

## **From competition to collaboration: Automated identification of right whales**

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<sup>8</sup>*Department of Biology, University of Utah, Salt Lake City, Utah, USA*

<sup>9</sup>*Instituto de Conservación de Ballenas, Capital Federal, Buenos Aires, Argentina*

<sup>10</sup>*Mammal Research Institute Whale Unit, University of Pretoria, Hatfield, South Africa*

<sup>11</sup>*Marine Science Department, Te Tari Putaiao Taimoana, University of Otago, New Zealand*

<sup>12</sup>*Southern Right Whale Project / Instituto Australis, Imbituba, Santa Catarina, Brazil*

Photo identification plays a major role in endangered species research and conservation and recent developments in artificial intelligence promise to increase the efficiency of matching photographs to known individuals. At the last Society for Marine Mammalogy conference, we presented on the Kaggle data science competition to automate the identification of endangered North Atlantic right whales based on 7,000 aerial images. The winning algorithms developed by deepsense.ai were able to identify individuals with 87% accuracy using a series of convolutional neural networks. Since that time, we have brought in many more collaborators as we move from prototyping to production. Leveraging the existing infrastructure by Wild Me, the developers of Flukebook, we are creating a website platform that allows biologists with no machine learning expertise to automatically identify right whales. New models will be generated using both the winning deepsense.ai algorithms and the Wild Me HotSpotter algorithm (used for humpbacks, jaguar, giraffe, and other species). Given the morphological similarity between the North Atlantic right whale and closely related Southern right whale, our goal is to create an automatic identification system that will benefit right whale researchers worldwide. The updated dataset will incorporate the largest long-term photo-identification catalogs; including over 400,000 images from the United States and Canada curated by the New England Aquarium; 12,311 images from Australia from Curtin University; 8,461 images from South Africa from the University of Pretoria; 8,952 images from Argentina from the University of Utah; 5,473 images from Brazil from Instituto Australis; and 2,913 images from New Zealand from the University of Otago. We hope to encourage researchers to embrace data collaboration and computer vision to increase our understanding of wild populations.

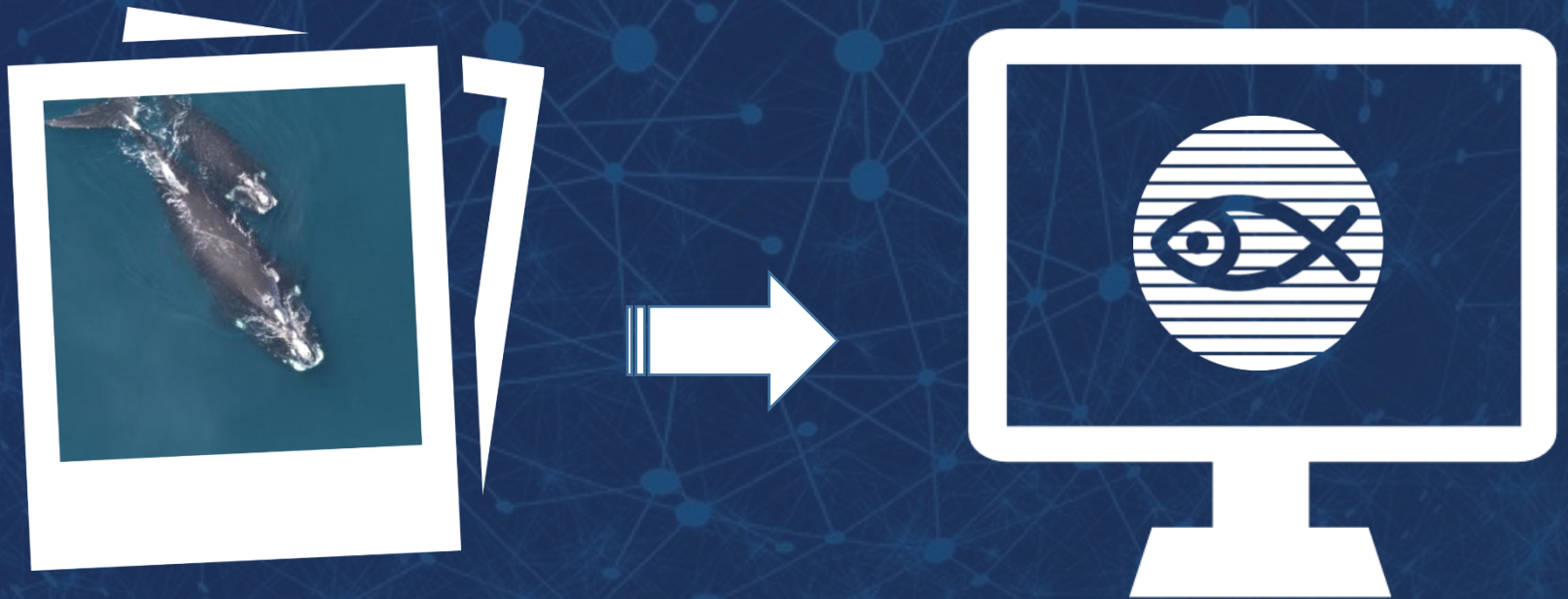
# AI RIGHT WHALES

**Christin Khan, Jason Holmberg, Philip Hamilton, Heather Pettis, Marek Cygan, Robert Bogucki, Jason Parham, Drew Blount, Marcin Mucha, Maciek Klimek, Claire Charlton, Vicky Rowntree, Els Vermeulen, Will Rayment, Steve Dawson, Dave Johnston, and Karina Groch**

