Overview

Stream Gauge water pixel classification

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Image Processing (Unsupervised Learning)

Generate Mask (One time processing)

1. **Average and Subtract**
2. **Generate Mask**
   (with 4 color regions)

Pick ROI and Generate HOGs

3. **Sample Region Of Interest (ROI)**
   (from each region)
4. **Generate Histogram of Oriented Gradients (HOG)**
   (Using ROI)

5. **Learn Regions using Artificial Neural Network (ANN)**
   (Run HOG through ANN to learn the 4 regions)

Image Classifying

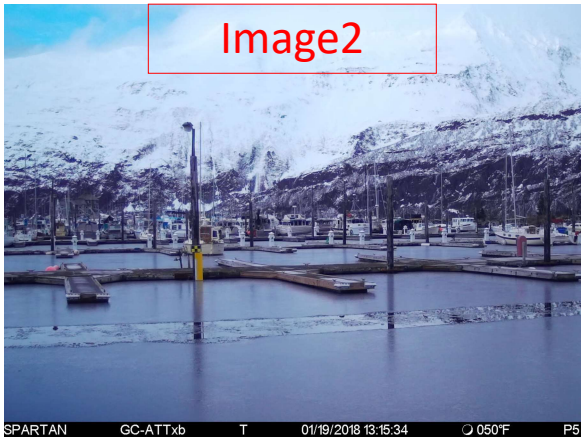
Daily Usage process (After the learning process)

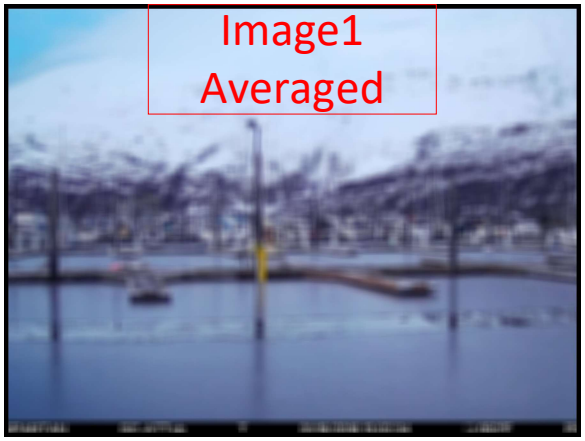
6. **Load Image**
   Run an Image through an ANN
7. **Output Mask**
   Generate image of Water Pixels

1. Averaging and Subtracting

Load Image1

Load Image2





Average Image1

Average Image2

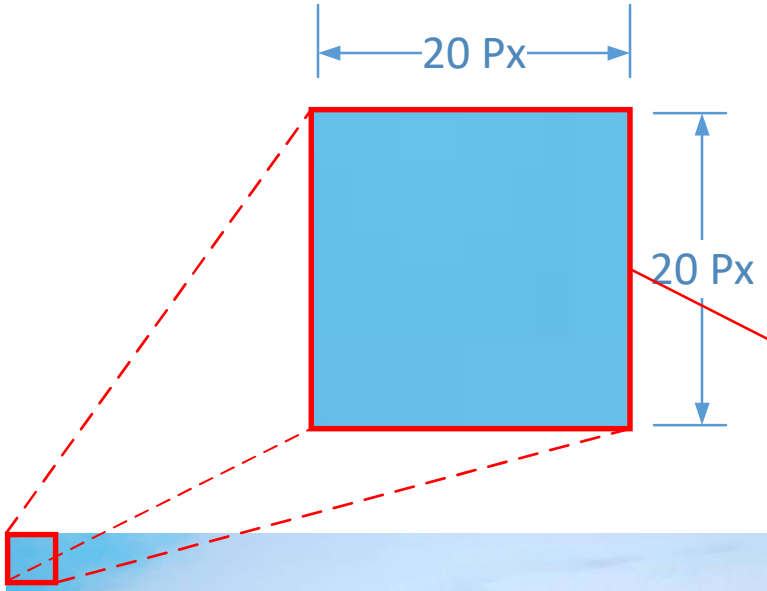
Subtract Averaged Images

**Output image will have low RGB values which make it hard to see by the naked eye.*

1. Averaging and Subtracting

(Averaging Details)

