

COMPUTER VISION

Assignment 1

- 1) Histogram Standardisation,
- 2) Basic spatial filtering,
 - 1) Averaging filter
 - 2) Gaussian filter
 - 3) Laplacian of Gaussian
- 3) Gaussian pyramid

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Histogram Standardisation

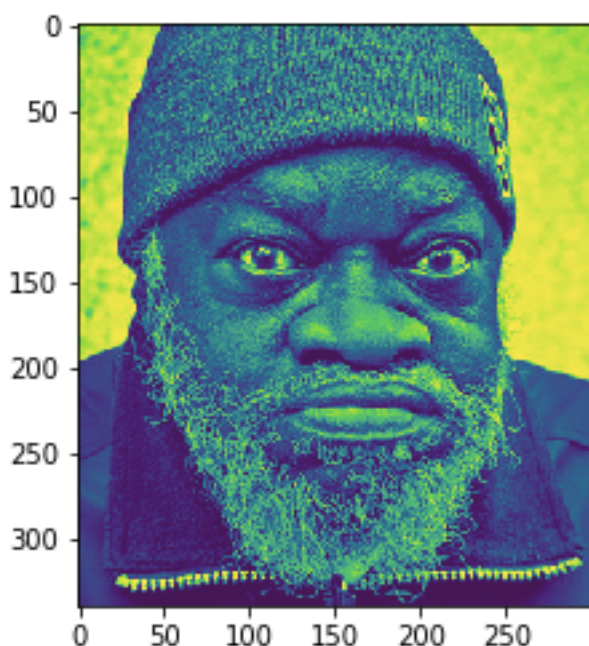
We take an image, which has some specific properties in histogram of the image which we are interested in. We are trying to bring those properties of that particular image in our test image.

In our attempt, I used a face portrait as reference image which I assumed to have better characteristics compared to my test image which was another portrait image from internet.

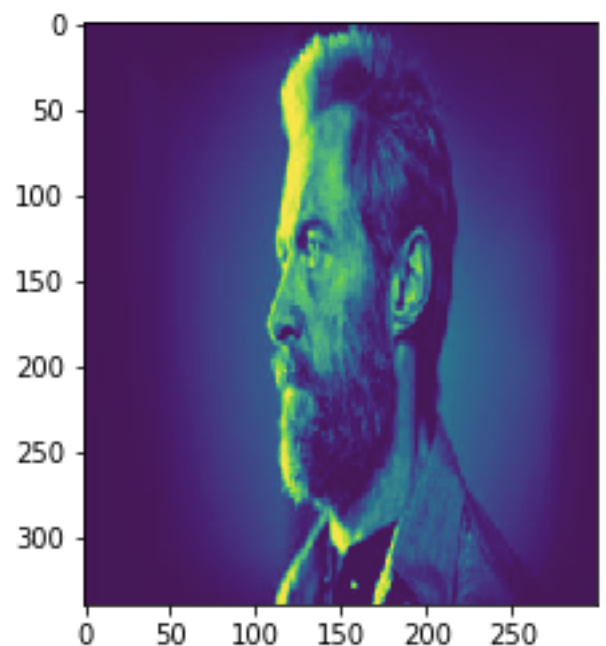
```
ans=[[0 for i in range(300)]for j in range(340)]
for i in range(256):
    sum=0
    l=0
    for j in range(340):
        for k in range(300):
            if datal[j][k]==i:
                sum+=data[j][k]
                l+=1
    val=np.ceil(sum/l)
    for j in range(340):
        for k in range(300):
            if datal[j][k]==i:
                ans[j][k]=val
```

FIG. LOGIC OF PROGRAMME

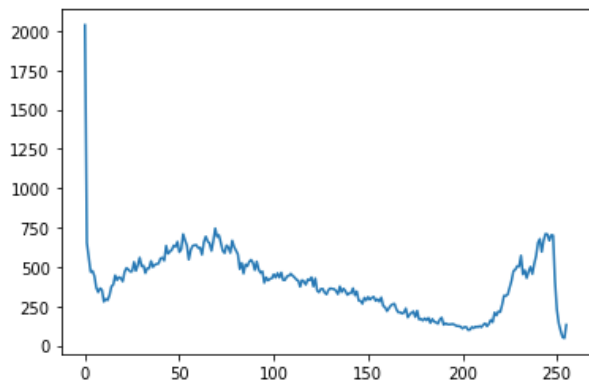
After implementing I got an image which have an histogram given below.



