

## **AquaAI: Smart Detection Beneath the Waves**

The marine environment covering approximately two-thirds of the Earth's total surface area boasts a wide diversity of objects, thereby necessitating detection of marine objects as a pivotal aspect. Marine Object Detection encompasses a broad range of applications spanning from maritime surveillance to submarine cable detection, underwater pipeline monitoring, underwater oil spill detection. Additionally, MOD plays a crucial role in marine organism detection, underwater trash detection, underwater cultural artifacts, underwater navigation and numerous other applications. Although numerous of methodologies pertaining to general object detection have been suggested over the years but the challenges encountered in detecting marine objects are unique that requires advanced detection methods.

Several methods for MOD have been proposed over a decade, ranging from conventional-based approach to Advance Learning (AL) based approach. Despite of this progress, MOD still remains a challenging task. The complex characteristics of maritime settings poses significant challenges in detecting marine objects. The images captured in marine environments often encounter issues such as haziness, low contrast, color distortion and uneven lightning causing severe degradation in quality of the images.

Specifically, marine organisms typically appear small, often gathers in groups and face obstacles from surrounding objects. Additionally, they frequently bear a resemblance to their environment including coral reefs and rocks. Moreover, the detection process is further complicated by the significant variation in size, texture, shape, movement and changing postures of the marine organisms. Changing water quality and dynamic water conditions further aggravates the problem. To add further, MOD necessitates research into lightweight model that offers both real-time efficiency with excellent accuracy. Robust MOD mechanisms are essentially needed to effectively address these distinct challenges