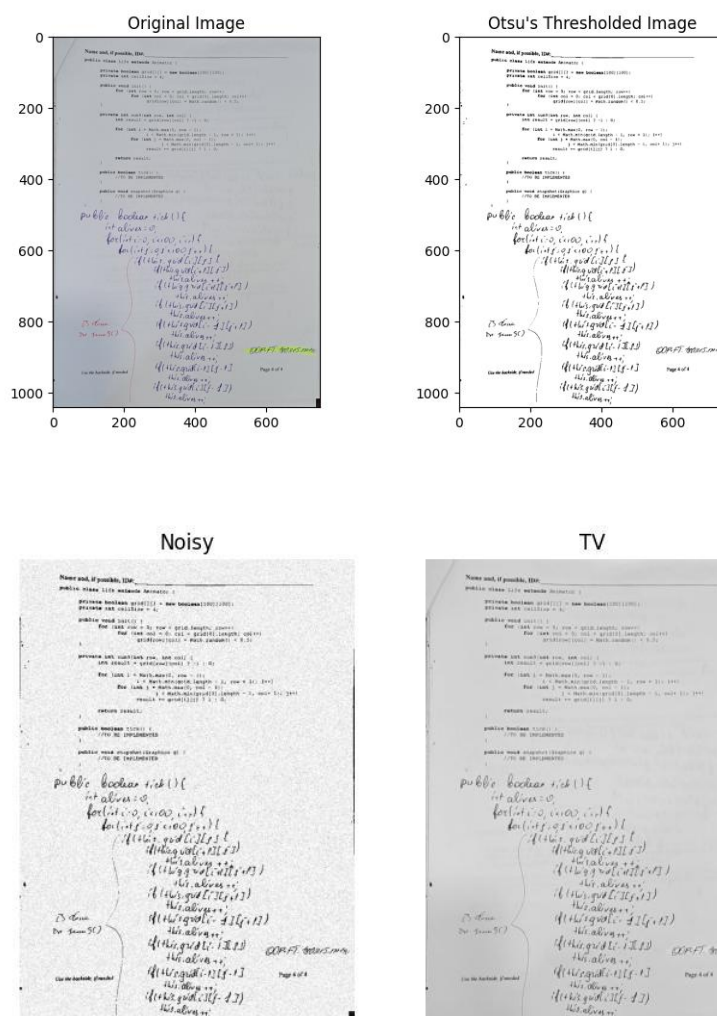Image processing, AUA

Instructor Suren Khachatryan

Paper/Research by Artur Sahakyan

This document describes my research on handwriting areas and features detection on images.

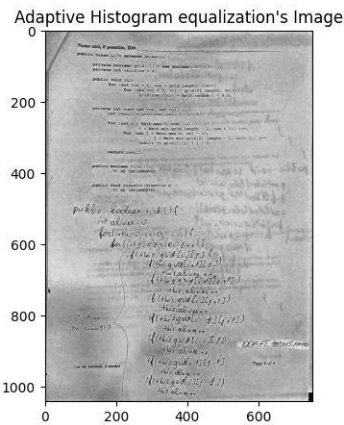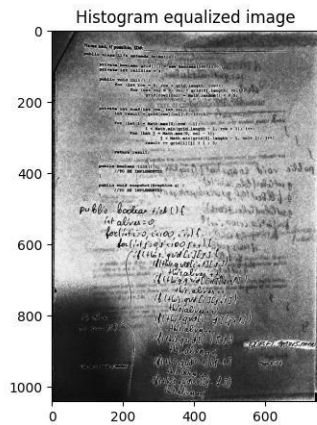This research is part of final project for Image Processing course at AUA.

So, let's start.

