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DA-2

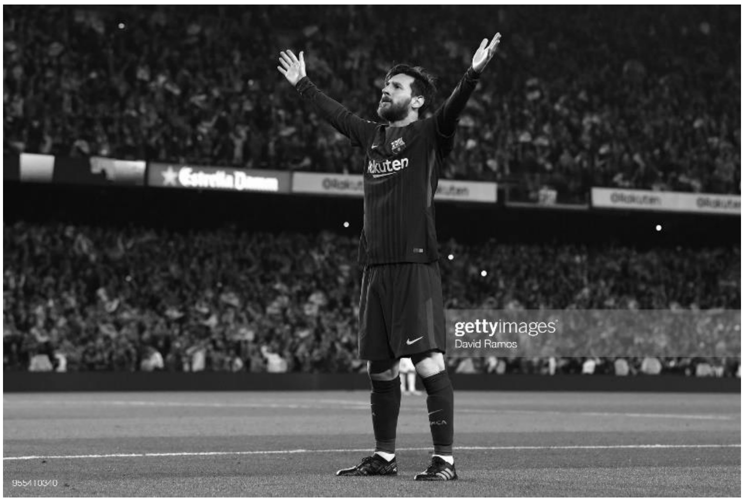
1. Take your picture, convert into a grey scale image and perform the following point

operations (choose appropriate constants):

Converting to GreyScale image first :-

Initial Image

After Conversion



Code for GrayScale Conversion :-

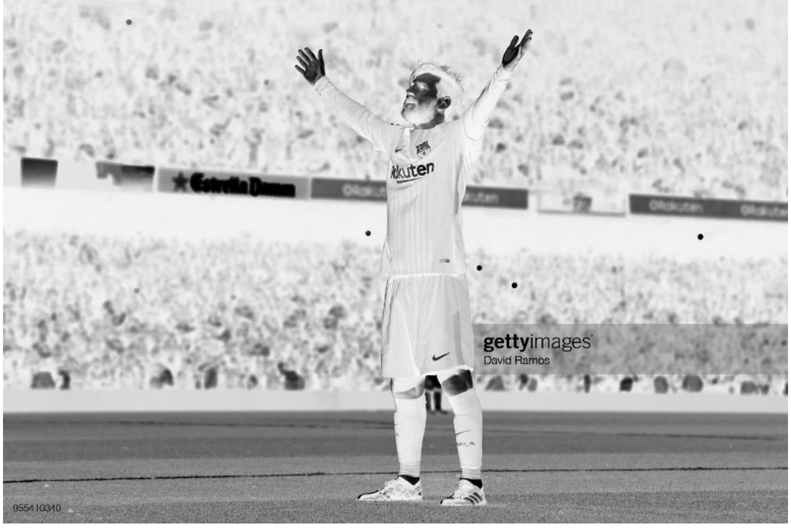
```
import numpy as np
import cv2 as ll
img = ll.imread("D:\VIT\Second-Yr-Winter\SignalProcessing_TH\DA2\messi.jpg",0)
ll.imshow("output",img)
ll.imwrite('new.jpg',img)
ll.waitKey(0)
ll.destroyAllWindows()
```

a. Image Negation

Code :-

```
import cv2 as cv

img = cv.imread('new.jpg',0)
img1 = 255 - img

cv.imshow('input',img)
cv.imshow('image negated',img1)
cv.imwrite('new1.jpg',img1)
cv.destroyAllWindows()
```

