

# OFFICIAL ABSTRACT and CERTIFICATION

## Coral Grief: Machine Learning on Crowd-sourced Data to Highlight an Ecological Crisis

Rithika Narayan

Elwood John Glenn High School, Elwood, NY, USA

Almost on a seasonal basis we are experiencing biosphere tipping points, ecomarkers of climate change, some reversible, others not. Human footprints, including pollution and global warming, are beginning to leave indelible marks on our fragile ecosystem. Coral bleaching and disease of the world's reefs are such markers. Triggered largely by warming ocean waters, corals lose their vibrant colors when coral polyps expel algae that live inside their tissues, exhibiting a bleached appearance. Normally, coral polyps live in an endosymbiotic relationship with these algae, which are crucial for the health of the coral and the reef. After bleaching, the corals eventually starve, although with attention, regeneration is possible. Coral diseases including black band disease, dark spot disease, white syndromes, and yellow band disease affect corals from the Caribbean to the Indo-Pacific and decimate coral populations as well as harm the structure of reef ecosystems. These diseases can directly result from pollution and their spread is facilitated by warming oceans. Proposed herein is a solution that couples crowd-sourced data with Machine Learning to build a repository of coral health by identifying bleached and diseased corals. This diagnostic tool has the ability to highlight this threat to our ecosystem and initiate restoration efforts. A model with greater than 85% accuracy in detecting the health class (healthy, bleached, or one of four disease categories) of corals in images and videos and in segmenting the coral and lesions has been developed and can be deployed globally for public, government, and private business use in order to build a database that tracks the condition of reefs across time to determine the allocation of conservation resources.

### Category

Pick one only — mark an "X" in box at right

Animal Sciences

Behavioral & Social Sciences

Biochemistry

Biomedical & Health Sciences

Biomedical Engineering

Cellular & Molecular Biology

Chemistry

Computational Biology & Bioinformatics

Earth & Environmental Sciences

Embedded Systems

Energy: Sustainable Materials and Design

Engineering Mechanics

Environmental Engineering

Materials Science

Mathematics

Microbiology

Physics & Astronomy

Plant Sciences

Robotics & Intelligent Machines

Systems Software

Translational Medical Sciences

- As a part of this research project, the student directly handled, manipulated, or interacted with (check ALL that apply):
 

☐ human participants
 ☐ potentially hazardous biological agents
 ☐ vertebrate animals
 ☐ microorganisms
 ☐ rDNA
 ☐ tissue
- I/we worked or used equipment in a regulated research institution or industrial setting: ☒ Yes ☐ No
- This project is a continuation of previous research. ☐ Yes ☒ No
- My display board includes non-published photographs/visual depictions of humans (other than myself): ☐ Yes ☒ No
- This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only: ☒ Yes ☐ No
- I/we hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work. ☒ Yes ☐ No

*This stamp or embossed seal attests that this project is in compliance with all federal and state laws and regulations and that all appropriate reviews and approvals have been obtained including the final clearance by the Scientific Review Committee.*

