AGU 100 ADVANCING EARTH AND SPACE SCIENCE | **FALL MEETING** Washington, D.C. | 10–14 Dec 2018

H34B-06: NeMO-Net – The Neural Multi-Modal Observation & Training Network for Global Coral Reef Assessment

Wednesday, 12 December 2018
17:15 - 17:30
📍 *Walter E Washington Convention Center - 146C*

In the past decade, coral reefs worldwide have experienced unprecedented stresses due to climate change, ocean acidification, and anthropomorphic pressures, instigating massive bleaching and die-off of these fragile and diverse ecosystems. Furthermore, remote sensing of these shallow marine habitats is hindered by ocean wave distortion, refraction and optical attenuation, leading invariably to data products that are often of low resolution and signal-to-noise (SNR) ratio. However, recent advances in UAV and Fluid Lensing technology have allowed us to capture multispectral 3D imagery of these systems at sub-cm scales from above the water surface, giving us an unprecedented view of their growth and decay. By combining spatial and spectral information from varying resolutions, we seek to augment and improve the classification accuracy of previously low-resolution datasets at large temporal scales.

NeMO-Net, the first open-source deep convolutional neural network (CNN) and interactive learning and training software, currently being developed at NASA Ames, is aimed at assessing the present and past dynamics of coral reef ecosystems through determination of percent living cover and morphology. The latest iteration uses fully convolutional networks to segment and identify coral imagery taken by UAVs and satellites, including WorldView-2 and Sentinel. We present results taken from the Indian Ocean where classification accuracy has exceeded 91% for 24 geomorphological classes given ample training data. In addition, we utilize deep Laplacian Pyramid Super-Resolution Networks (LapSRN) to reconstruct high resolution information from low resolution imagery, trained from various UAV and satellite datasets. Finally, in the case of insufficient training data, we have developed an interactive online platform that allows users to easily segment and submit their classifications, which has been integrated with the current NeMO-Net workflow. Specifically, we present results from the Fiji islands in which preliminary user data has allowed for the accurate identification of 9 separate classes, despite issues such as cloud shadowing and spectral variation. The project is being supported by NASA's Earth Science Technology Office (ESTO) Advanced Information Systems Technology (AIST-16) Program.

Authors

Alan Sheng Xi Li
NASA Ames Research Center

Ved Chirayath
NASA Ames Research Center

Kamalika Das

University of Maryland Baltimore County

Michal Segal-Rosenhaimer
NASA Ames Research Center

Jarrett van den Bergh

NASA Ames Research Center

Juan Torres

ARC-SGE)[Bay Area Environmental Research Institute]

Find Similar

View Related Events

Day: Wednesday, 12 December 2018