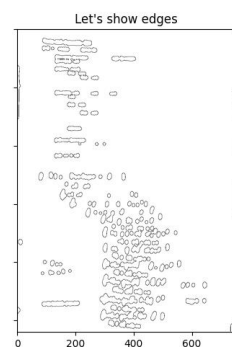First, I've binarized my image with an optimal threshold value.
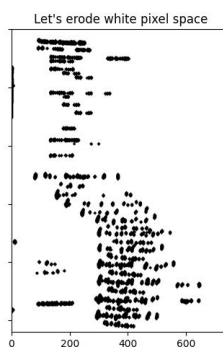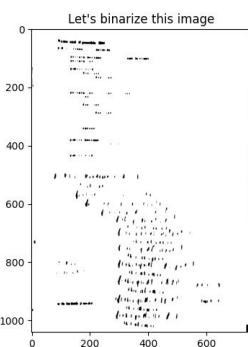

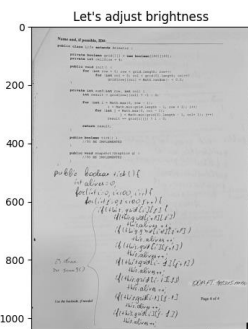Then I tested adding artificial noise and denoising.

Next I tested histogram equalization.

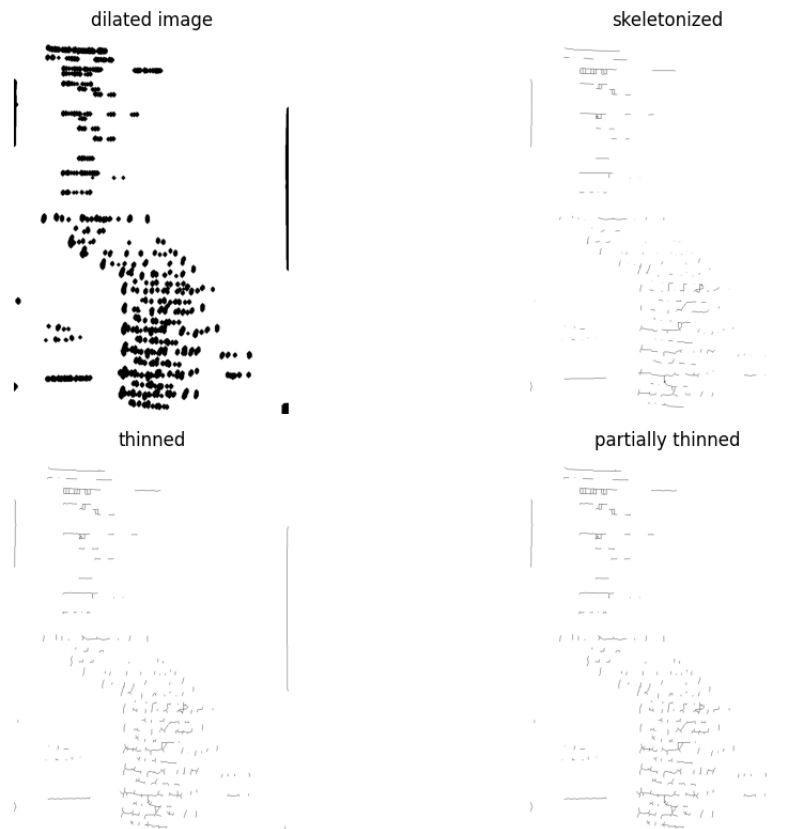Histogram equalized image · Adaptive Histogram equalization's Image

Afterwards I implemented the following process – blur, denoise, binarize, detect edges or skeletonize.
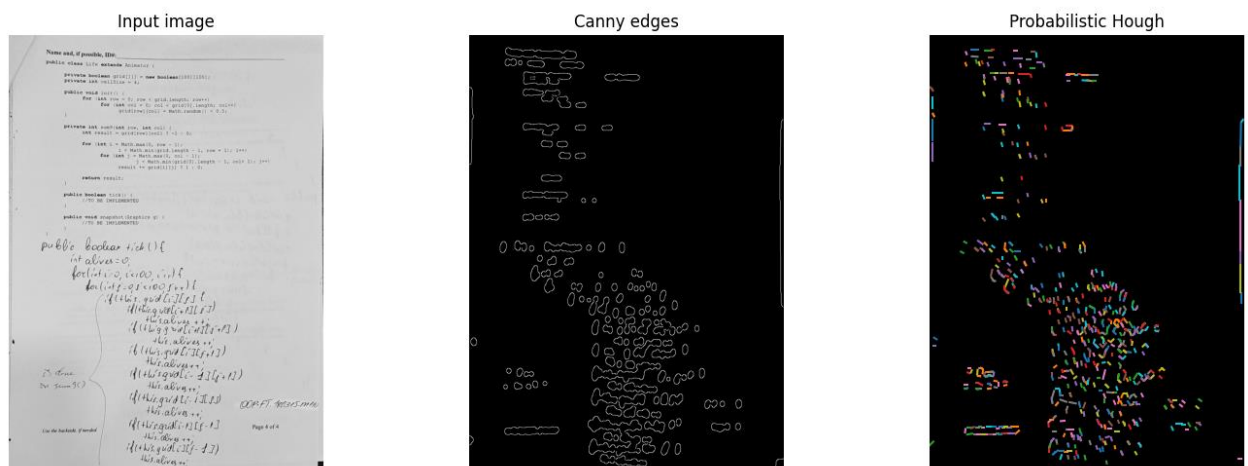
I think skeletonized images contain valuable information about handwriting direction, angle, font size.

