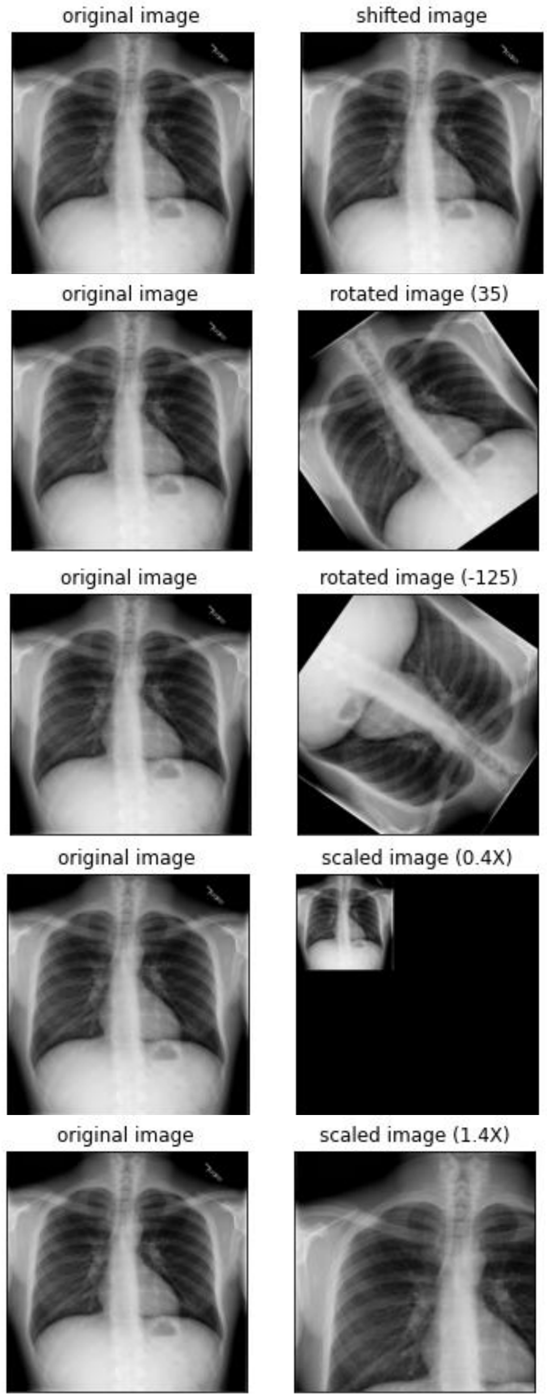
ED6001: Medical Image Analysis

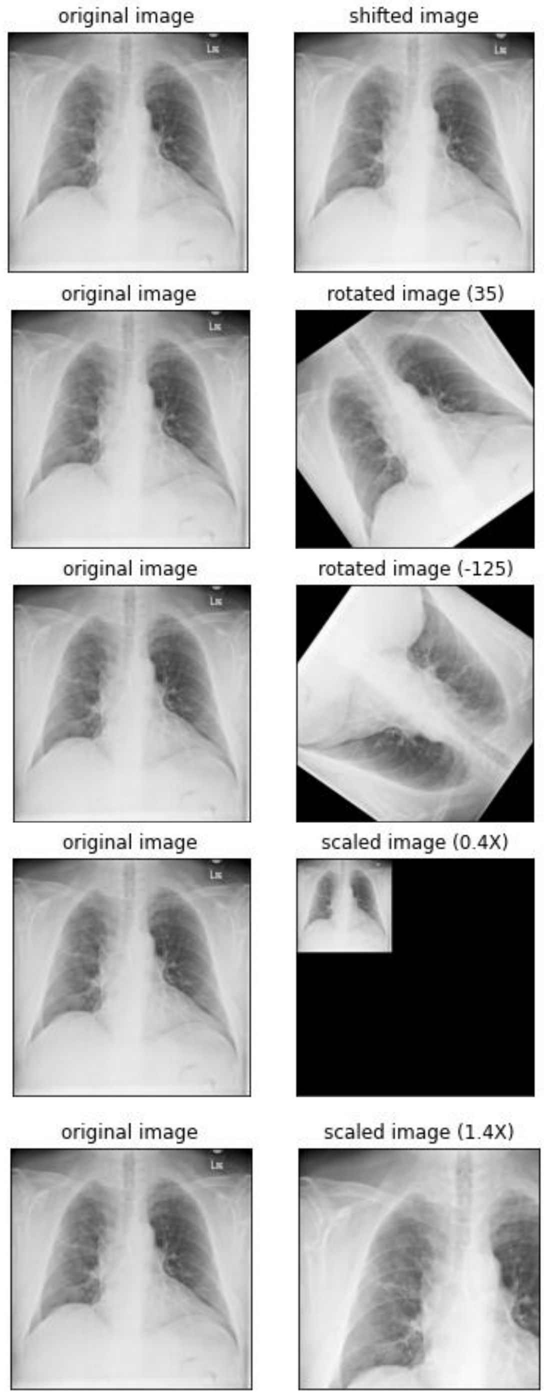
Programming Assignment 1

Name: Mohammad Al Fahim K **Roll No.:**EE21S050

1. **Brief Description:**
   To translate the images by $tx = 5.5, ty = 4.4$ pixels, rotate the images by 35° and -125°, and to scale the images by 0.4 and 1.4

   Results:





