FINAL PROJECT: BREAKING IS BAD IMPLEMENTATION OF A BASIC CRACK DETECTOR
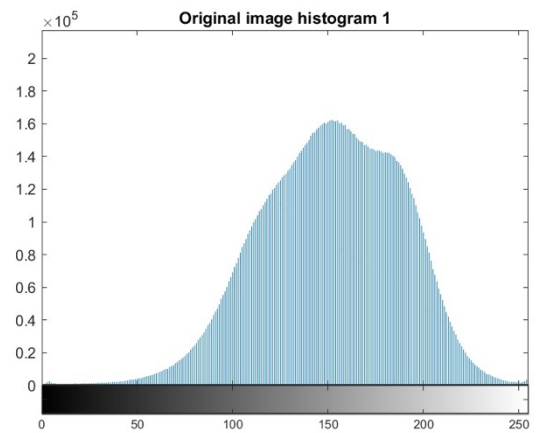
by
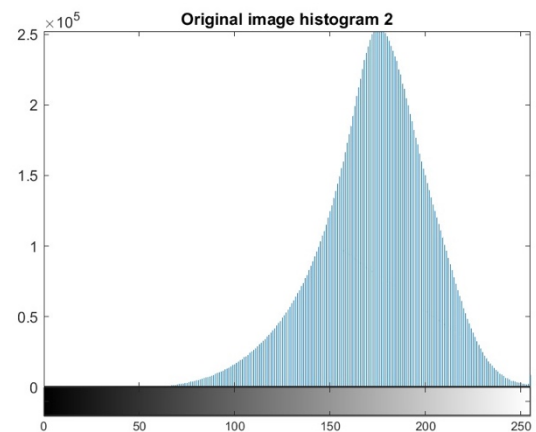**Group 08**

Eyasu Berhane Habte [125461]

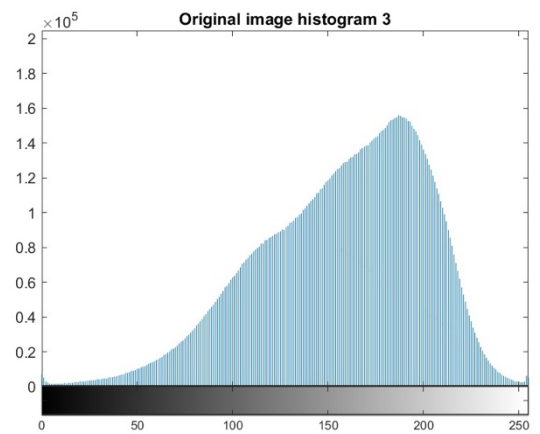Bauhaus-Universität Weimar

Task 1: Data Acquisition

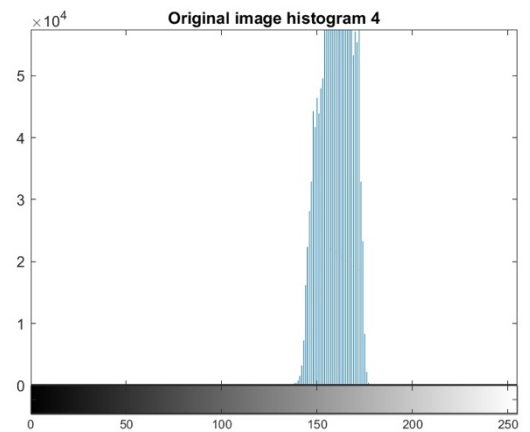Number of pixels: 4608*3456
Location: Postamt, Goetheplatz, Weimar

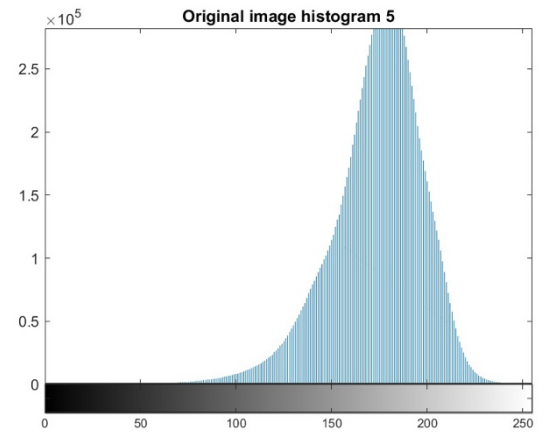Number of pixels: 1201*1600
Location: Merketalstraße 48a

