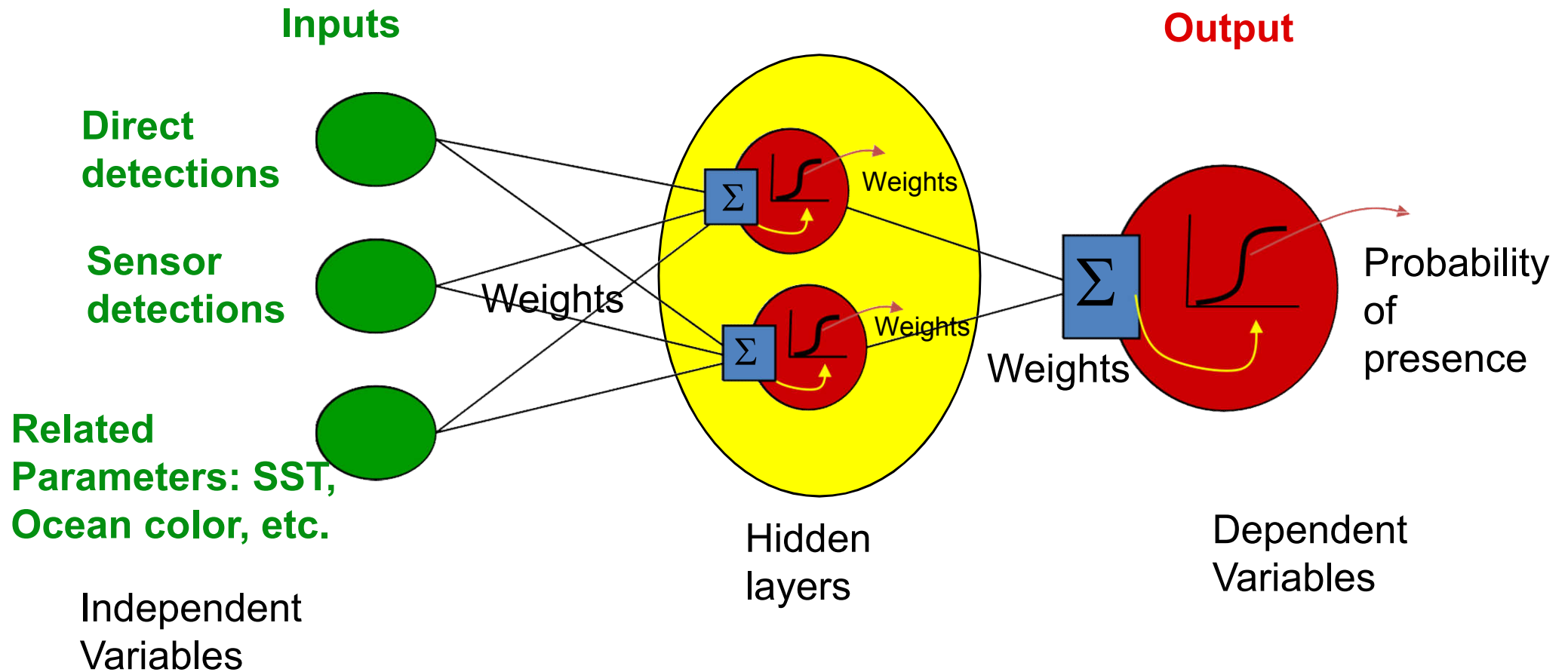
- ❖ Deluge of available data, BUT in need of interoperability (unit, time & space, etc...), synergy and models,
- ❖ Systems too difficult/expensive to manage manually,
- ❖ Systems that can automatically adapt and customize,
- ❖ Towards AI, as a help.

