



# Tutorial: Computer Vision for Underwater Environmental Monitoring

14<sup>th</sup> International Symposium on Visual Computing

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<http://www.isvc.net>

## Tutorial abstract

Monitoring marine ecosystems is of critical importance for gaining a better understanding of their complexity and of their delicate balancing processes, which are significantly affected by climate change and other anthropogenic influences.

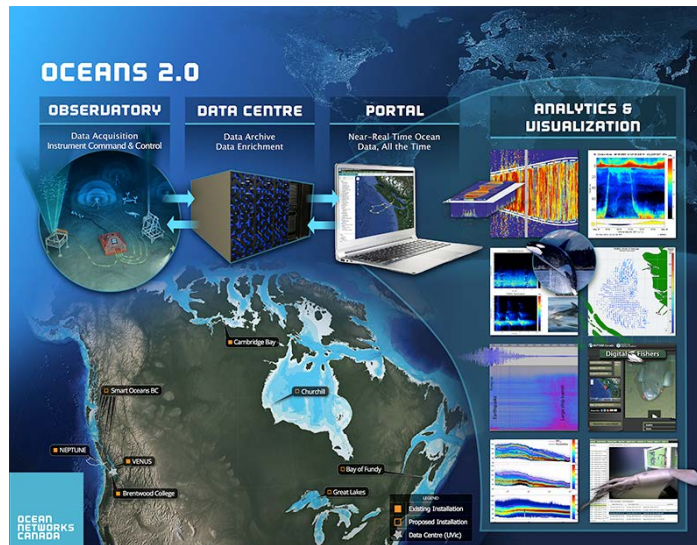
Recently, oceanographic data acquisition has been greatly facilitated by the establishment of seafloor cabled observatories whose co-located sensors facilitate interdisciplinary studies and real-time observations. Prior to the advent of cabled observatories, the majority of deep-sea video data was acquired by ROVs (remotely operated vehicles), and was analyzed and annotated manually. In contrast, seafloor cabled observatories such as those operated by Ocean Networks Canada (<http://www.oceannetworks.ca>) offer a 24/7 presence, resulting in unprecedented volumes of visual data. Scheduled recordings of underwater imagery are gathered with Internet-connected fixed and PTZ cameras, which observe a variety of biological processes.

The analysis of underwater imagery imposes a series of unique interdisciplinary challenges, which need to be tackled by computer vision researchers in collaboration with biologists and ocean scientists. This tutorial will present the state of the art in computer vision and image processing approaches for

- underwater image enhancement
- underwater scene understanding
- detection and monitoring of marine life
- fish behaviour analysis
- automated analysis for fisheries research
- video summarization

## Tutorial description

This tutorial aims to raise awareness in the computer vision research community about the vital and timely role that computer vision can play in environmental monitoring and climate modelling. Participants will gather an understanding about the specific challenges of working with underwater imagery, and about the types of algorithmic methods that are most in demand. They will also be introduced to the Ocean 2.0 data portal, which is an open-source framework that will provide them with the opportunity to download and analyze underwater imagery acquired by Ocean Networks Canada.



The Oceans 2.0 data portal ([www.oceannetworks.ca/innovation-centre/smart-ocean-systems/ocean-observing-systems/oceans-20](http://www.oceannetworks.ca/innovation-centre/smart-ocean-systems/ocean-observing-systems/oceans-20))

This tutorial assumes that participants have a basic knowledge of Computer Vision and Image Analysis techniques, and that they will be equipped with personal computers in order to be able to access and experiment with the Oceans 2.0 data portal.

Duration: 3 hours

## Organizers

- **Alexandra Branzan Albu**, Associate Professor, Electrical and Computer Engineering, University of Victoria, BC, Canada, [aalbu@uvic.ca](mailto:aalbu@uvic.ca)

Dr. Alexandra Branzan Albu is an associate professor with the Department of Electrical and Computer Engineering at the University of Victoria (BC), Canada. She holds a PhD in Electrical Engineering from Politehnica University of Bucharest. Alexandra's research focus is on computer vision. From a practical standpoint, her contributions to this field involve raising and solving research questions that are closely linked to societal needs such as environmental monitoring, medical imaging, document image analysis, and human motion analysis. Due to the interdisciplinary and applied nature of the research problems under investigation, Alexandra has developed a number of industrial collaborations with companies such as Intel,

SAP, Kongsberg-Mesotech, Triumph Ltd., ViVITRO Labs, and Quirklogic Inc. who have all provided funding for her research. Her research is also funded by NSERC (The Natural Science and Engineering Research Council of Canada). She is a member of the Ocean Observatory Council, which provides formal and informal advice from a user perspective on the Ocean Networks Canada (ONC) science plan and on details of ongoing operations to maintain, fix, and expand the observatory. She is the 1<sup>st</sup> Vice-President of the International Association on Pattern Recognition (IAPR).

## Date

- Sunday, October 6, 2019 (tentatively)

