# FathomNet for Ocean Imaging Machine Learning Algorithms
How Can FathomNet be Used to Create Ocean Imaging Machine Learning Algorithms?

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Abstract

This poster explains what FathomNet is, why it is important, how its data are curated, who it is intended for, and how it can be used to create machine learning algorithms that will help the world better understand our oceans.
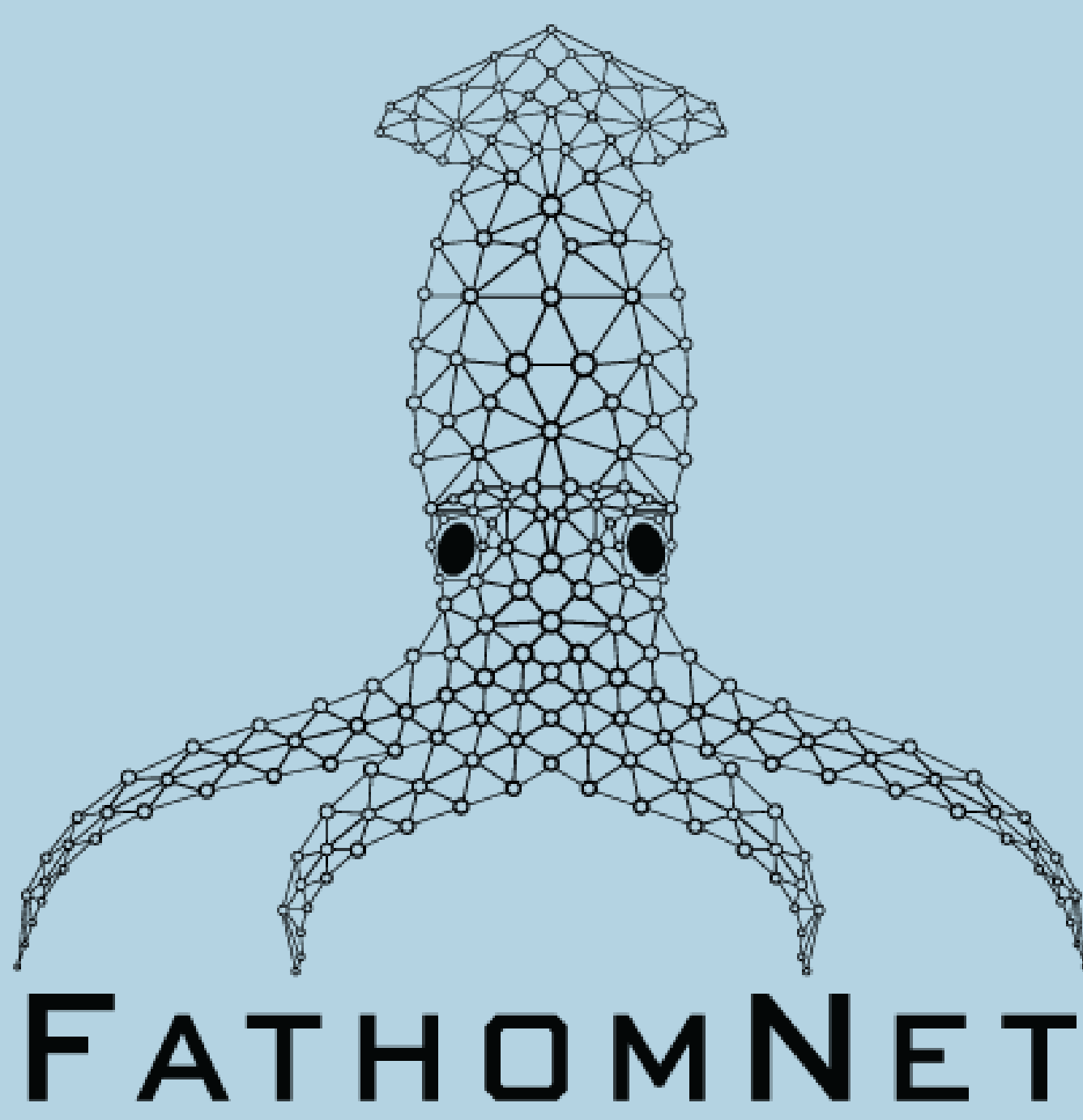
Introduction

First, what problem is FathomNet trying to solve? To understand our changing oceans, research institutions and private sectors create ocean-going platforms with cameras to observe parts of the ocean humans cannot traverse and also collect images overtime. These platforms create a plethora of data, but the problem is that humans cannot process and analyze these data fast enough to make this data useful.