Output



b. Log transformation

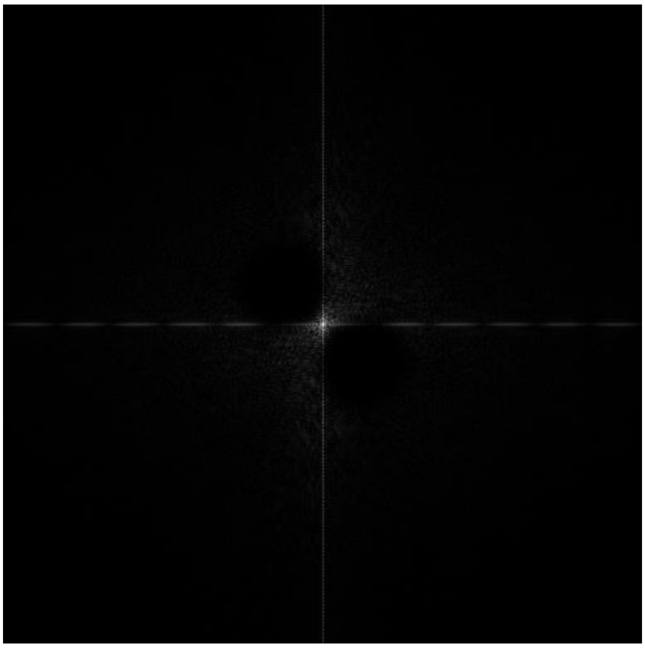
Code :-

```
import cv2 as cv
import numpy as np

img = cv.imread('log.png',0)
img1 = np.uint8(np.log1p(img))

th = 1
out = cv.threshold(img1,th,255,cv.THRESH_BINARY)[1]

cv.imshow('input',img)
cv.imshow('out',out)
cv.imwrite('new2.jpg',out)
cv.destroyAllWindows()
```

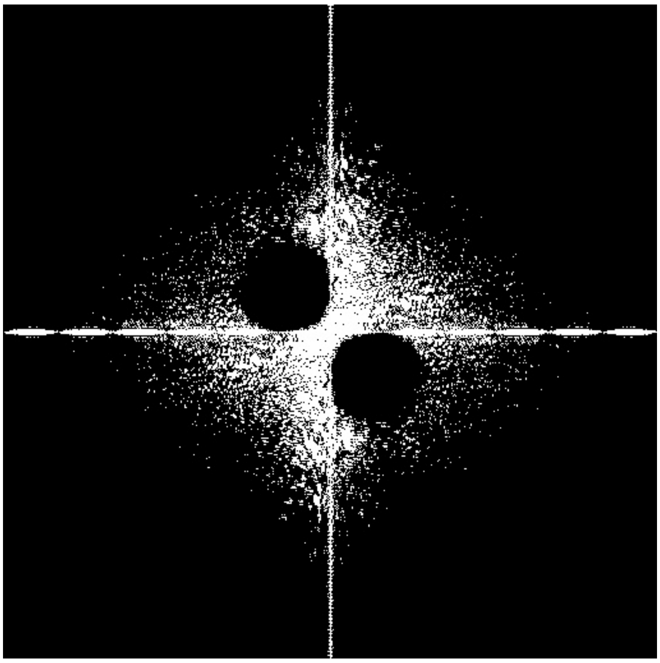
Output

C = 50

Initial Image



After Log Transformation



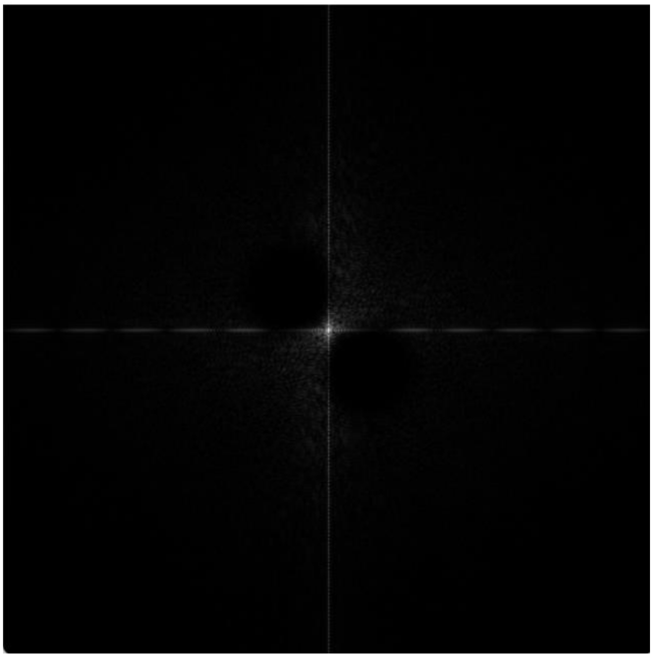
c. Gamma correction

Code :-

```
import cv2 as cv
import numpy as np

img1 = cv.imread('log.png',0)

gamma = 2
img2 = np.power(img1,gamma)

gamma = 3
img3 = np.power(img1,gamma)

gamma = 4
img4 = np.power(img1,gamma)

cv.imshow('input',img1)
cv.imshow('img2',img2)
cv.imshow('img3',img3)
cv.imshow('img4',img4)

cv.waitKey(0)
cv.destroyAllWindows()
```

