

# DEEP-SEA: Deep-Learning Enhancement for Environmental Perception in Submerged Aquatics



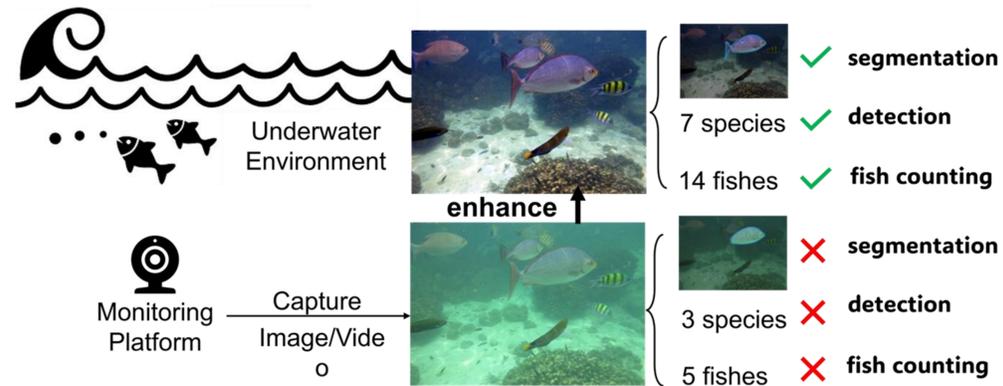
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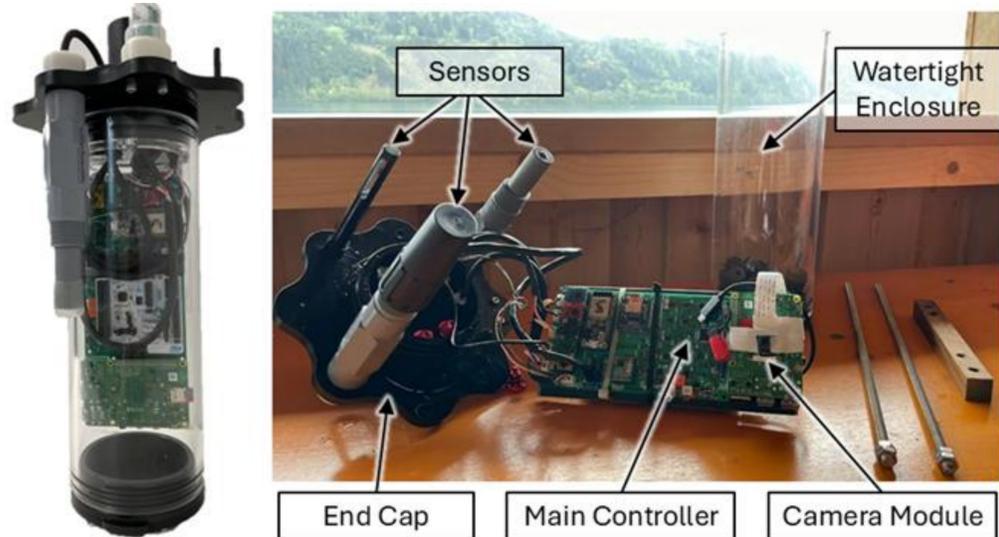


## Motivations



An underwater monitoring platform captures visual data that is often degraded due to poor visibility, colour distortion and lighting conditions. Such degraded data negatively impacts downstream tasks and makes marine research, object detection and ecological monitoring challenging. By applying enhancement techniques to restore clarity and colour fidelity, the data becomes significantly more valuable and suitable for downstream tasks, maximising the effectiveness of underwater monitoring efforts.

