



## *Research Opportunity*

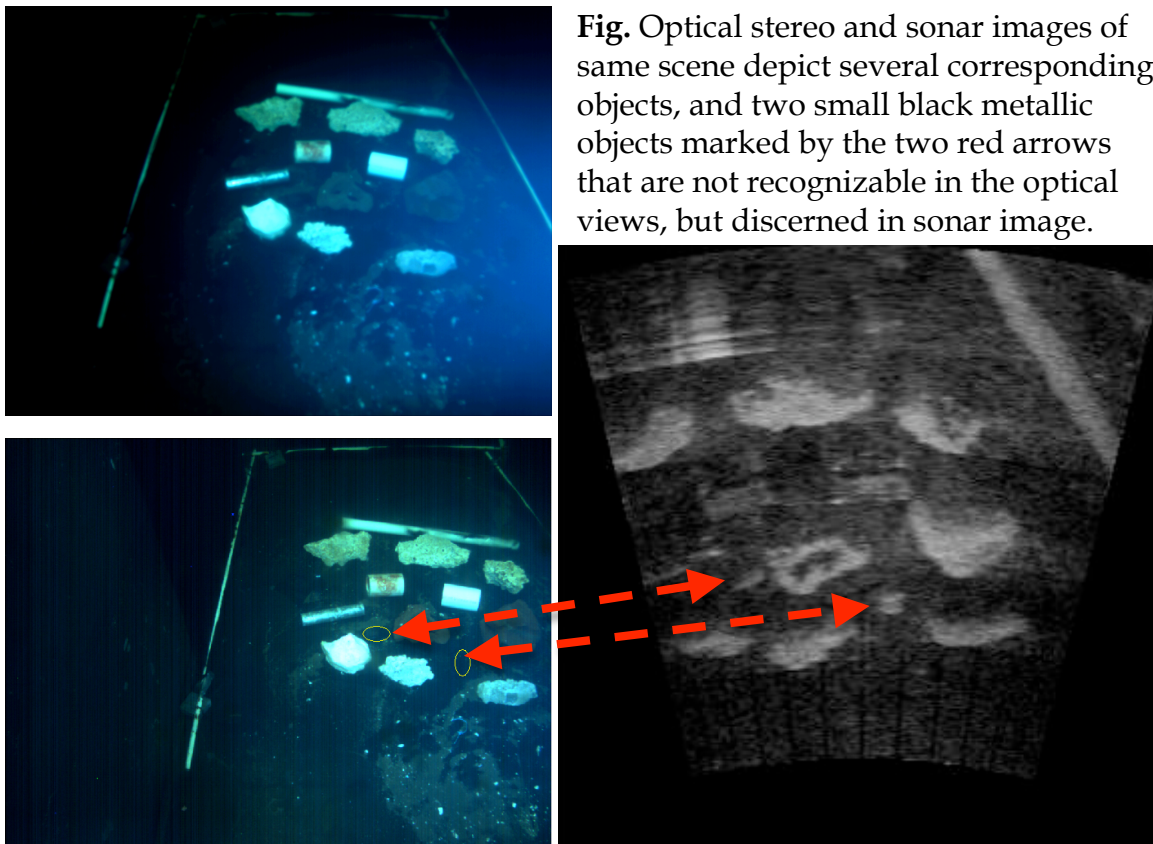
### *Computer Vision for Optical and Sonar Imaging Underwater Vision & Imaging Lab University of Miami Coral Gables, FL*

**Overview:** There is a unique opportunity to attend *The University of Miami in Coral Gables (Miami), Florida*, the largest private research university in the Southeastern United States. The *UoM* is one of the most diverse cultural US universities, located in the most lively and exotic city of the western hemisphere. During a short-term visit of 4-6 months with the possibility to extend, you will engage in the state of art computer vision research, with opportunity to contribute to ground breaking technological advances in marine sciences and underwater exploration, with potential application in other fields including medical imaging.

**Project:** There has been growing interest in developing automated systems for the inspection and maintenance of subsea structures, e.g., ship hulls, oil pipelines, bridge pilings and dams based on optical and sonar imaging technologies. Due to various environmental conditions, including turbidity and acoustic clutter, the use of a single imaging modality is insufficient. The integration of multi sensing modalities is inevitable in developing a technology that is robust and provides acceptable accuracy under adverse environmental conditions.

An ongoing project at the Underwater Imaging and Vision Laboratory (UVIL) of the UoM explores the integration of information from high-

resolution 2-D optical and sonar images for target-based positioning and navigation, as well as 3-D object reconstruction. While we have developed a number of 3-D shape and motion estimation techniques, the fundamental problem is the multi-modal correspondence and image registration. This is illustrated in the example below, depicting an optical stereo pair and the sonar image of the same scene. The goal here is to automatically establish the correspondence between matching points, contours and objects that can be readily carried out by visual inspection. Additionally, the red arrows point to two small black metallic objects, not distinguishable in the optical images but detectable in the sonar image because of their strong acoustic reflectance. This highlights why multi imaging modalities are critical to detect and recognize all of the objects in a scene, which is critical during the inspection and surveillance operations.



**Fig.** Optical stereo and sonar images of same scene depict several corresponding objects, and two small black metallic objects marked by the two red arrows that are not recognizable in the optical views, but discerned in sonar image.

*Qualifications:* We seek hard working and highly motivated graduate students, either at MS level interested in an internship opportunity or preferably in the early stages of PhD studies. Expertise in computer vision and ideally fundamental knowledge of the physics of acoustic imaging, e.g., based on research in medical ultrasound imaging, are desired. This is a very unique opportunity to expand one's technical expertise by engaging in challenging project.