Data scientists and researchers have used these data to create machine learning algorithms that can help categorize unknown species in the ocean and also produce predictions of ocean health, but due to the lack of standardization in ocean data, few annotation tools, and the lack of a large database of labelled images to train algorithms on, these algorithms are not as powerful as they could be. This is why FathomNet was created.
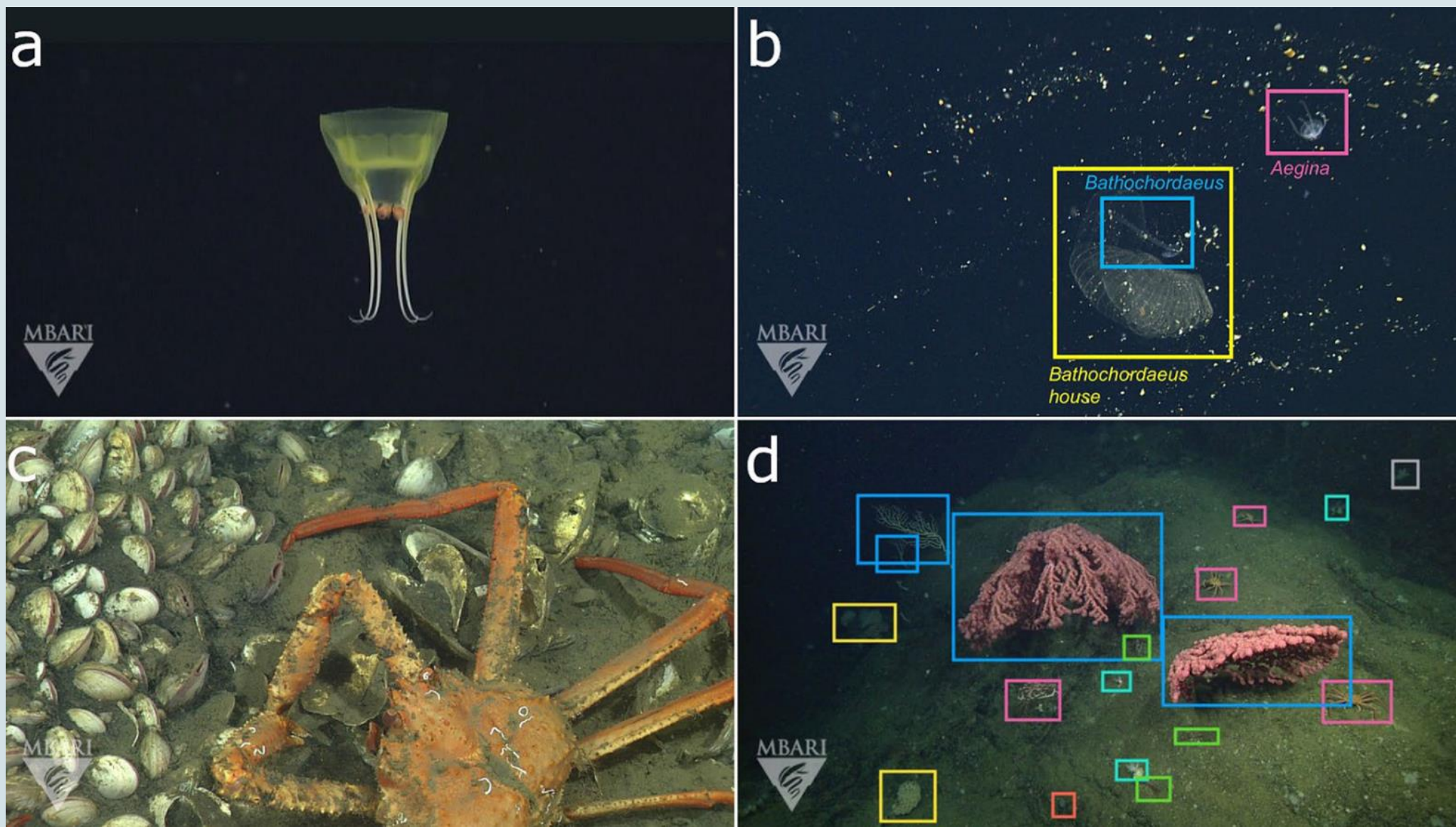
FathomNet Website

