

## ABSTRACT

In the realm of underwater photography, the quest to overcome challenges related to limited visibility and color distortion has spurred innovative research endeavors. This study integrates cutting-edge deep learning methodologies with conventional image processing techniques, particularly emphasizing the efficacy of hybrid networks. The primary workflow involves the enhancement of low-quality underwater images through the application of hybrid convolutional neural networks (hybrid-CNNs). The process begins with the collection and preprocessing of a comprehensive underwater image dataset. This includes extracting the Red, Blue, and Green color channels, resizing the images, and performing color correction. The dataset is then split into training and validation sets in an 80:20 ratio, introducing variability to the model. The pivotal stage employs hybrid-CNNs to transform low-quality underwater images into high-quality, visually enhanced images. The hybrid architecture combines the strengths of different CNN models, enabling more effective feature extraction and image restoration. This approach aims to mitigate the challenges posed by the unique characteristics of underwater environments, such as light attenuation, backscattering, and color cast. Furthermore, the study incorporates the YOLO-v8 (You Only Look Once) object detection algorithm to provide additional parameters for image verification. The performance of the image enhancement models is evaluated using various metrics, including Mean Squared Error (MSE), Mean Absolute Error (MAE), and Root Mean Squared Error (RMSE). These metrics help quantify the improvements in visual clarity and accuracy achieved by the hybrid-CNN approach. The study culminates in the evaluation of the model's performance, elucidated by accuracy and loss metrics. The findings contribute to the advancement of underwater image enhancement, enabling improved visualization and subsequent applications in areas such as marine biology, underwater exploration, and environmental monitoring.