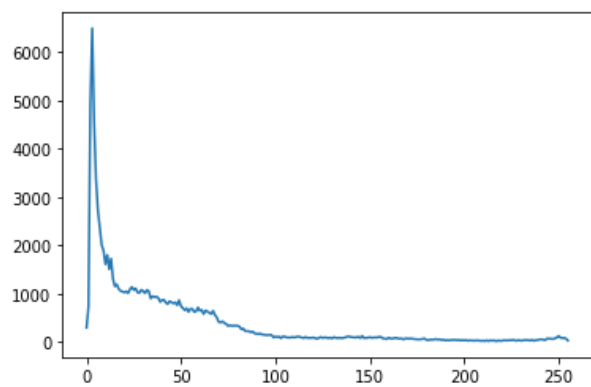
Reference image



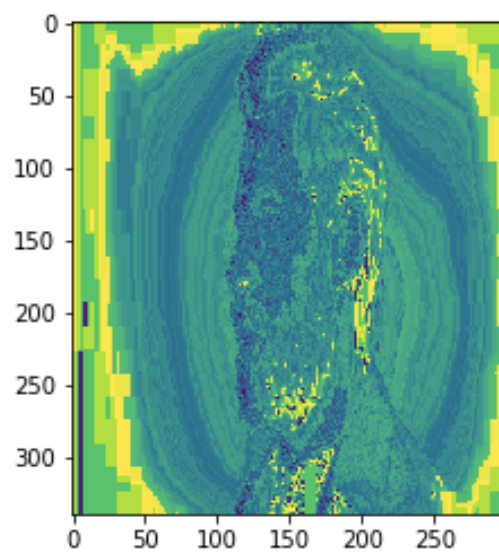
Test image



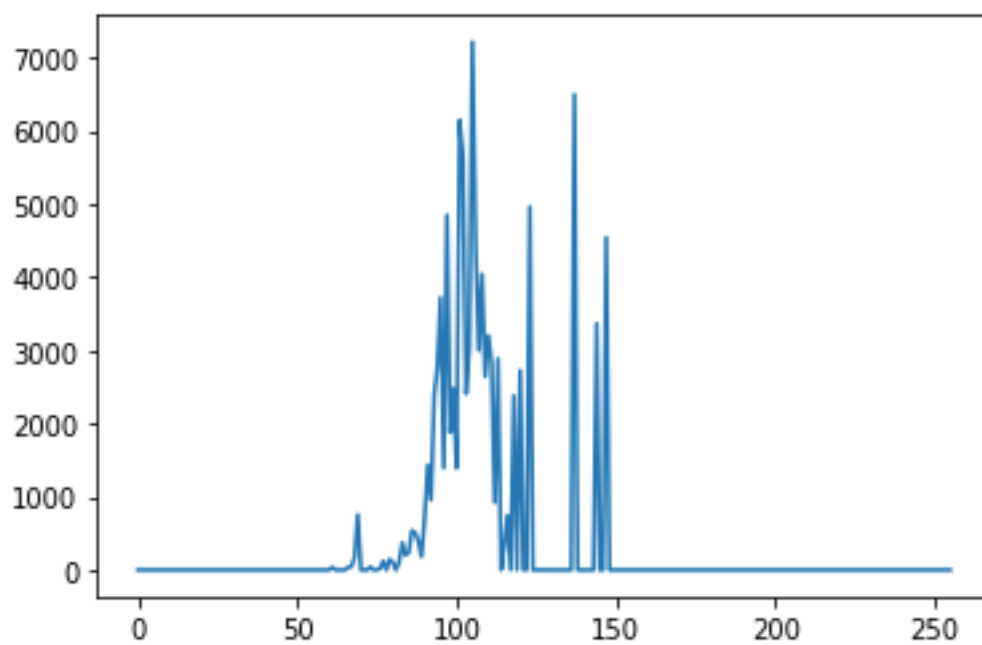
Histogram of Reference image



Histogram of test image



Output image

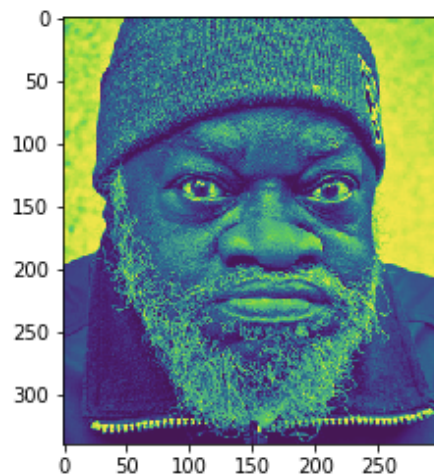


Histogram of output

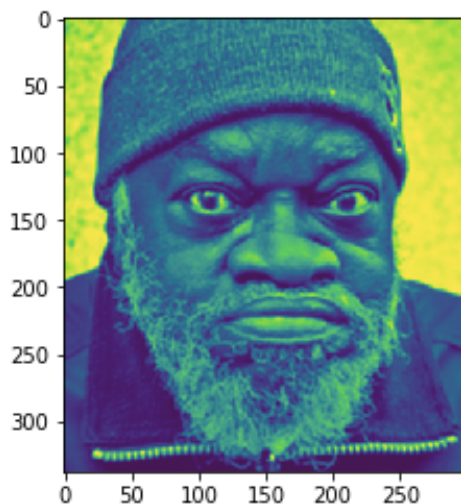
Averaging Filter

Averaging filter adds the whole pixel values under the mask which convolutes over the whole image over different steps calculating individual pixel values of new image.

