

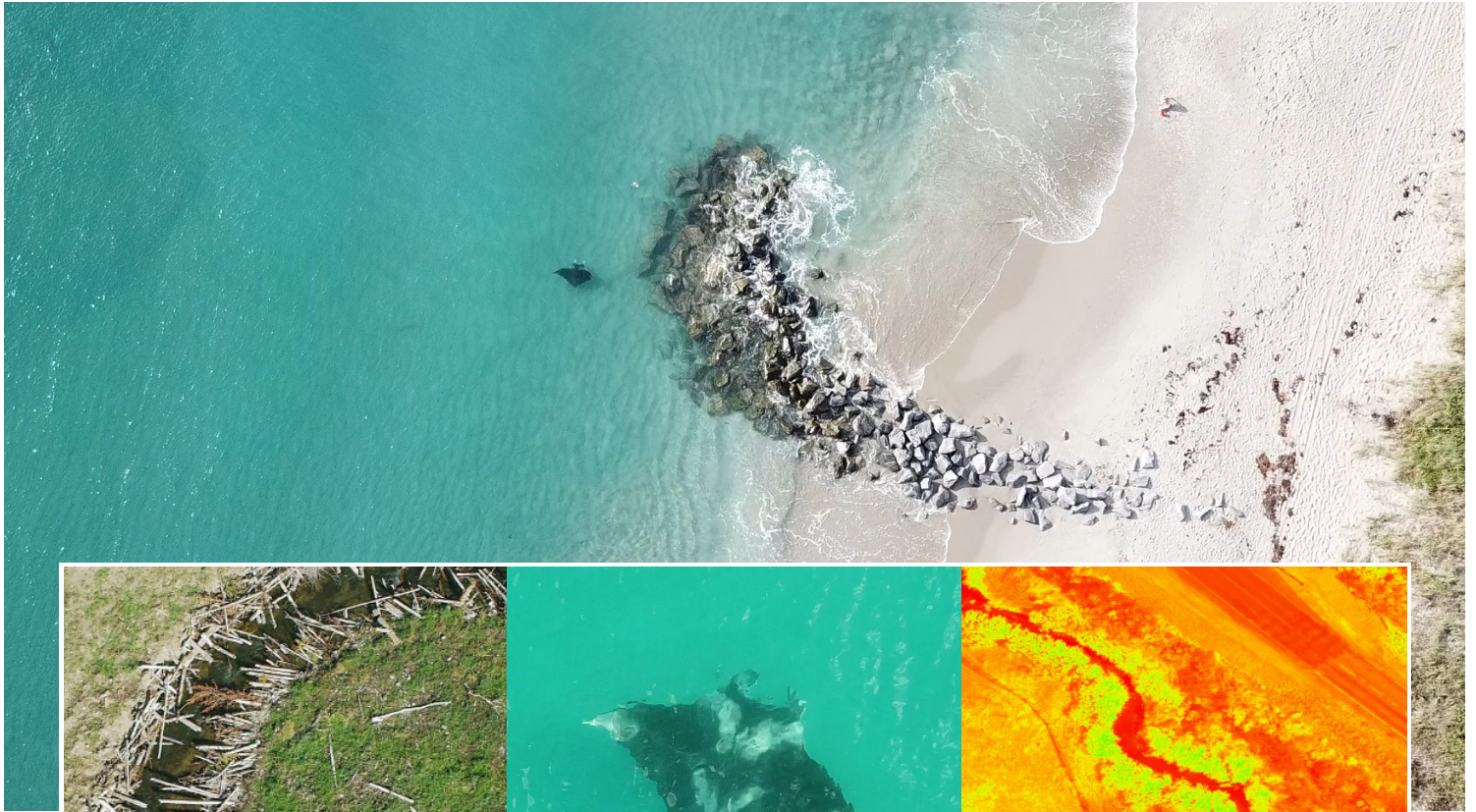
SPECIALISTS IN IDENTIFICATION SOLUTIONS



**Biomark**

# MACHINE LEARNING

FOR AUTOMATED DRONE IMAGERY PROCESSING



**COMPLEX ENVIRONMENTS**

**MOVING TARGETS**

**MULTISPECTRAL IMAGERY**

Effective ecosystem management relies on accurate and timely evaluation of ecological trends, often equating to costly, time intensive survey efforts. Advances in remote sensing technology are continually evolving the fields of fisheries and wildlife by reducing cost, increasing time efficiency, and enabling surveys in previously inaccessible habitats. The development of small, commercially available Unmanned Aerial Vehicles (UAVs – drones) puts large-scale data collection directly in the hands of researchers for a relatively low cost. While drones can generate high-resolution (and/or multispectral), permanent data, the handling, storage, and processing of imagery is a noted barrier to entry for their broad application in ecosystem sciences. Biomark researchers are at the cutting edge of imagery collection and processing to make drones a more accessible tool for researchers worldwide. We employ a number of methods such as random forest classifiers, object-based detection, and convolutional neural network modeling to generate a variety of data, from measuring habitat characteristics to identifying and tracking animals. Drones have significantly improved data collection, and the application of machine learning to image processing will further increase efficiency by improving data analysis: all working towards improved wildlife management decisions.

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# FEATURED PROJECT