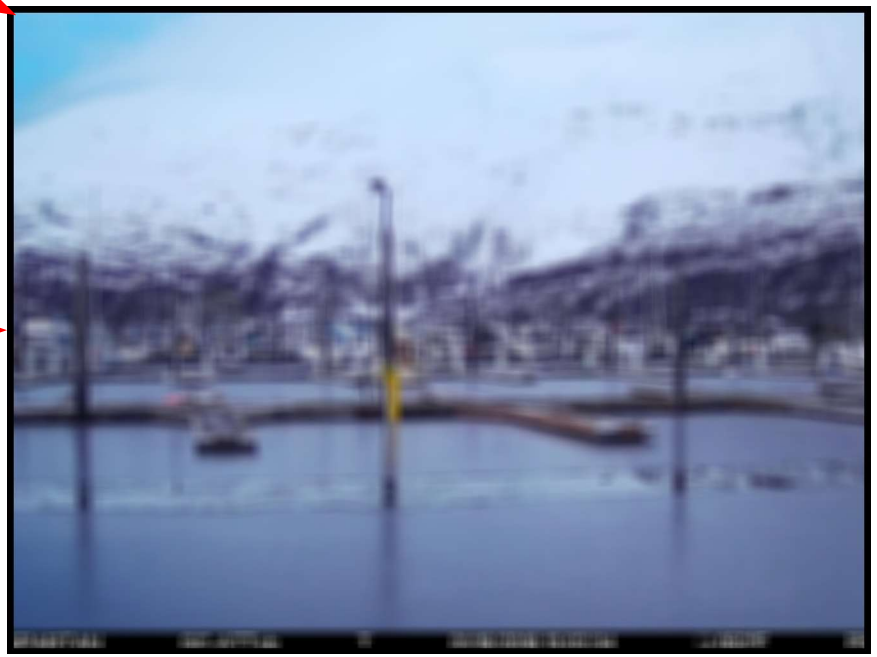
A 20 x 20 block of pixels is averaged to produce a single center pixel for the resulting Averaged image



This produces the below averaged image which reduces artifacts by small differences in the image.

The averaged image ends up with a board of 10 pixels we are unable to create an average for

Original Image

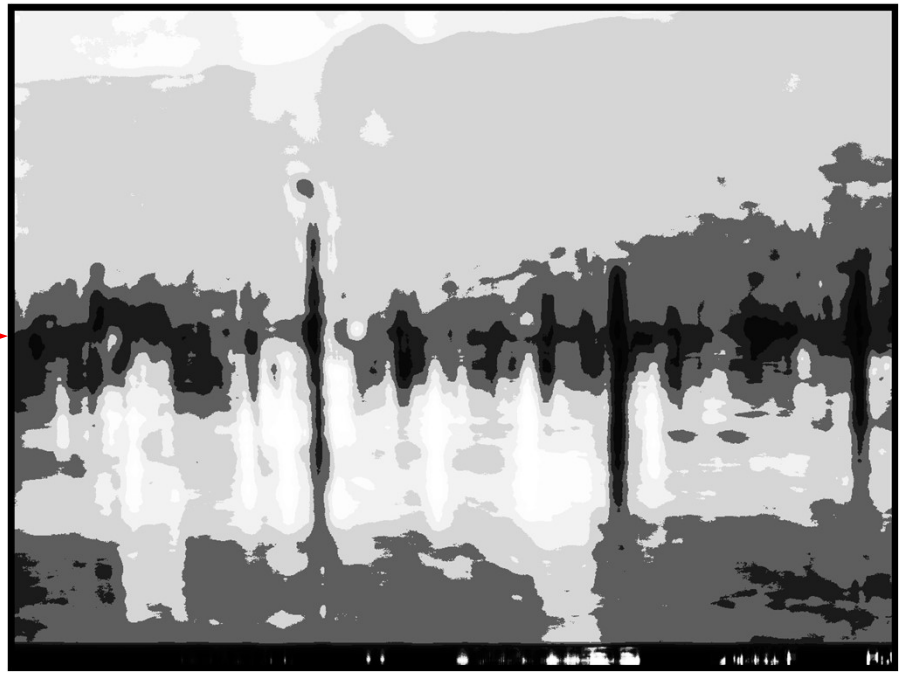


Averaged Image

2. Generate Mask

All images averaged and subtracted.
(Exaggerated brightness as it was too dark without for example)

Region mask generation
Example only using equalizeHist, real mask will use connectedComponents