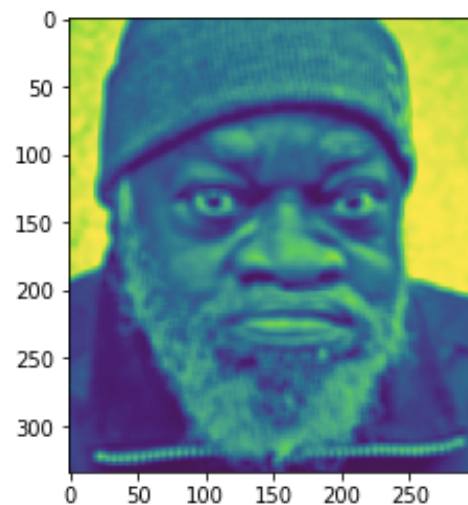
I used a 3×3 filter as an example for the same, which produced an image with very little blur. When I increased the filter size the blur in image become more intense and visible.



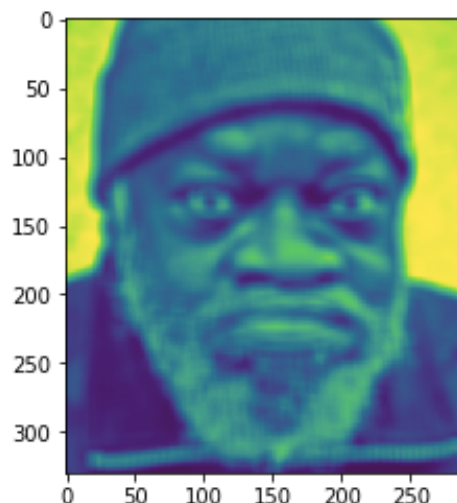
Test image



3×3 filter



5×5 filter

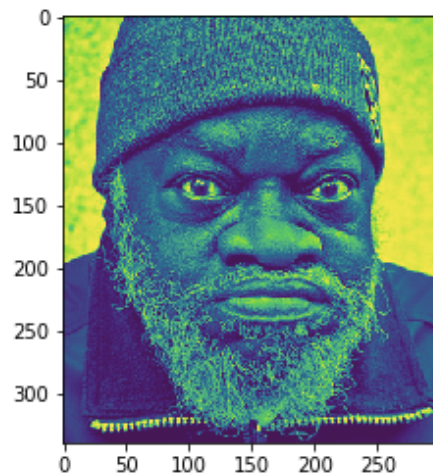


11×11 filter

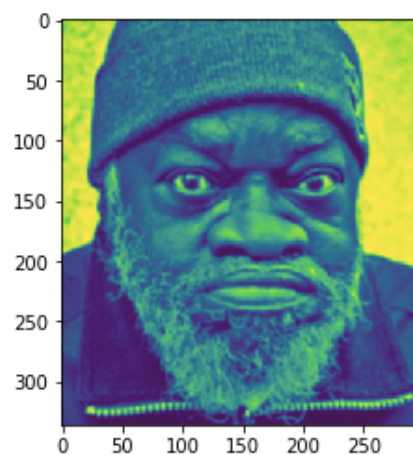
Gaussian Filter

I used a gaussian filter of size 5 x 5 for this purpose. The resultant image was more smooth than the original image.

