

Seafloor to Satellites Crowdcomputing and Data Across Scales

Neil S. Gaikwad*, Max Vilgalys*, Jeremy Stroming*, Ben Woodward**, Rebecca Browder*

Massachusetts Institute of Technology*, CVision AI**
gaikwad@mit.edu

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Abstract

Deep ocean ecosystems are an important component of our planet, but they remain scientifically underexplored. Traditionally, research on the ocean ecosystems has been decentralized and scattered, involving small teams of experts, on single ships, traveling to distant locations, and mapping oceans as much as possible within a limited time. As a result, rapid advancement and scientific knowledge remain restricted to a handful of few.

On the other hand, the advent of deep learning and unprecedented growth of the seafloor and satellite datasets provide an exciting opportunity to decode patterns in deep ocean ecosystems. However, these datasets are unlabeled, decentralized, and disorganized. Additionally, existing deep learning algorithms often fail to capture and incorporate human insights and local knowledge in scientific explorations.

We present foundational and methodological building blocks required to design a centralized citizen science platform for collectively studying and exploring the ocean. First, we illustrate the science of the crowd-powered computational ecosystem. Second, we examine incentive mechanisms to accomplish high cognitive overload tasks and augment human-AI performance at scale. Third, we address specific ethical challenges that may arise while designing a sustainable community of citizen scientists. Through this tutorial, we provide an important opportunity to harness crowd-computing and AI for deep ocean exploration.