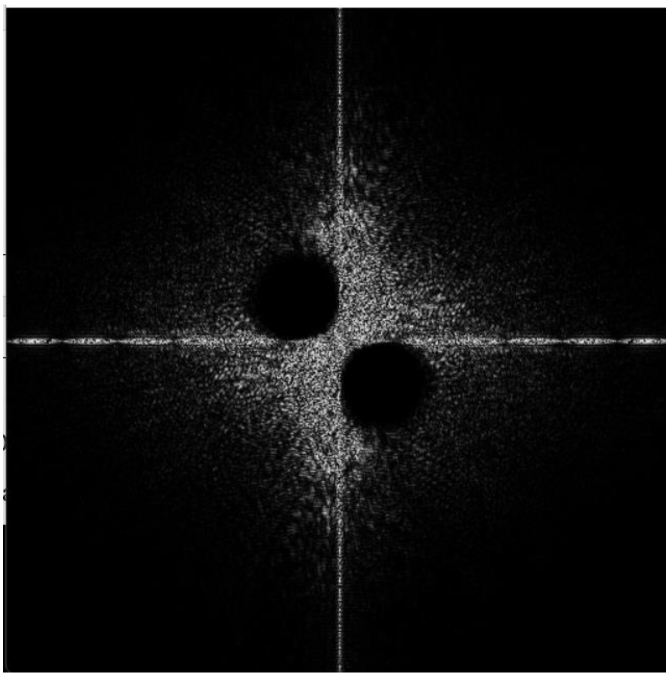
Output

Initial Image



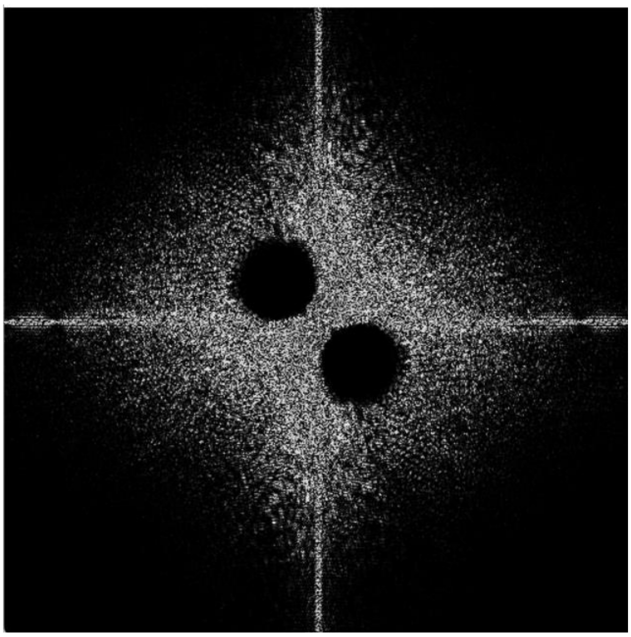
After applying Gamma Transformation

(Gamma = 2)



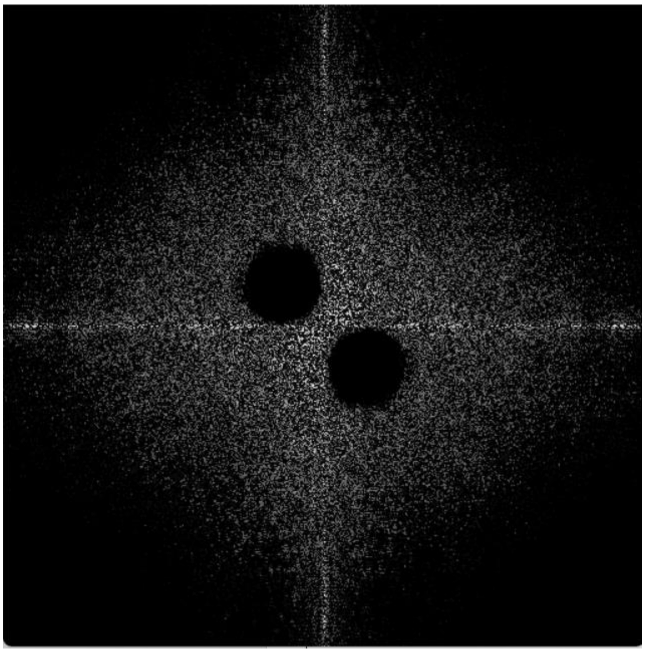
After applying Gamma Transformation

(Gamma = 3)