Number of pixels: 4608*3456
Location: Karl-Liebknecht-Straße, Weimar
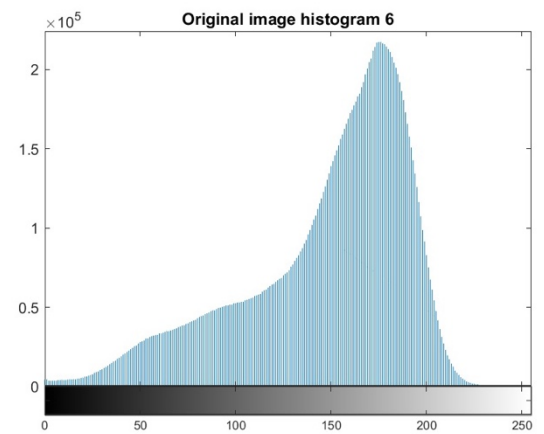

Number of pixels: 4608*3456
Location: Carl Alexandaer Groszherzog Von Sachsen Memorial, Goetheplatz

Bauhaus-Universität Weimar

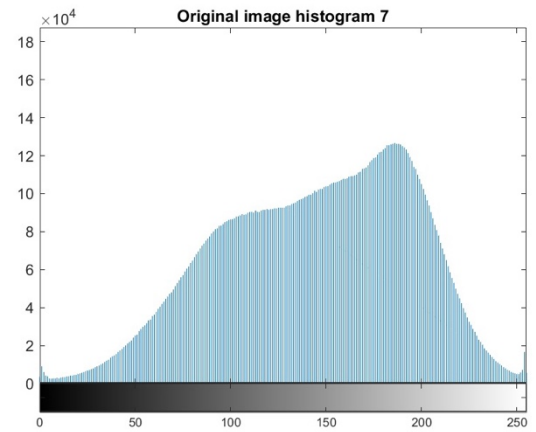Number of pixels: 4608*3456
Location: Goetheplatz

Number of pixels: 4608*3456
Location: Merketalstraße 48a

Bauhaus-Universität Weimar

Number of pixels: 4608*3456
Location: Merketalstraße

Number of pixels: 4608*3456
Location: Arnold-Böcklin-Straße (Gate Pillar), Weimar