# AERIAL SURVEYS



# PHOTO IDENTIFICATION







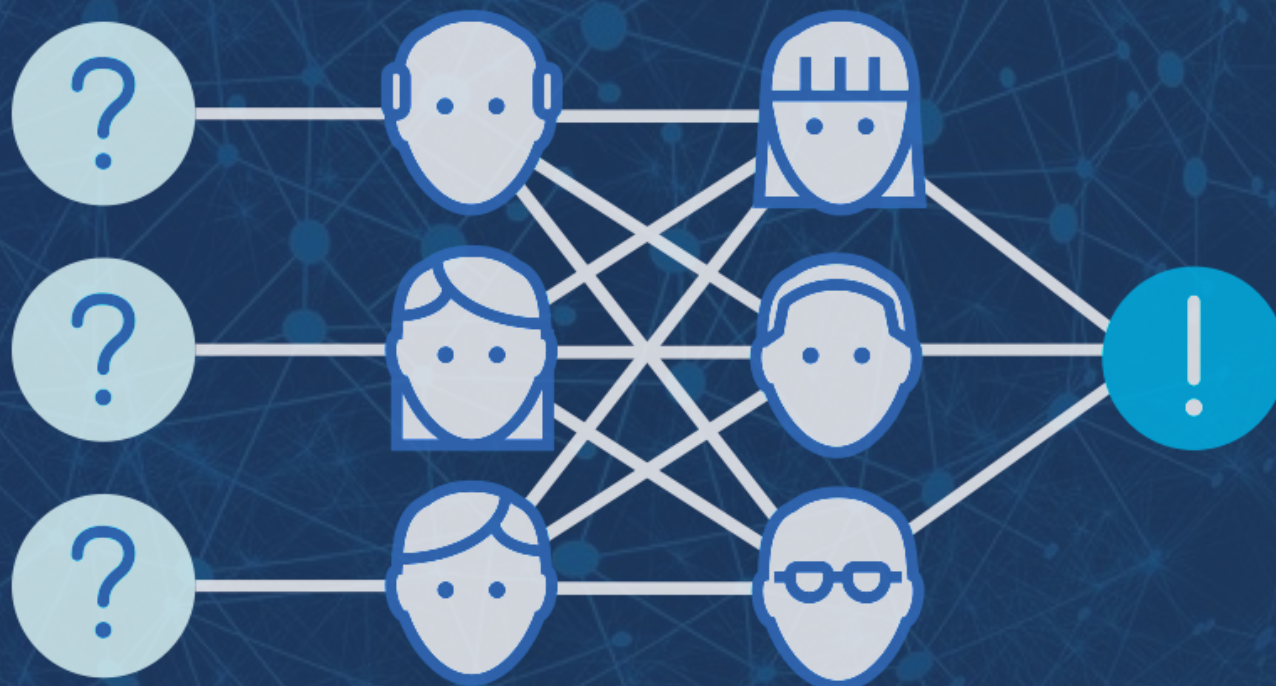
**Christin Brangwynne Khan**



September 9, 2013 at 2:31 PM · 

anyone know anyone involved in high tech satellite imagery type stuff? If they can read a license plate from a satellite image, then in theory, one could recognize whales that way... how cool would that be? Anyone know someone I could talk to about that?