After applying Gamma Transformation

(Gamma = 4)



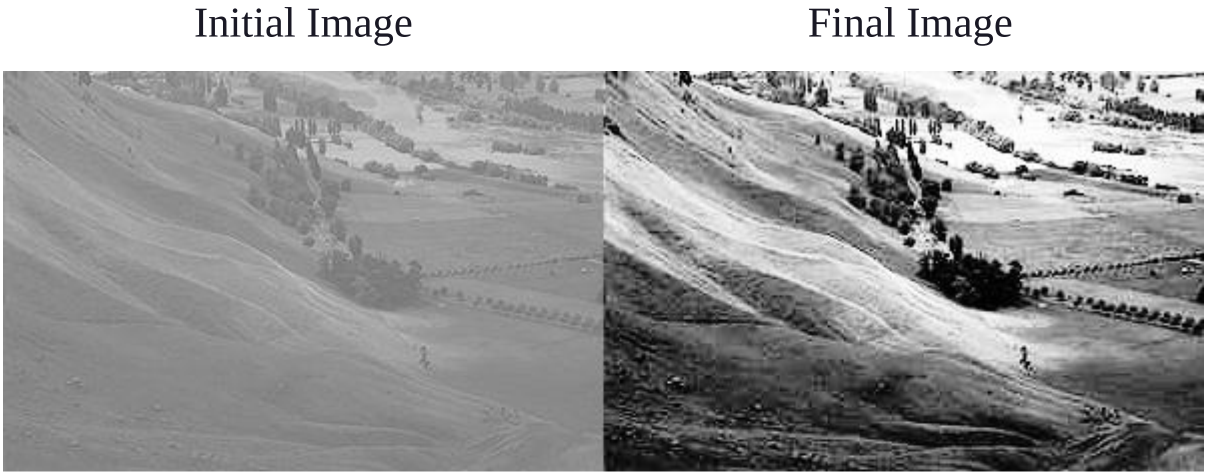
2. Consider an image of your choice and perform histogram equalization and histogram matching. Choose a gray scale image or a colour image

Histogram Equalization

Code :-

```python
import cv2 as cv
import numpy as np

img = cv.imread('histogram.jpg',0)
equ = cv.equalizeHist(img)
res = np.hstack((img,equ))
cv.imwrite('new3.png',res)
```