Gaussian filter reduces the noise and blurs the image edges and reduces its contrast.



Test image

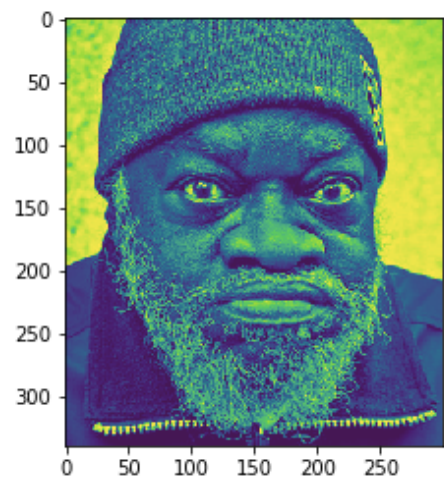


Output of gaussian filter

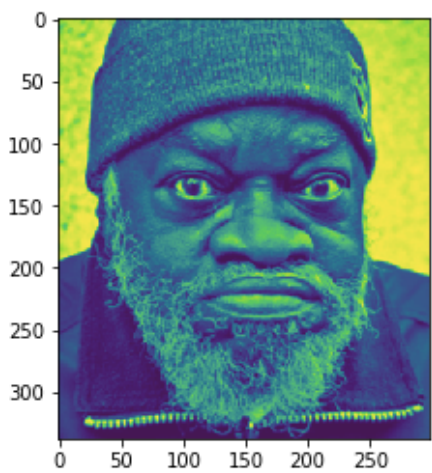
```
fill = [[1 / 256, 4 / 256, 6 / 256, 4 / 256, 1 / 256],  
        [4 / 256, 16 / 256, 24 / 256, 16 / 256, 4 / 256],  
        [6 / 256, 24 / 256, 36 / 256, 24 / 256, 6 / 256],  
        [4 / 256, 16 / 256, 24 / 256, 16 / 256, 4 / 256],  
        [1 / 256, 4 / 256, 6 / 256, 4 / 256, 1 / 256]]
```