# KAGGLE COMPETITION



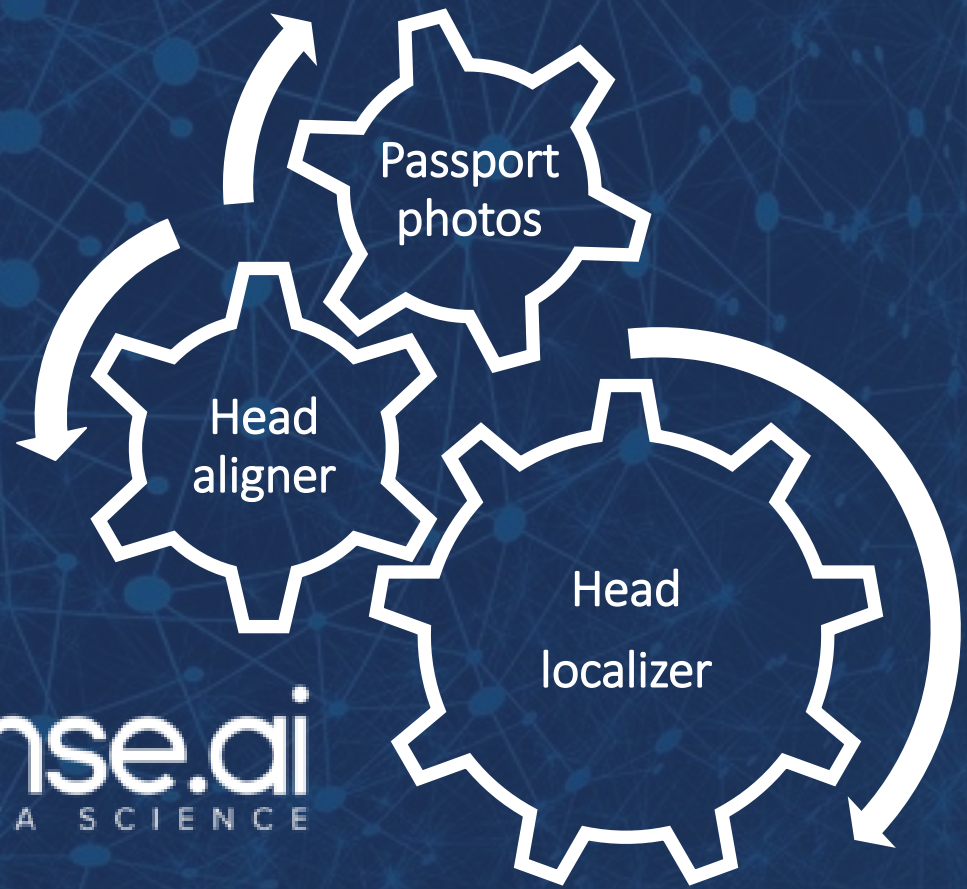
87% CORRECT!



deepsense.ai  
BIG DATA SCIENCE



# DEEP LEARNING



deepsense.ai  
BIG DATA SCIENCE

# PUBLICATION

*Conservation Biology*



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*Conservation Methods*

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## **Applying deep learning to right whale photo identification**

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Jan Kanty Milczek,<sup>1</sup> and Marcin Mucha<sup>2</sup>

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# PROTOTYPE TO PRODUCTION



# RETRAINED DEEPPSENSE



# RETRAINED HOTSPOTTER



# LIVE BETA NOW!

Home Submit Learn Individuals Sightings Encounters Search Administer

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## A.I. for Cetacean Research

Date: 2018-09-21  
Location: Unknown  
Sex: Female  
Assigned ID: H-03  
Size: Unknown  
Number: lssd94kp

# LIVE BETA NOW!



nickname, id, site, encou



LOGOUT



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## Success

**Thank you for submitting your encounter!**

**Images/Videos uploaded:** [IMG\_1423.JPG, IMG\_1424.JPG]

**Files rejected, not valid images:** none

For future reference, this encounter has been assigned the number **3eaca529-2a6f-41cd-b707-30d49c71aa4d**.

If you have any questions: [info@flukebook.org](mailto:info@flukebook.org)

[View encounter 3eaca529-2a6f-41cd-b707-30d49c71aa4d.](#)



# LIVE BETA NOW!

 flukebook

nickname, id, site, encou



LOGOUT



Submit Learn Individuals Sightings Encounters Search Administer *Maximum Event Date: None*

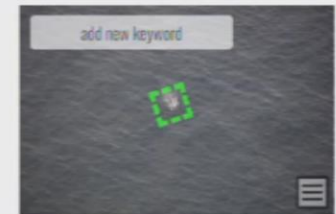
Country

Water depth: Unknown

Note: If you zoom in too quickly, Google Maps may claim that it does not have the needed maps. Zoom back out, wait a few seconds to allow maps to load in the background, and then zoom in again.



## Gallery



## Add image to Encounter

Choose Files No file chosen



# NEXT STEPS



New England Aquarium Special Section

## The North Atlantic Right Whale Catalog

[Scroll Through All Whales](#)   [Search For Individual Whales](#)   [Return to Right Whale Projects](#)

558 of 746 whales

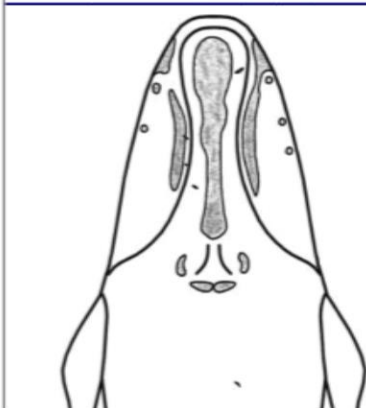
<< Previous   Catalog No: 3617   Go   Next >>

### Whale Summary

Catalog No:	3617	Whale Name:	SALEM	Sex:	Male	Year of Birth:	2006
Calving Female:	No	Mother:	1817	Last Year Seen:	2018	Death Year:	

### Whale Composite

[View Sightings](#)



2006 Call Of 1817

Drawing created: June 2009  
Created by: Y. Guibaud  
Drawing revised: June 2016  
Edited by: Y. Guibaud

### Whale Images (Click an image for a larger view)

Body Part Filter: <All Body Parts>

2007/03/23 CCS



2009/09/12 NEA



2008/05/24 NEFSC



2008/05/24 NEFSC



# NEXT STEPS



# WORLDWIDE SOLUTION