Number of pixels: 4608*3456
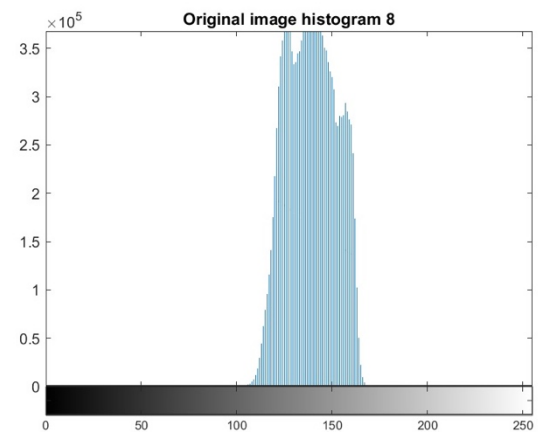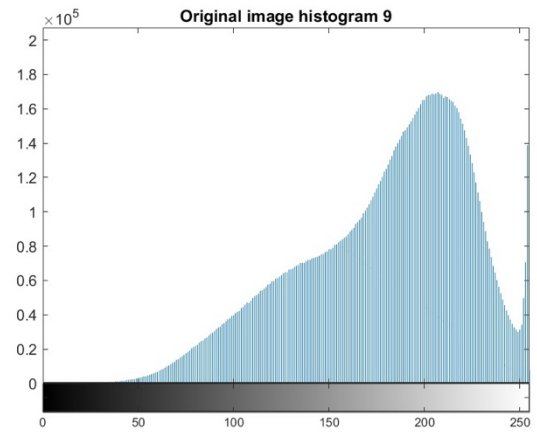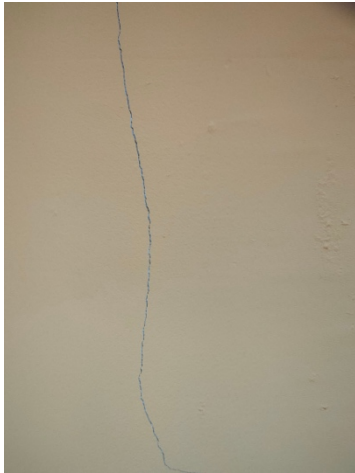Location: Merketalstraße, Weimar
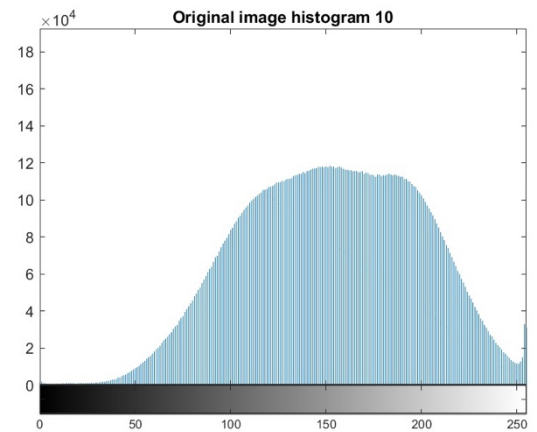
Number of pixels: 4608*3456
Location: Merketalstraße, Weimar
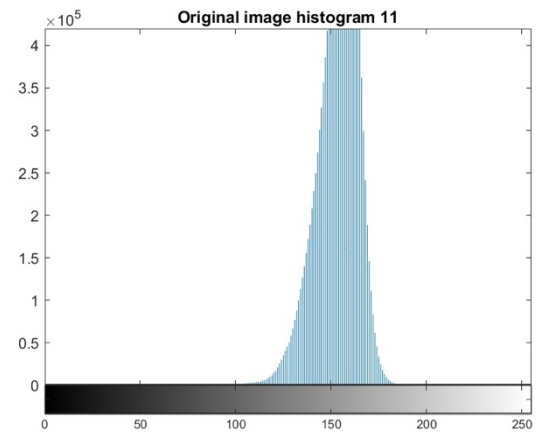
Number of pixels: 4608*3456
Location: Merketalstraße, Weimar

Sl. No.	Stats	Value
1	The number of collected images	11
2	Dataset size after augmentation	38
3	Software used for annotation	GIMP®
4	Annotated images number of crack region	91
5	Annotated images number of non-crack region	9792

In the annotation the cracks are labelled with white (0) as foreground and non-crack regions are labelled with black background (255).

Task 2: Crack Segmentation

Features extracted from the regions obtained from connected component analysis are,
1. Number of pixels
2. Perimeter
3. Eccentricity

The number of pixels and perimeter are selected specifically as the cracks will have less pixels in relation to the perimeter, therefore the classifier will be able to better train and better distinguish between the crack and non-crack regions.

The extracted dataset is split into:
- 80% for training
- 20 % for testing

There are two classifiers used support vector machines and Decision Tree Classifier and the test accuracies are as below:

Accuracy of <u>SVM Classifier: 98.1791%</u>
Accuracy of <u>Decision Tree Classifier: 98.9378%</u>

Task 3: Crack Analytics

Lengths of cracks detected in the <u>test set</u> are as below,

Sl.No.	Length (pixels)
1	58516
2	236693
3	187300
4	358841
5	15919183
6	15328986
7	7024646
8	15817488
9	15875445
10	15797302
11	84285
12	15875445

Comments and observation:

- The decision tree classifier is having an accuracy which is marginally better than support vector machines classifier.
- The accuracy of the model suggests that there might be a possibility of overfitting and diversity in dataset is required, so that the model can work with different types of cracks.
- Furthermore, the features selected, number of pixels and perimeter can be used for training the models and are proving to be effective indicators of crack regions.
- The ratio of the features can be also used for further improvements and understanding.