Filter

High Pass

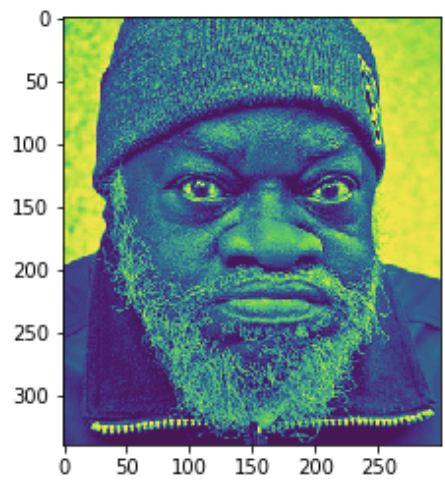


Test image

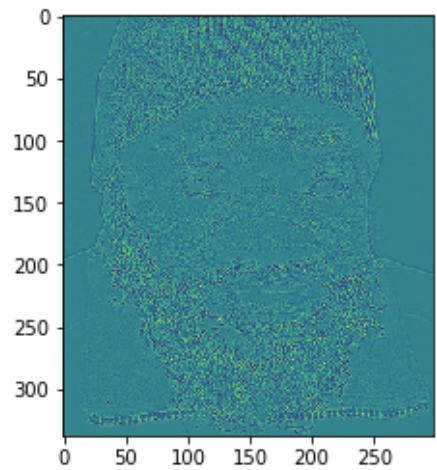


Output image

Laplacian filter

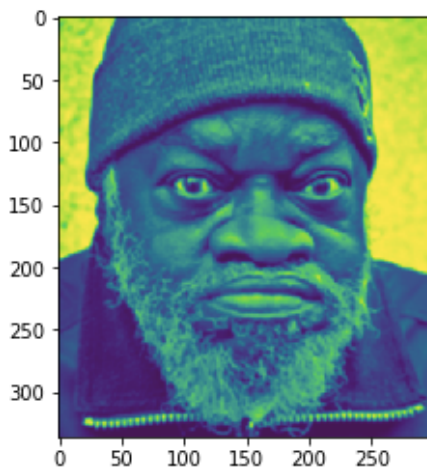


Test image

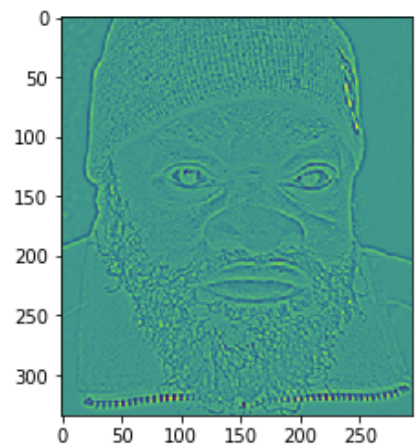


Output of laplacian filter

Laplacian after gaussian

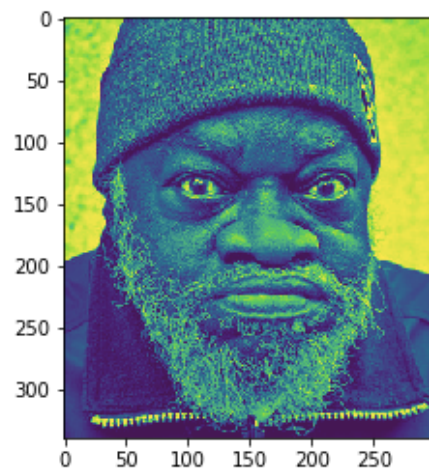


Output of gaussian

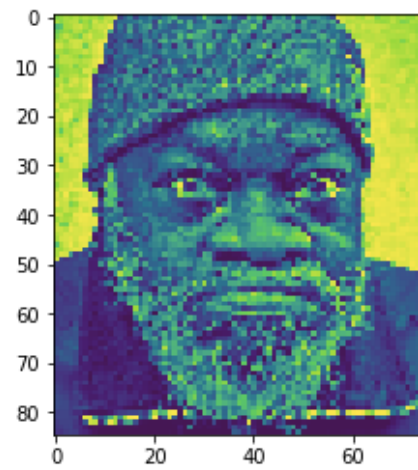


Output of laplacian filter
After gaussian

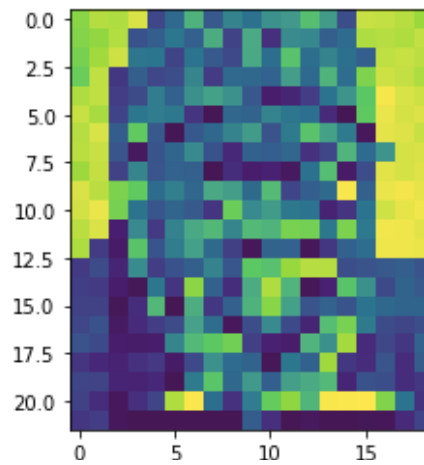
Gaussian Pyramid



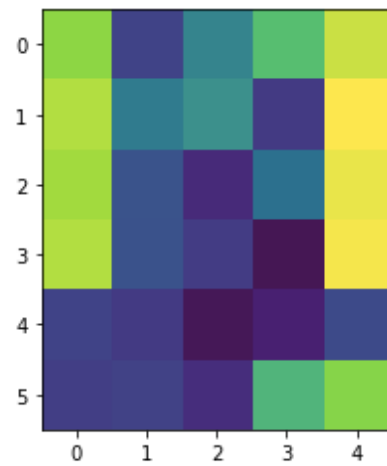
Test image



1st stage



2nd stage



3rd stage

Conclusion

Standardisation helps in getting desired properties in the histogram of one image in other image.

Averaging filter blurs the image and the intensity of blurring is directly proportional to the size of the filter used.

Gaussian filter reduces the noise and blurs the image edges and reduces its contrast.

High pass filter reduces the contrast of the image.

Laplacian gives the high pixel values for edge changes, ie 2nd order derivative of the image, while if we perform laplacian filtering after gaussian filtering then we get a more smooth laplacian filter output compared to that of initial image.

pyramid is plotted using sampling image at decreasing frequencies.