# MACHINE LEARNING



After "Machine Learning", Dr. Lior Rokach,  
Ben-Gurion University

# NEURAL NET - KALMAN



# OUTCOME

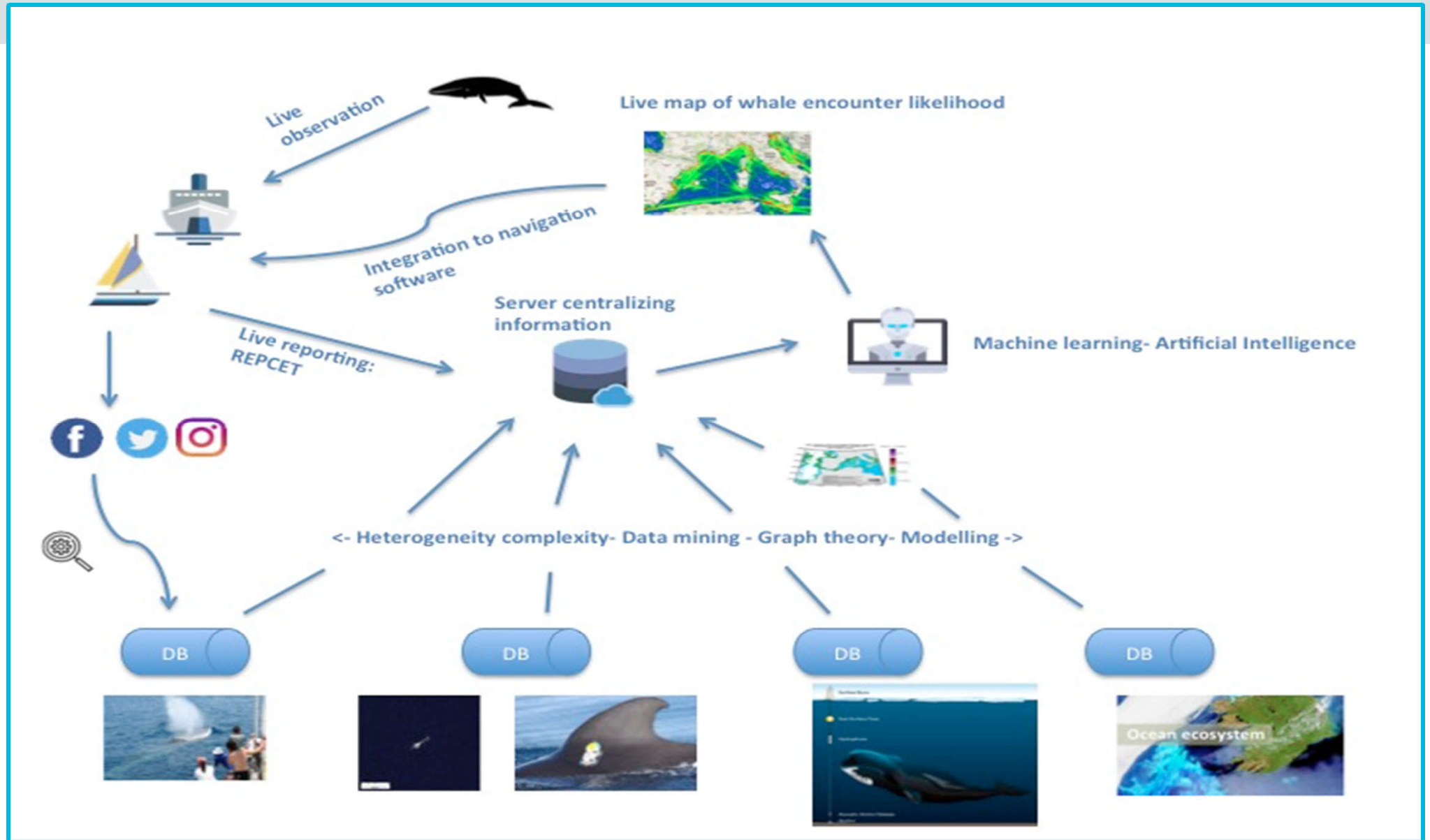


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institut méditerranéen de biodiversité et d'écologie  
marine et continentale

# TENTATIVE SCHEME





# CONCLUSION

- ❖ 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

# MERCI