Output



Initial Image

Final Image

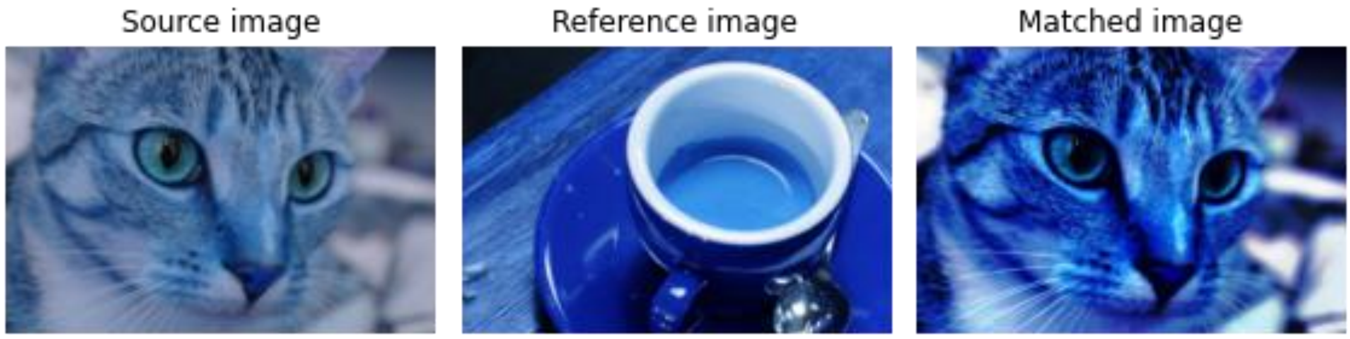
Histogram Matching

Code :-

```python
import matplotlib.pyplot as plt
from skimage import data
import cv2 as cv
from skimage import exposure
from skimage.exposure import match_histograms

# loading data
reference = cv.imread('reference.png')
```

```
image = cv.imread('source.png')

matched = match_histograms(image, reference,
                           multichannel=True,)

fig, (ax1, ax2, ax3) = plt.subplots(nrows=1,
                                    ncols=3,
                                    figsize=(8, 3),
                                    sharex=True,
                                    sharey=True)
for aa in (ax1, ax2, ax3):
    aa.set_axis_off()

# displaying images
ax1.imshow(image)
ax1.set_title('Source image')
ax2.imshow(reference)
ax2.set_title('Reference image')
ax3.imshow(matched)
ax3.set_title('Matched image')

plt.tight_layout()
plt.show()
```

Output



Source image

Reference image

Matched image

3.Take any of the image from the above link and perform both mean, median and Gaussian filters on it. Compare the results with respect to PSNR (peak signal to noise ratio)

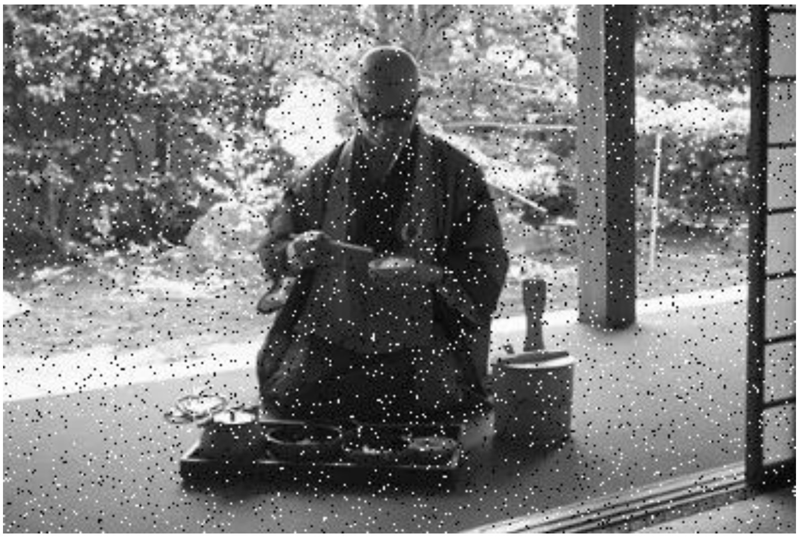
Using Mean Filters

Code (Done Using Matlab) :-

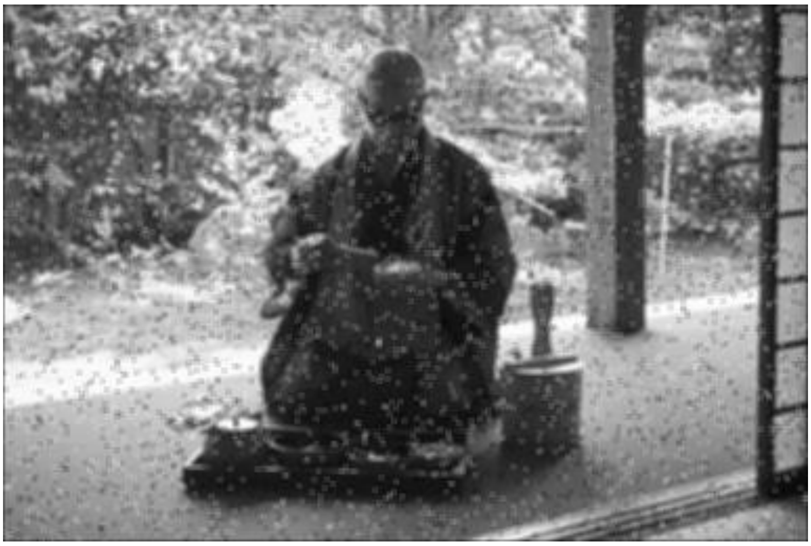
```
img = imread('salt.png');
filter = ones(3,3)/9;

img1 = imfilter(img,filter);

subplot(2,2,1),imshow(img),title('with salt&pepper noise');
subplot(2,2,2),imshow(img1),title('after removing salt&pepper
noise');

imwrite(img1,'final.png');

[psnr,snr] = psnr(img1,img);
fprintf('PSNR value : %0.5f',psnr);
```