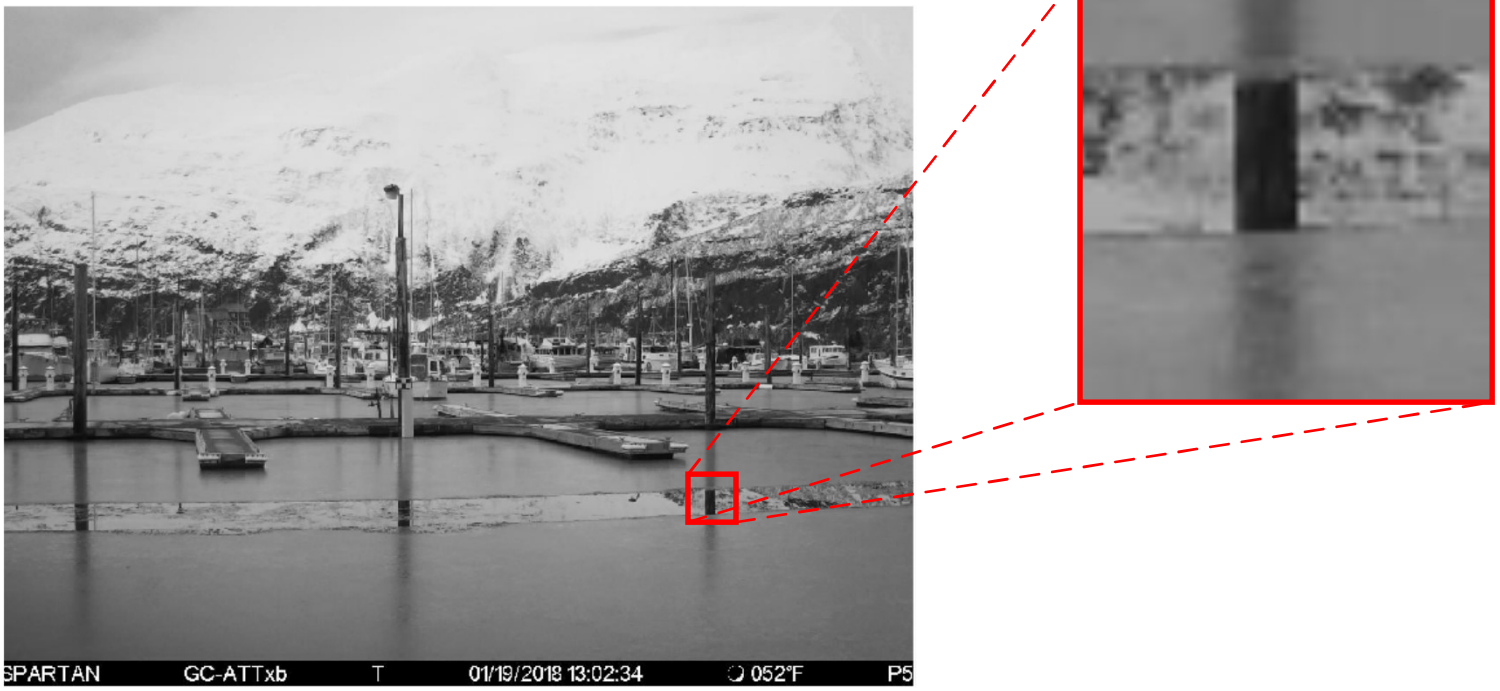


3. Sample ROI

Image converted to greyscale

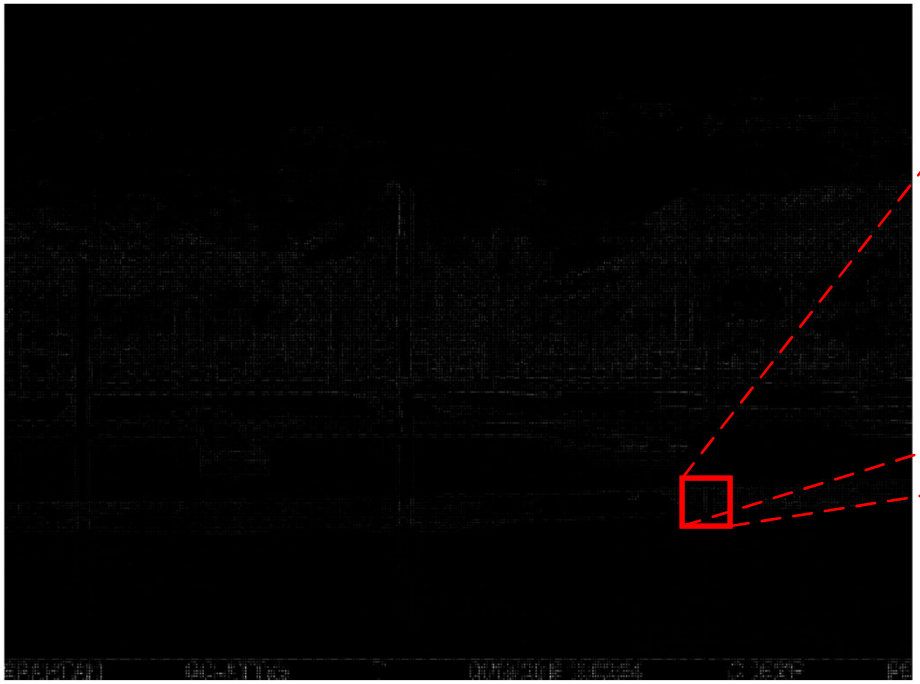
(Current OpenCV method requires greyscale)

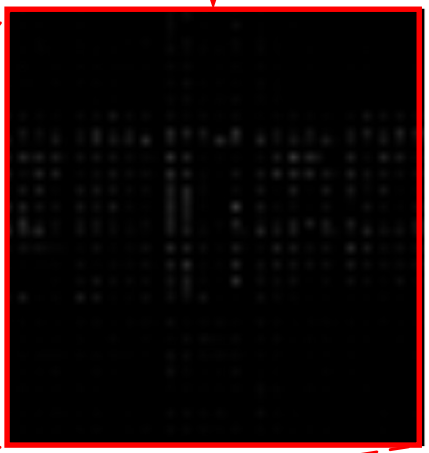
Grab sections within each Mask Region



Extracted ROI

4. Generate HOGs





Resulting HOG

5. Learn regions using ANN

6. Load Image

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