## MACHINE LEARNING FOR MANTAS

Coastal southeastern Florida is home to white sand beaches, crystal clear water, and a variety of marine megafauna. Of these species including sea turtles, dolphins, sharks, and manatees, the giant manta ray population is all but unstudied in this area. In contrast with the white sand, their dark, uniquely shaped body makes manta rays an ideal candidate for drone surveys.

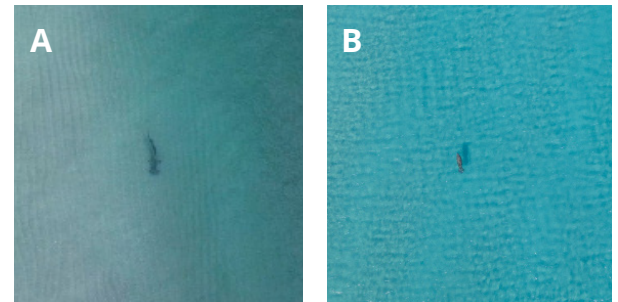
The Marine Megafauna Foundation: Florida Manta Project has employed hybrid boat and drone surveying to produce a wealth of data including individual identification, home range analysis, and behavioral observations. Biomark researchers partnered with MMF to automate the post processing of drone imagery by using a convolutional neural network (CNN) model to identify and track manta rays in drone video. These data will be used to monitor the south Florida population of manta rays and document movements, behavior, and anthropogenic interactions to help make informed decisions for species conservation. Biomark researchers are working to train additional layers to recognize other commonly sighted marine megafauna such as sharks (A) and manatees (B)

Biomark products, technology, and services used for this project:

- **Study Design**
- **Data Reduction, QA/QC**
- **Imagery Preparation and Processing**
- **Object-based Detection**
- **Convolutional Neural Network Modeling**



*A trained object-based classifier detects and tracks a manta ray (yellow) and a shark (blue) captured in drone video.*



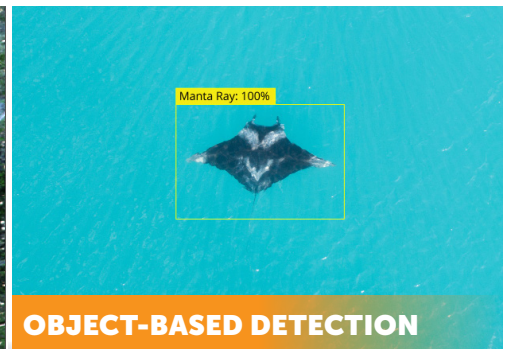
## OTHER PROJECT APPLICATIONS



**DRONE SURVEYING**



**RANDOM FOREST CLASSIFIER**



**OBJECT-BASED DETECTION**