FathomNet is a public platform (website) that allows the public, subject matter experts, and institutions like the Monterey Bay Aquarium Research Institute (MBARI) and National Geographic to contribute to the database with their own annotated images. This actually all started because the MBARI had 30+ years of MANUALLY annotated ocean images so creating a database of reliable images is where it started. The data that are uploaded to FathomNet is verified to determine whether or not the uploaded images are correctly annotated. As more data are created, the database will grow.
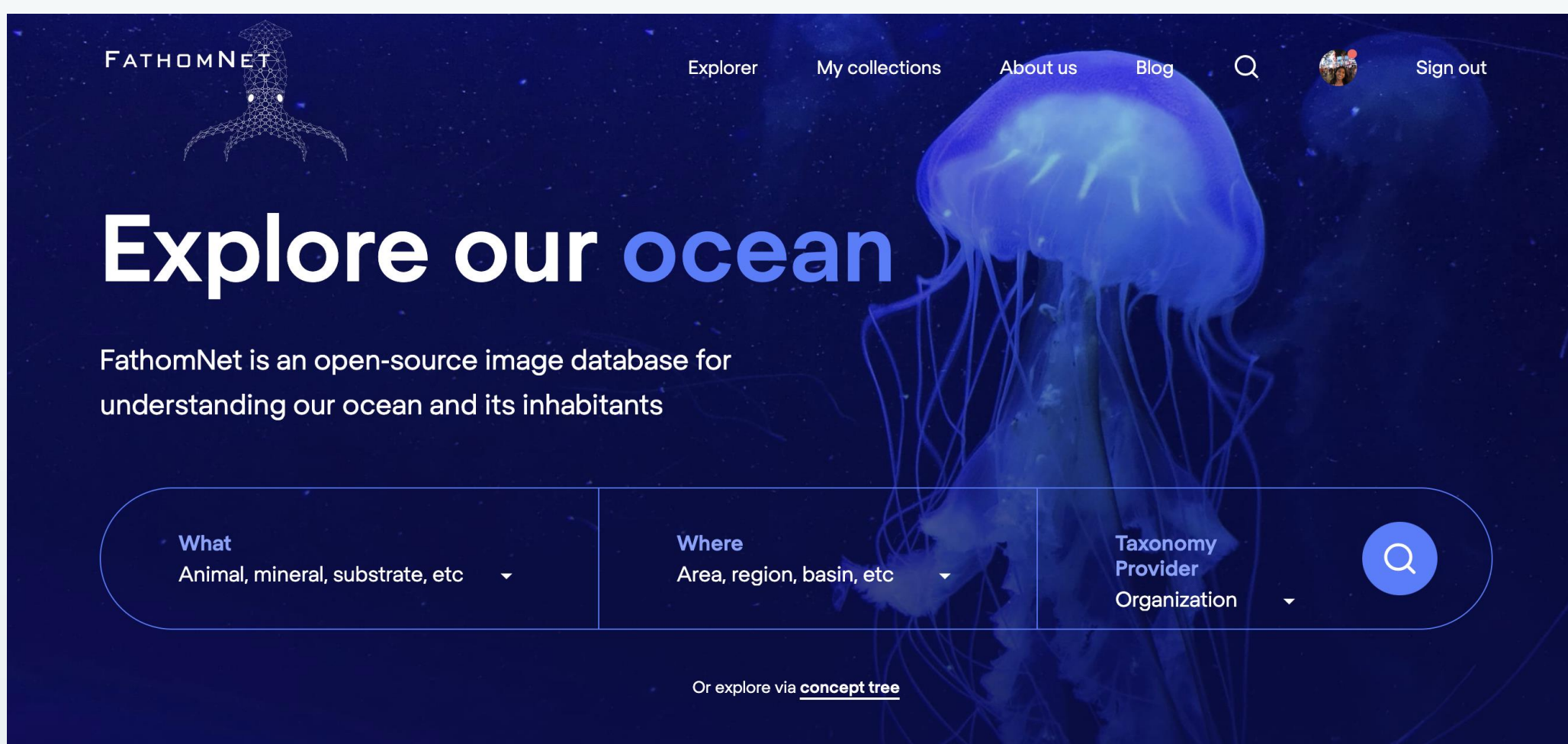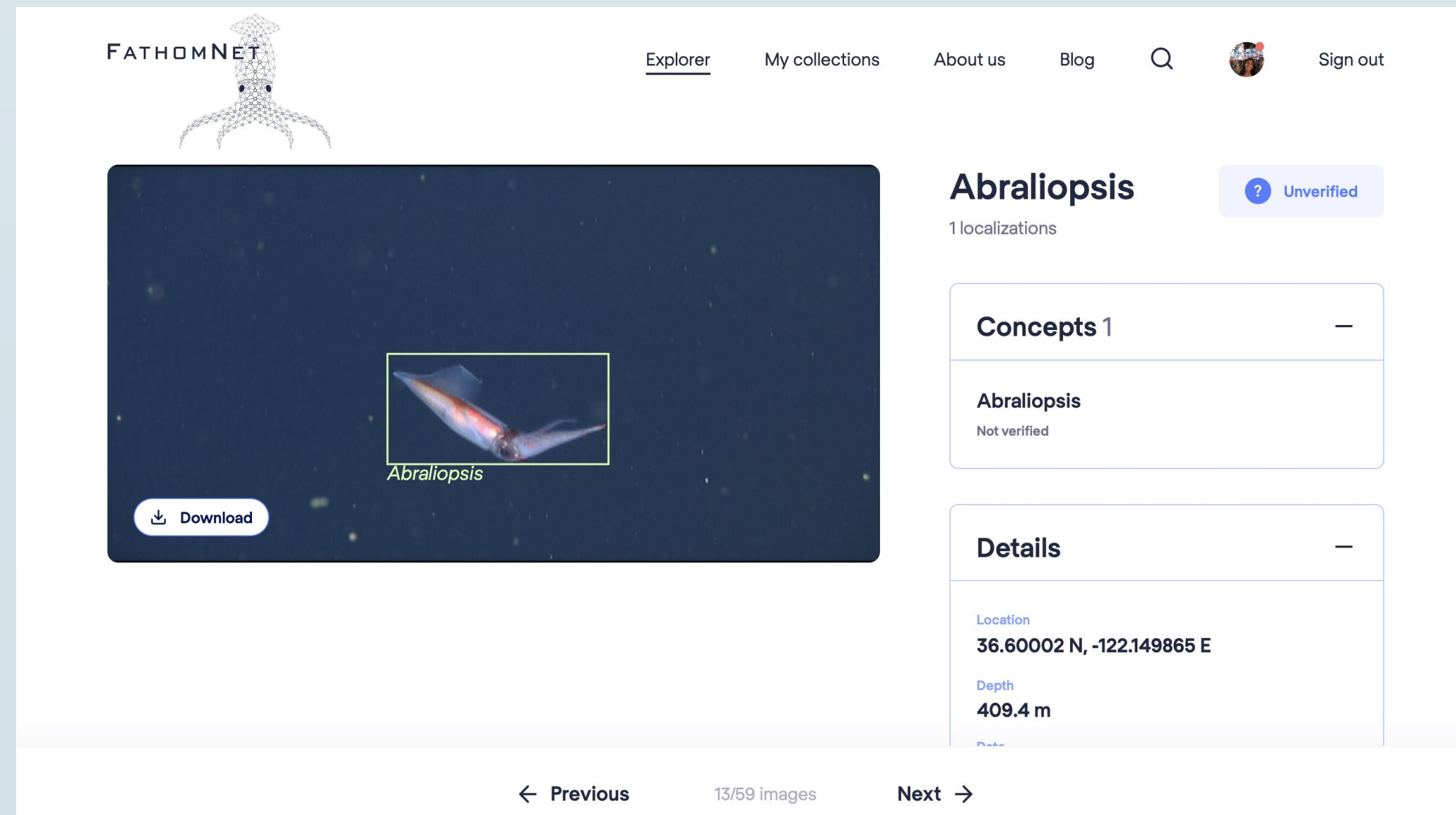
FathomNet Homepage
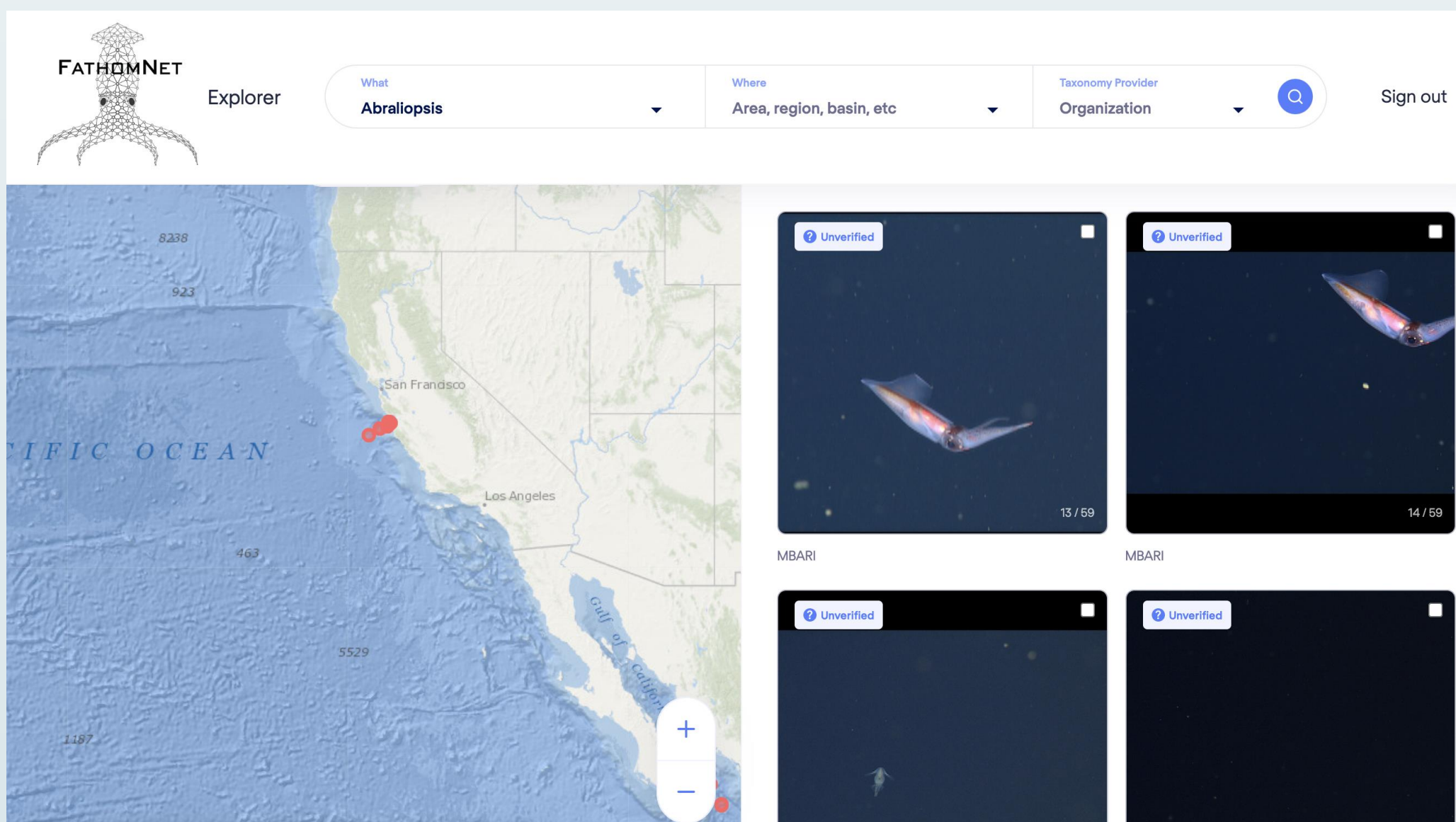
FathomNet Searchbar