## Submerged Robot

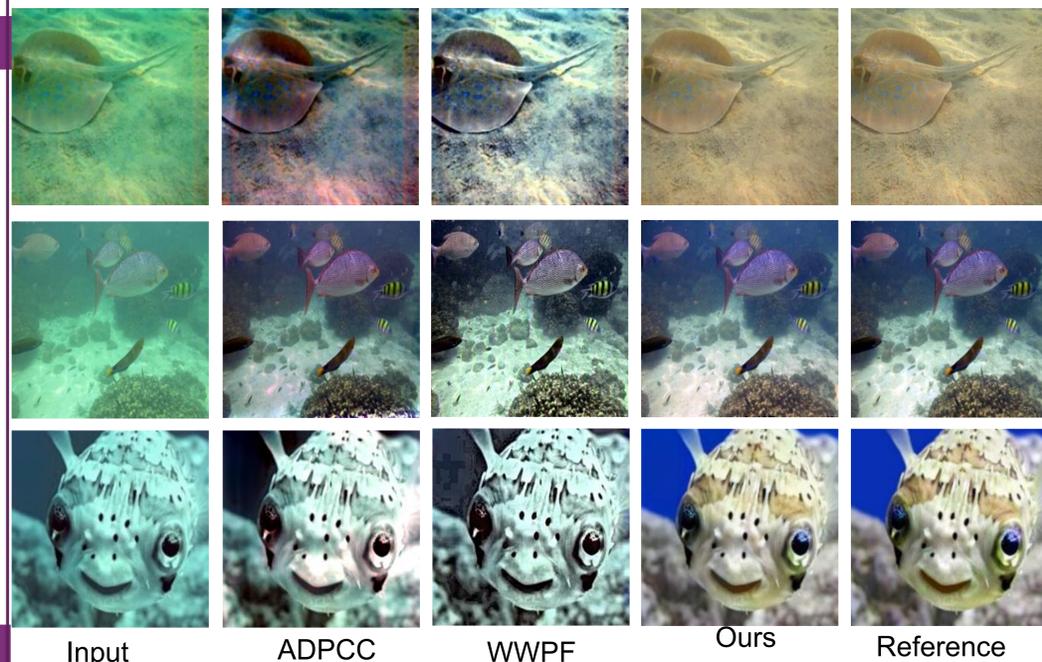


Submerged robot and its components which have been developed for long-term underwater monitoring.

