# The Bucket Project

Background

Underwater computer vision has become an important tool for applications such as marine biodiversity monitoring, habitat mapping, pipe inspection, and surveillance. However, the underwater environment poses significant challenges for visual perception tasks compared to terrestrial settings. Factors such as water turbidity, light attenuation, scattering, and color distortion introduce noise and degrade image quality, which in turn may affect the accuracy of downstream vision tasks. The Bucket dataset aims to simulate these problems in a controlled environment. The setup consists of:

Cameras: Four synchronized cameras mounted at fixed positions, capturing each scene simultaneously from different angles to enable both single-view and multi-view analysis.

Lights: Five controllable light sources positioned in and above the tank. Different lighting configurations are tested by turning specific lights on or off, creating variations in direction and shadows.

Data: 35 scenes, underline images and annotations are available.
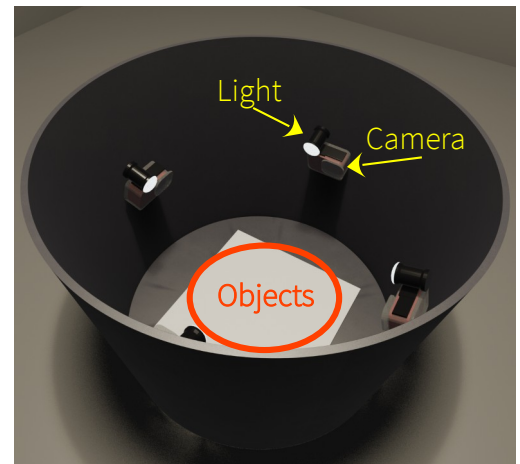
Research questions

The aim of this project is to train and validate a computer vision model for downstream tasks, such as instance segmentation or 3D reconstruction and investigate how changes in the environment affects the performance of the model.

- How does increasing water turbidity affect the performance of downstream vision tasks?
- At what levels of turbidity do these performance degradations become critical and how do we mitigate this?
- How does the position and configuration of light sources influence the accuracy of the downstream tasks?
- How does the visual appearance of the objects (e.g., shape, texture, reflectivity, and color) influence the performance of downstream tasks under varying conditions?
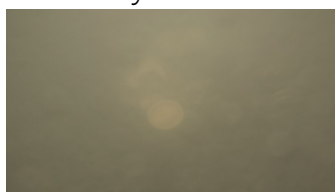

Clear water

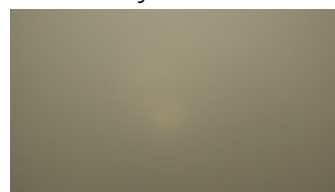Turbidity level 1

Turbidity level 2

Turbidity level 3

Turbidity level 4

Turbidity level 5

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