Image Selection and Download

Example Use Case– Activity Detection

This project is called "Midwater transect activity detections using NOAA (National Oceanic and Atmospheric Administration) footage and MBARI training data" and used the MBARI's annotated images to train machine learning algorithms for underwater activity detection. Why is this project important? Reviewing footage after collection can be very "costly and tedious" if the reviewer is watching hours of videos just for a few events.

An AR (activity recognition) routine was fine-tuned and tested with FathomNet's underwater, annotated imagery and the MBARI's Video Annotation and Reference System.
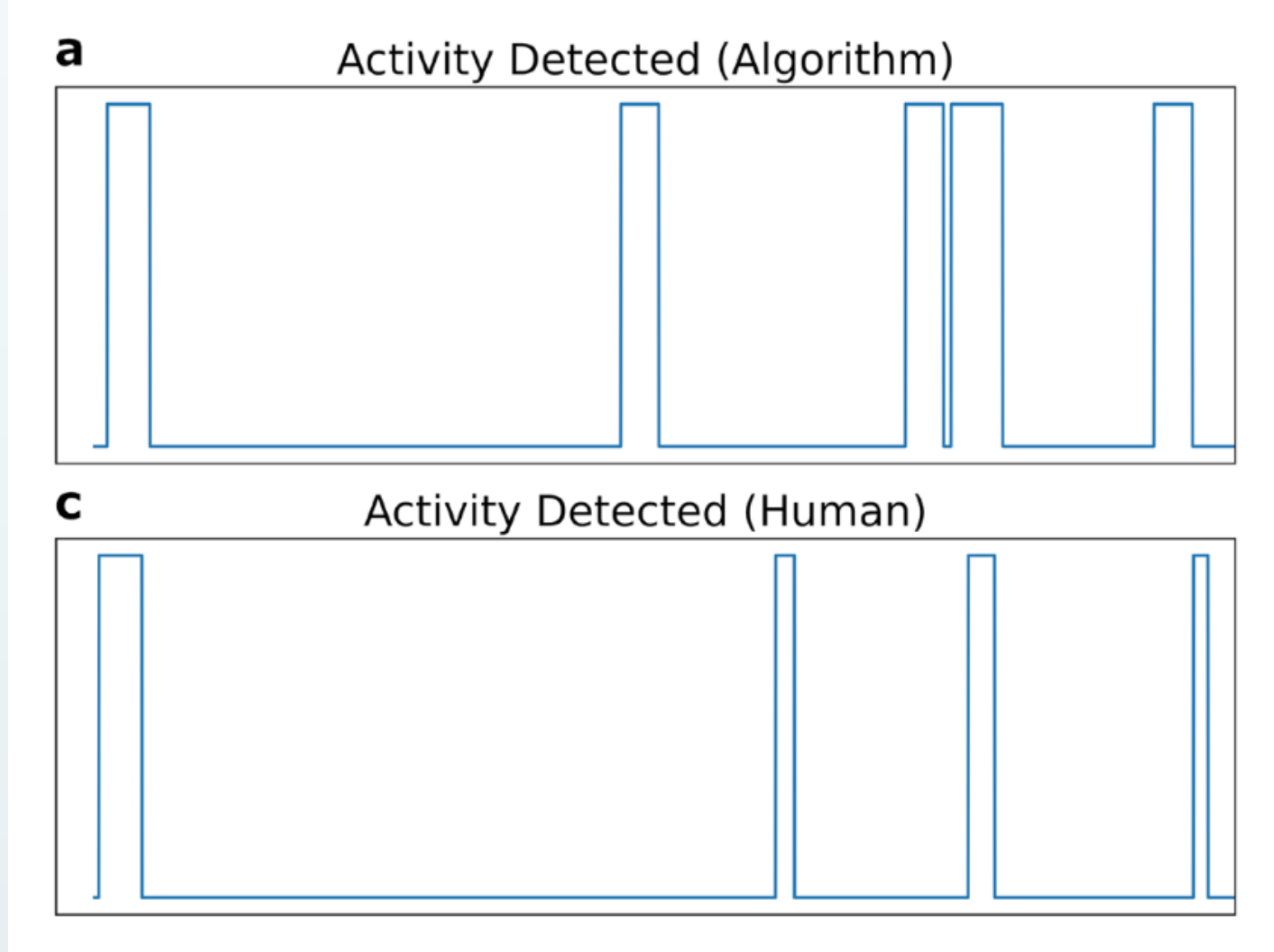
(a) Activity detected by algorithm for video collected by NOAA ROV Deep Discover (c) Activity detected by human expert for same video.
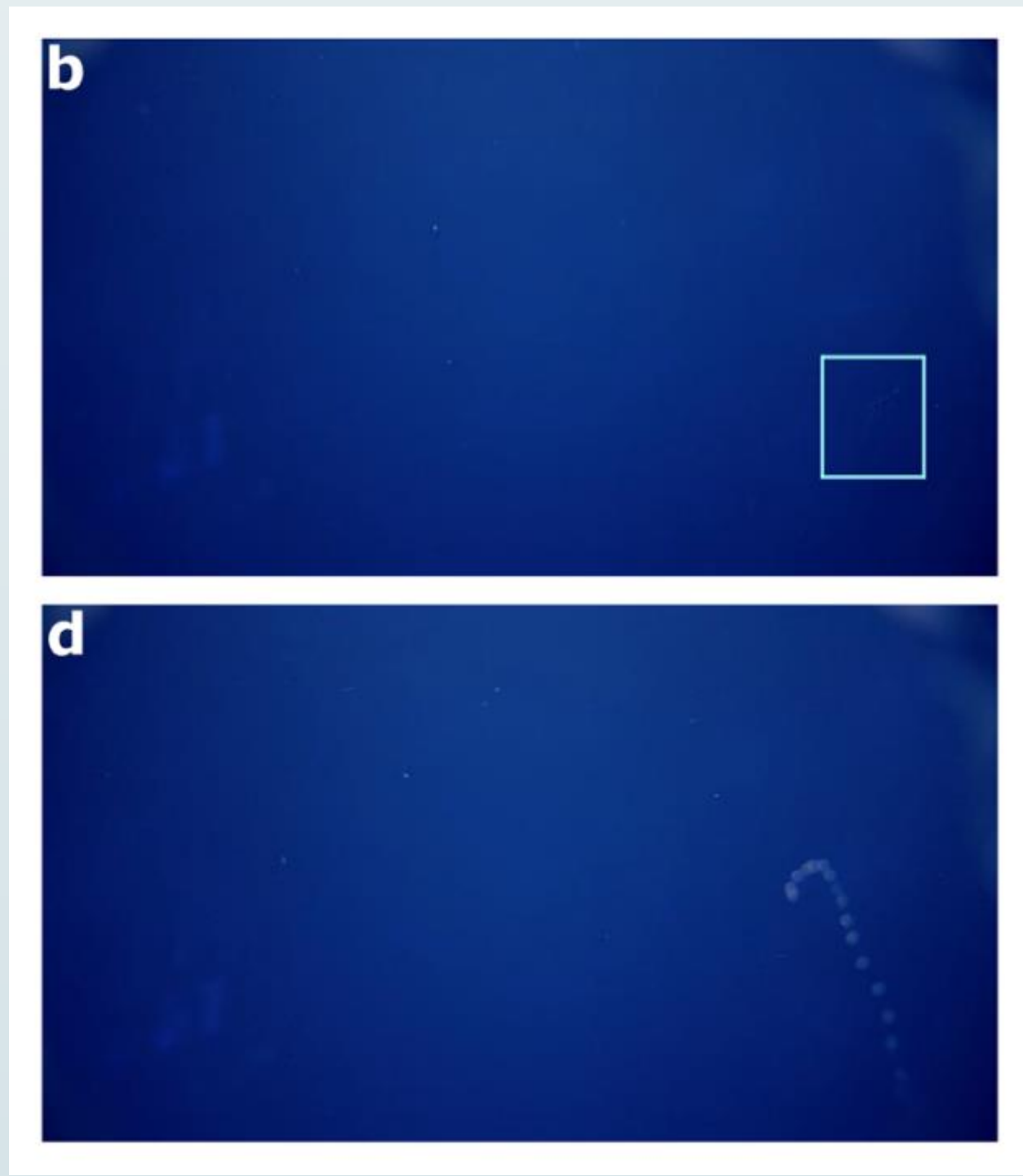
(b) Algorithm correctly identifies an animal for activity detection (c) Algorithm cannot distinguish image because image is blurred.

Although the algorithm isn't perfect due to camera angles, inability to distinguish blurred images, etc., having an algorithm create some form of annotations for activity detection at least gives the human reviewer a place to start when they begin their reviewing process. Similarly, the datasets from FathomNet can be used for image recognition machine learning algorithms

Conclusion

Deep learning algorithms that are run on labelled datasets have significantly improves the classification of underwater species. This approach requires a large database of labeled images, and FathomNet provides just that.

FathomNet provides a platform for the general public, subject matter experts, and acclaimed and reliable institutions to contribute to a much needed database for ocean research in terms of labelled data, standardization in ocean data, and creating useful imagery data scientists/comp scientists have to create and test their ML algorithm. FathomNet allows computer scientists to create ML algorithms without having to be subject matter experts.

Acknowledgements

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