But what played a crucial role was detecting straight lines using Probabilistic Hough Transform on the edges of images.


Let's adjust brightness · Let's blur · Let's denoise · Let's binarize this image · Let's erode white pixel space · Let's show edges
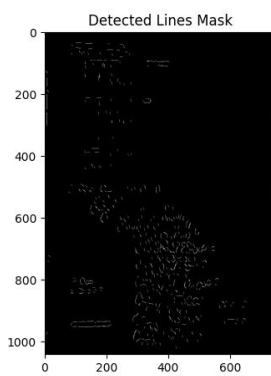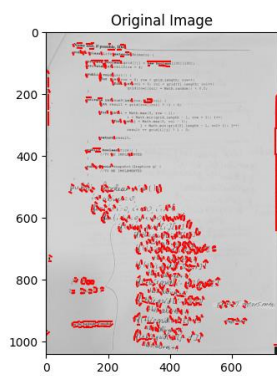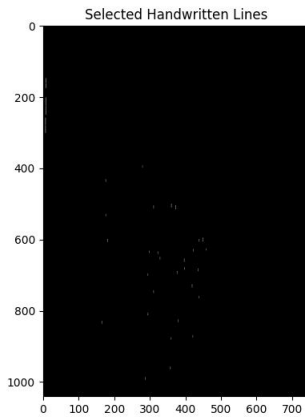
dilated image   skeletonized

thinned   partially thinned

Below let's observe my results for Probabilistic Hough Transform

Input image   Canny edges   Probabilistic Hough

Afterwards I tried to threshold by lines angle, setting angle threshold := π– π /50.
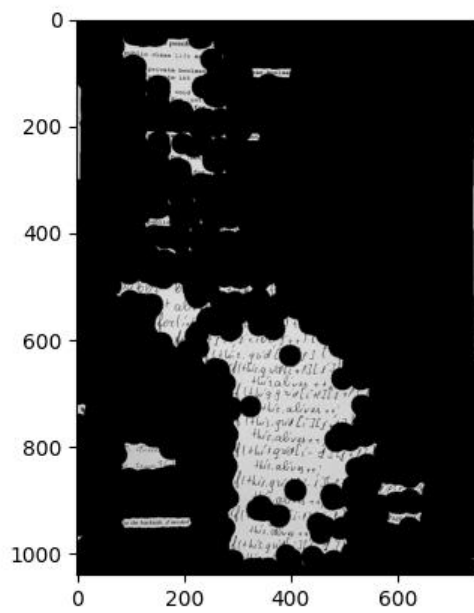
After that, I applied morphological filters to erode/dilate and then with the help of morphological
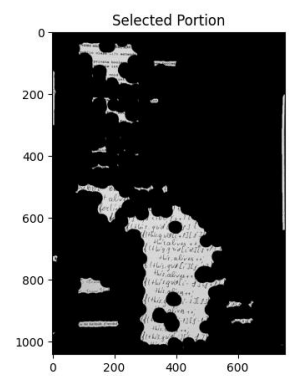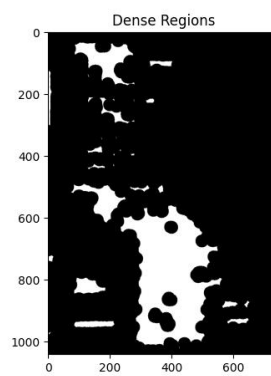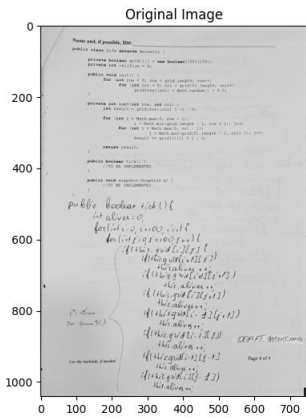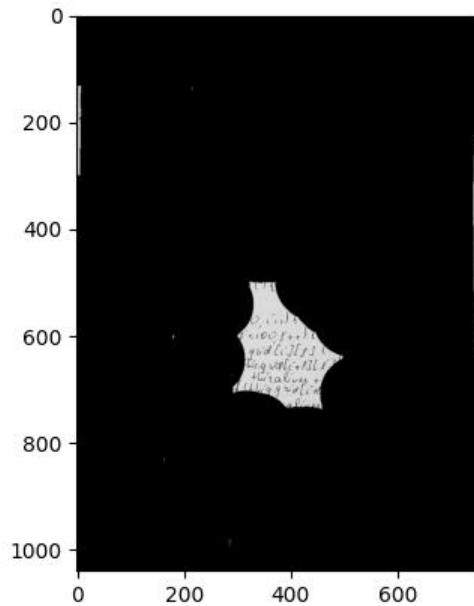
discs show the areas of handwriting.

