Underwater image processing project modules:

1. Image enhancement
2. Image denoising
3. Image defogging/Image dehazing
4. Image segmentation
5. Image saliency detection
6. Color constancy and correction
7. Image recovery
8. Contrast enhancement
9. Object detection (optional)

Algorithms for every project module:

1. Image enhancement:
    a. Adaptive histogram equalization (AHE) algorithm: It is a non-linear technique for image enhancement that can improve the contrast of images with uneven lighting conditions. **Source:** https://ieeexplore.ieee.org/document/580358
    b. Retinex algorithm: A multi-scale approach that can enhance image details and improve color constancy by decomposing the image into reflectance and illumination components. **Source**: https://ieeexplore.ieee.org/document/7809513
2. Image denoising:
    a. Non-local Means algorithm: A popular denoising algorithm that exploits the redundancy in natural images to remove noise while preserving image details. **Source**: https://ieeexplore.ieee.org/document/1652135
    b. Wavelet-based denoising: A method that uses wavelet transform to decompose the image into different

frequency components, denoise them separately, and then reconstruct the image. **Source**: https://ieeexplore.ieee.org/document/8436074

3. Image defogging/dehazing:
    a. Dark Channel Prior algorithm: A method that uses the observation that the intensity of the dark channel in a haze-free image is low to estimate the transmission map and recover the haze-free image. **Source**: https://ieeexplore.ieee.org/document/4359326
    b. Color Attenuation Prior algorithm: A method that uses the color information in the hazy image to estimate the transmission map and remove the haze. **Source**: https://ieeexplore.ieee.org/document/5649217
4. Image segmentation:
    a. Watershed algorithm: A method that segments an image into regions based on the morphology of its gradient map. **Source**: https://ieeexplore.ieee.org/document/4767851
    b. Mean-Shift algorithm: A method that segments an image based on the similarity of its pixel intensities and can handle non-parametric density distributions. **Source**: https://ieeexplore.ieee.org/document/1000236
5. Image saliency detection:
    a. Spectral Residual algorithm: A method that uses the spectral properties of an image to detect its salient regions. **Source**: https://ieeexplore.ieee.org/document/4541141
    b. Deep Learning-based models: Several deep learning models have been proposed for saliency detection, including U-Net, SalGAN, and DeepGaze. **Source**: https://ieeexplore.ieee.org/document/9048586
6. Color constancy and correction:

a. Gray-World algorithm: A method that assumes the average color of a scene is neutral and uses it to correct the color balance of an image. **Source**: https://ieeexplore.ieee.org/document/329522
b. Retinex-based methods: Retinex-based algorithms can also be used for color constancy and correction by separating the reflectance and illumination components of an image. **Source**: https://ieeexplore.ieee.org/document/7809513

7. Image recovery:
    a. Inpainting algorithms: Inpainting methods can recover missing or damaged parts of an image by filling them in with information from the surrounding regions. **Source**: https://ieeexplore.ieee.org/document/1277536
    b. Super-resolution algorithms: Super-resolution methods can recover high-resolution details from a low-resolution image by exploiting the correlations between neighboring pixels. **Source**: https://ieeexplore.ieee.org/document/7539732
8. Contrast enhancement:
    a. Adaptive Contrast Enhancement algorithm: This method enhances the contrast of an image by adjusting the dynamic range of its intensity values based on local statistics. **Source**: https://ieeexplore.ieee.org/document/4075706
    b. Dualistic Sub-Image Histogram Equalization (DSIHE) algorithm: This method is an improved version of the traditional histogram equalization algorithm that works on smaller sub-images. **Source**: https://ieeexplore.ieee.org/document/5482368
    c. Brightness Preservation Histogram Equalization (BPHE) algorithm: This method enhances contrast while

preserving the overall brightness of the image. **Source**: https://ieeexplore.ieee.org/document/6056091

d. Dynamic Stochastic Resonance (DSR) algorithm: This method enhances the contrast of an image by adding noise to the image and using a stochastic resonance phenomenon to extract useful information. **Source**: https://ieeexplore.ieee.org/document/7400285
e. Local Contrast Enhancement using Homomorphic Filtering: This method enhances the contrast of an image by decomposing it into a low-frequency and high-frequency component using homomorphic filtering, and then enhancing the contrast of the high-frequency component. **Source**: https://ieeexplore.ieee.org/document/6849031
f. Dynamic Range Compression (DRC) algorithm: This method enhances the contrast of an image by compressing its dynamic range and redistributing the intensity values. **Source**: https://ieeexplore.ieee.org/document/6908949
g. Contrast Limited Adaptive Histogram Equalization (CLAHE) algorithm: This method improves the traditional histogram equalization algorithm by limiting the amplification of noise in the image. **Source**: https://ieeexplore.ieee.org/document/622290
h. Wavelet-based Contrast Enhancement: This method enhances the contrast of an image by decomposing it into different frequency components using the wavelet transform, and then enhancing the contrast of the high-frequency components. **Source**: https://ieeexplore.ieee.org/document/4787848