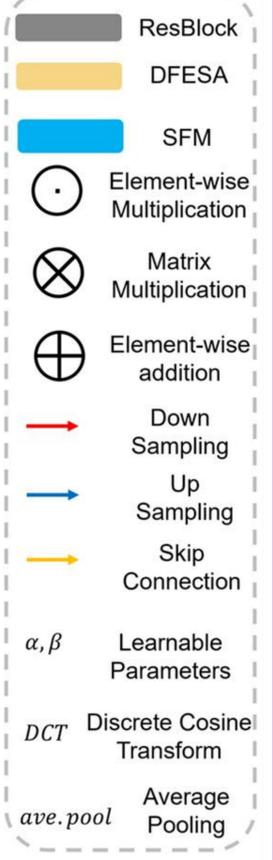
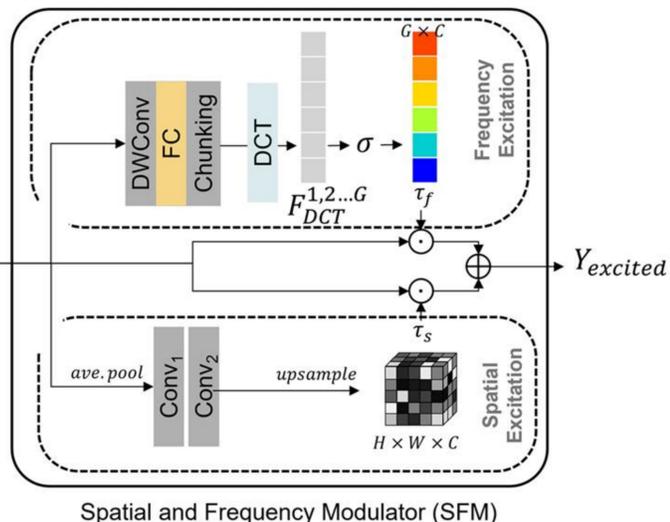
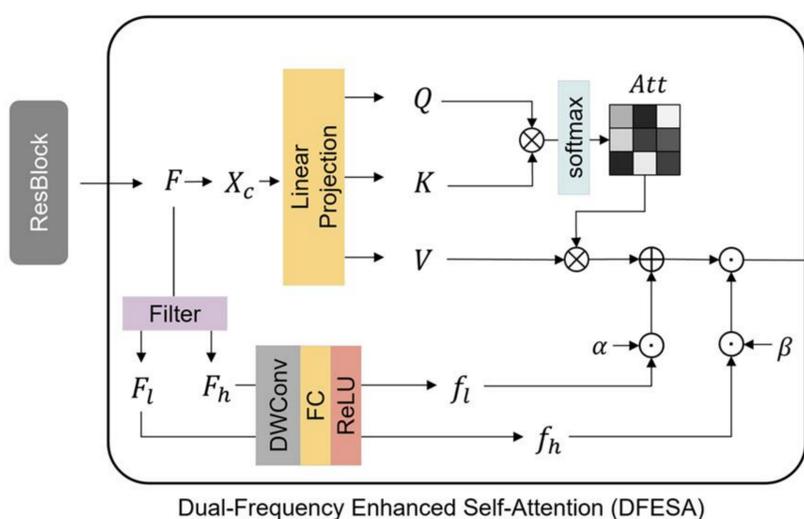
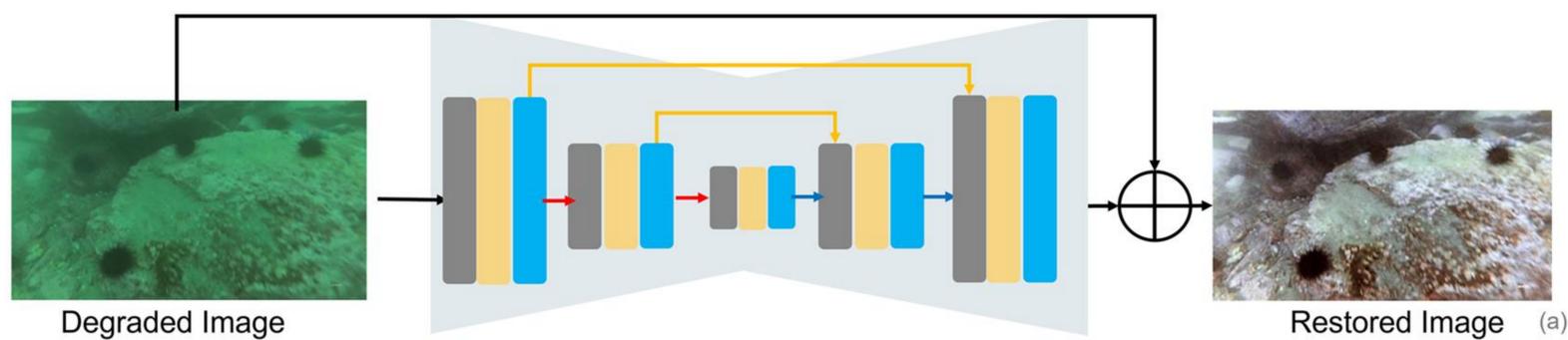
## Main Contribution

- We propose DEEP-SEA, a novel underwater image restoration model to process images captured from our biohybrid platform with a low-power STM32 MCU and Raspberry Pi module for long-term underwater image capture to address underwater image quality issues.
- We propose a novel Dual-Frequency Enhanced Self-Attention mechanism that separately processes low- and high-frequency components to improve feature representation and restore structural details.
- We propose a novel Spatial-Frequency Modulation to integrate spatial and frequency cues, ensuring better feature discrimination, noise reduction, and colour correction in underwater images.

## Results



## Methods



ArXiv Link



Github Link



Profile Link

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