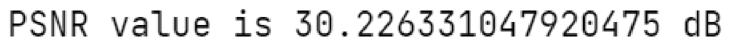
Output

Initial Image



Applying a Mean Filter





```
PSNR value is 30.226331047920475 dB
```

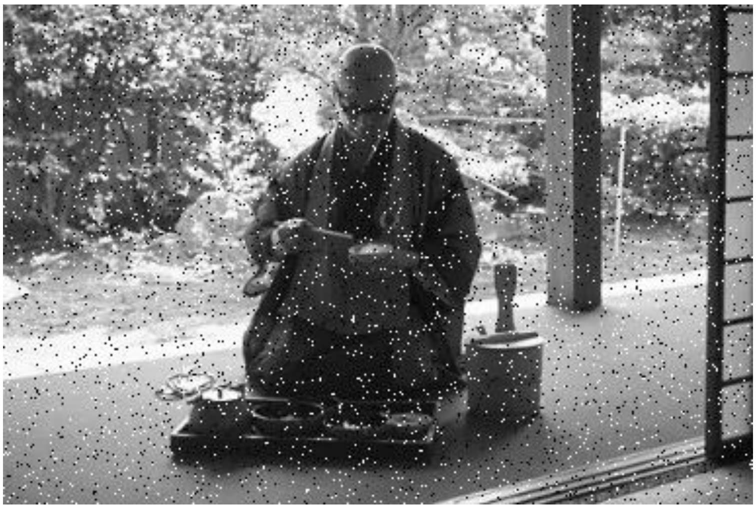
Using Median Filter

Code :-

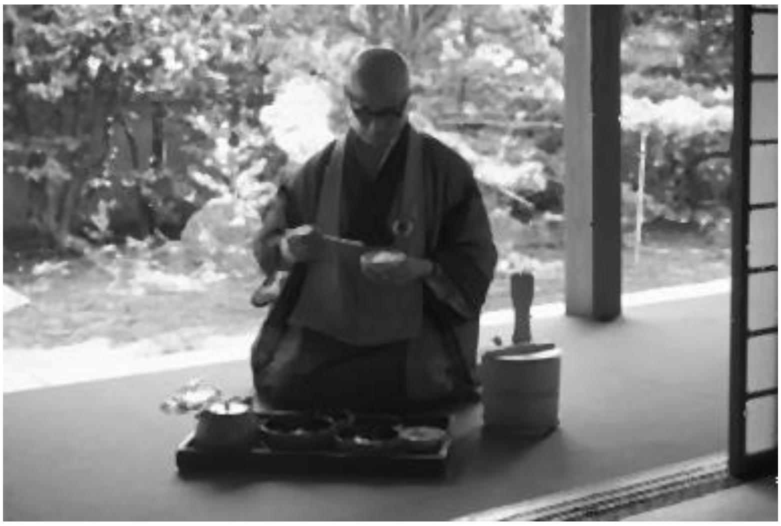
```
import cv2 as cv
from skimage.filters.rank import median
from skimage.morphology import disk
img = cv.imread('salt.png',0)

out1 = cv.medianBlur(img,3)

cv.imshow('Original',img)
cv.imshow('CV2 Median',out1)
cv.imshow('Using Skimage',out2)

cv.imwrite('new6.png',out1)

cv.waitKey(0)
cv.destroyAllWindows()
```