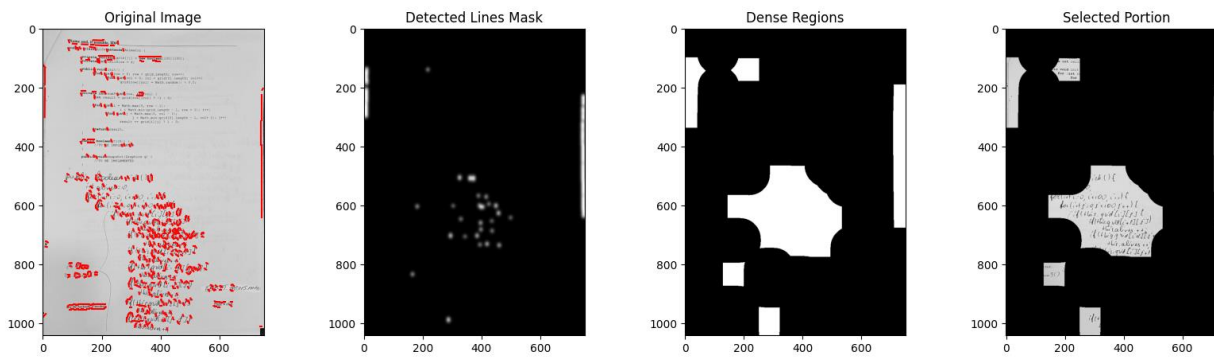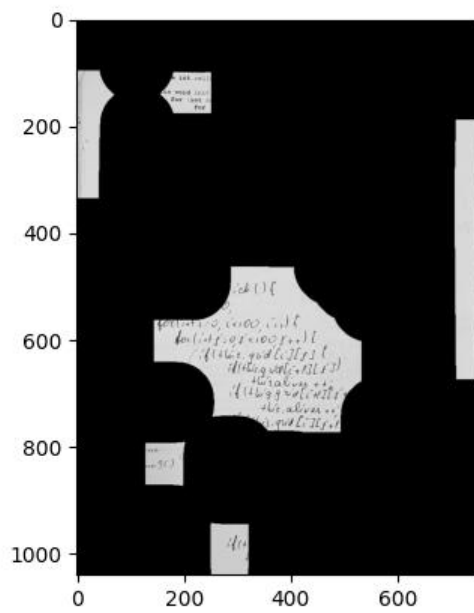Using this information it became possible to know each line's height.
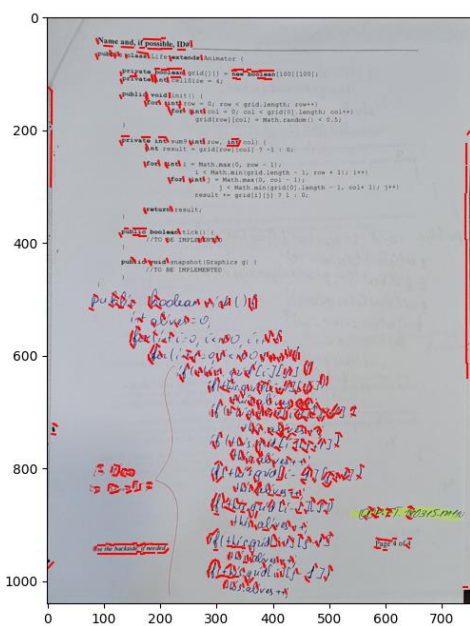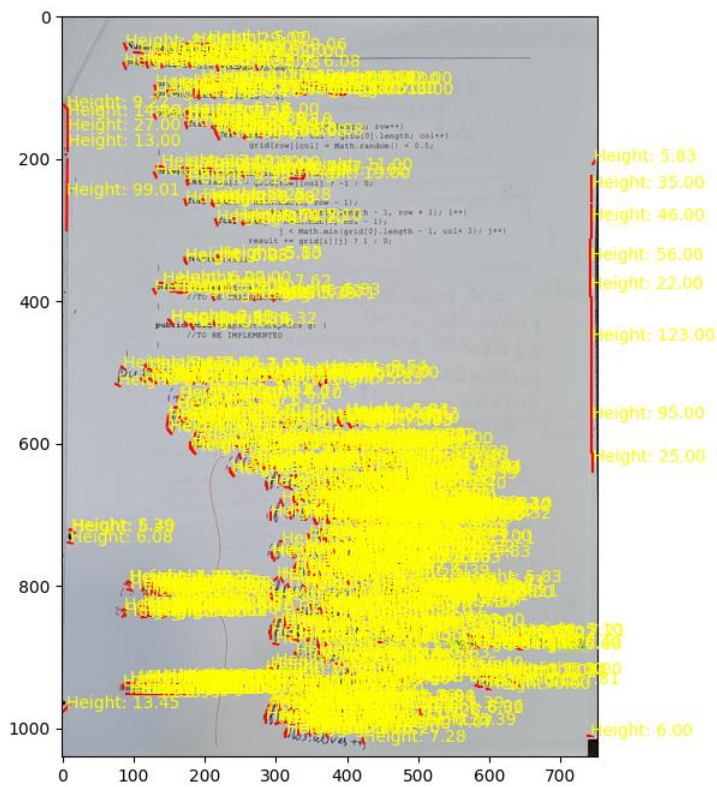
Less penalty applied on threshold value, as we observe some Hough Lines remained from