



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
PhD-17 SHORT ABSTRACT OF THESIS

Name of the Student : ALIK PRAMANICK

Roll Number : 206101101

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Name of Thesis Supervisor(s) : Prof. Arijit Sur & Prof. V. Vijaya Saradhi

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SHORT ABSTRACT

Recent advances in underwater exploration have attracted significant attention due to their wide-ranging applications in underwater navigation, marine warfare, oceanography, and marine scene understanding or measurements. In this case, computer vision plays a pivotal role because high-quality images are necessary for terrestrial workstations, which are recaptured by underwater surveillance systems and Autonomous Underwater Vehicle (AUV) through a camera. However, underwater image acquisition is inherently challenging. Images often suffer from low contrast, haziness, and blurriness due to the presence of suspended particles, plankton, and variations in light. They also suffer from strong color distortion, which causes them to appear blue or green due to the way light is absorbed underwater. These degradations make underwater image enhancement a critical research problem. Even after enhancement, many small objects, such as tiny fish, cables, coral tips, or trash, can still be hard to see clearly at the original resolution. This negatively impacts downstream tasks, such as object classification, detection, and segmentation, making them less accurate. To solve this, Super-resolution (SR) is necessary to recover sharper textures and more detailed object boundaries, making small or distant objects more visible in high-resolution images. Nowadays, researchers are focusing their work on Deep Learning (DL)-based methods due to their superior performance compared to traditional techniques. The existing literature clearly demonstrates that learning-based methods for enhancement and SR excel not only in performance but are also suitable for deployment in resource-constrained or real-time environments. With this motivation, this thesis presents efficient deep learning-based models for two specific tasks: (a) Underwater Image Enhancement (UIE) and (b) Underwater Image Super-resolution (UISR).