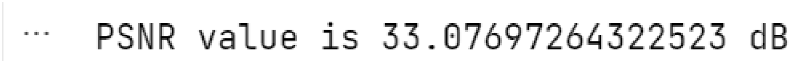
Output

Initial Image



Applying a Median Filter





```
PSNR value is 33.07697264322523 dB
```

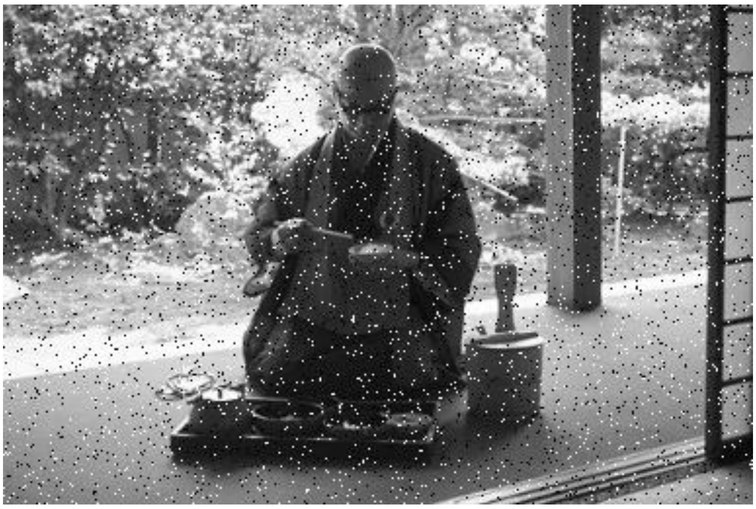
Using Gaussian Filter

Code :-

```
import cv2 as cv
from skimage import img_as_float,io
from skimage.filters import gaussian

img = cv.imread('salt.png',0)

out1 = cv.GaussianBlur(img,(3,3),0,borderType = cv.BORDER_CONSTANT)
# using cv2 package
out2 = gaussian(img,sigma = 1,mode = 'constant',cval = 0.0) # using skimage package

cv.imshow('Original',img)
cv.imshow('Using CV2 Gaussian',out1)
cv.imshow('Using Skimage',out2)
cv.imwrite('new5.png',out2)
cv.waitKey(0)
cv.destroyAllWindows()
```

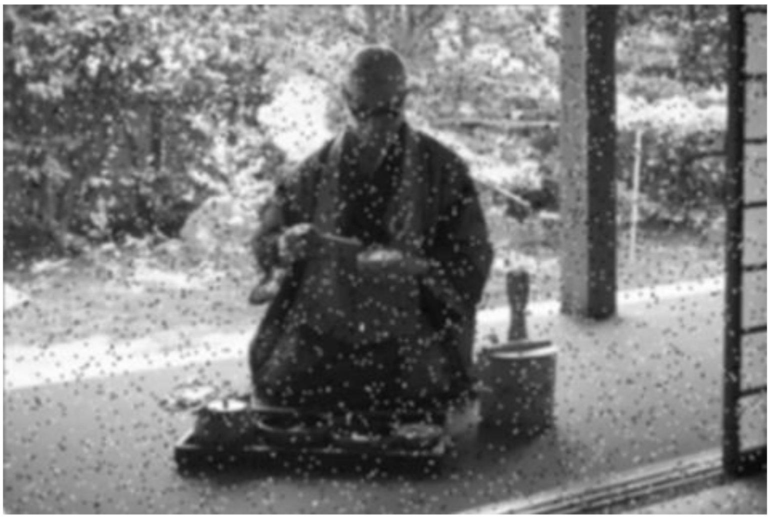
Output

Initial Image

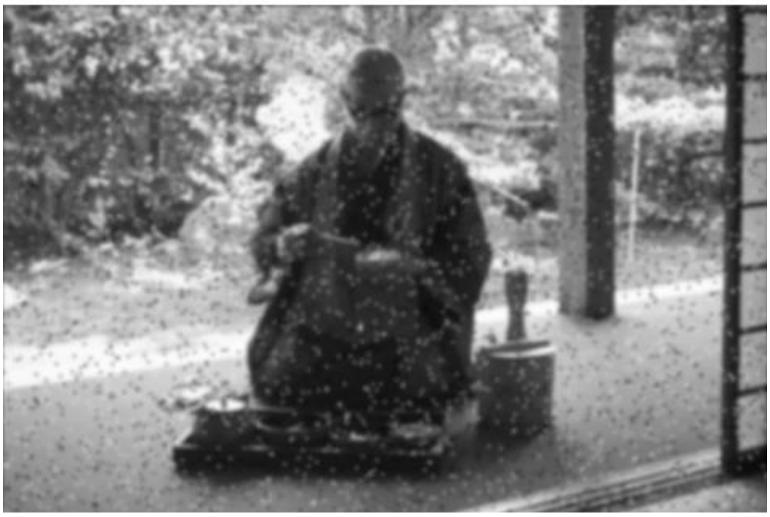


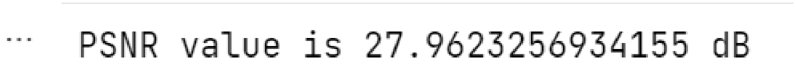
After applying Gaussian Image

(Using CV2 Package)



(Using Skimage Package)





```
...   PSNR value is 27.9623256934155 dB
```