printed part, but when we take into account angle of text results change.
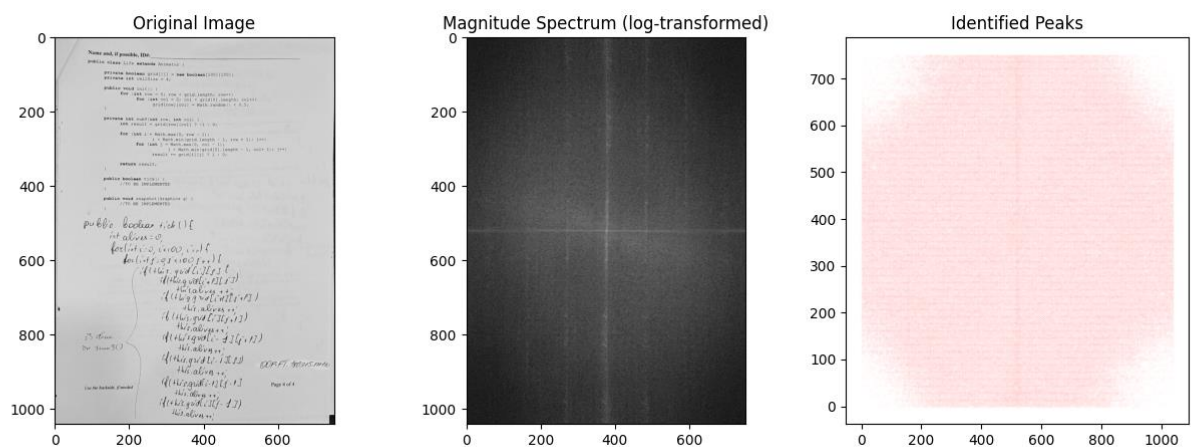

More penalty added.

Let's apply Gaussian Blur

My research also got to include application of fourier transform to have a blurred frame for the image and to

know the peaks of fftshift() on that image.