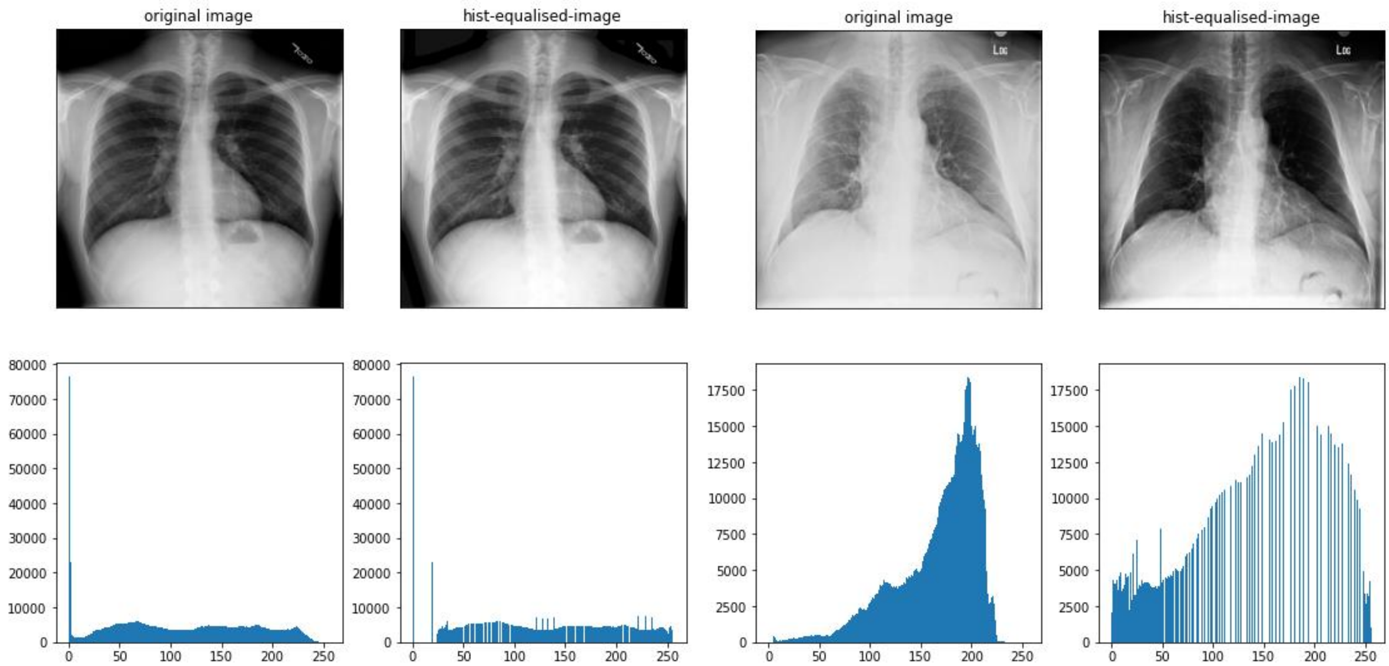
Observations:

There is no visible difference between the translated images and the original images because of the small amount of shift compared to the huge size of the images. The corners of the rotated images are cut out due to the fixed window size.

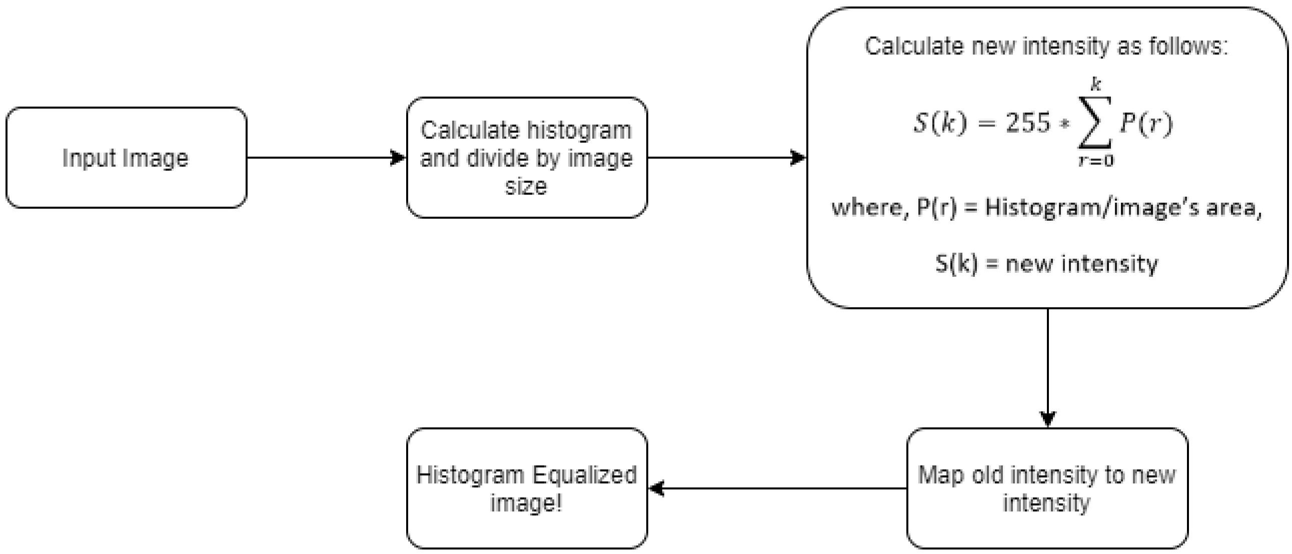
2. Brief Description

To apply Histogram Equalisation on all the given images

Results:



Flowchart:



Pseudo Code:

- img = Input(image)
- H = histogram(img)/size(img)
- for loop i in H: z[i] = 255*sum(H[:i])
- z = round(z)
- for loop (i,j) in img.shape: new_img[i,j] = z[img[i,j]]
- return uint8(new_img)

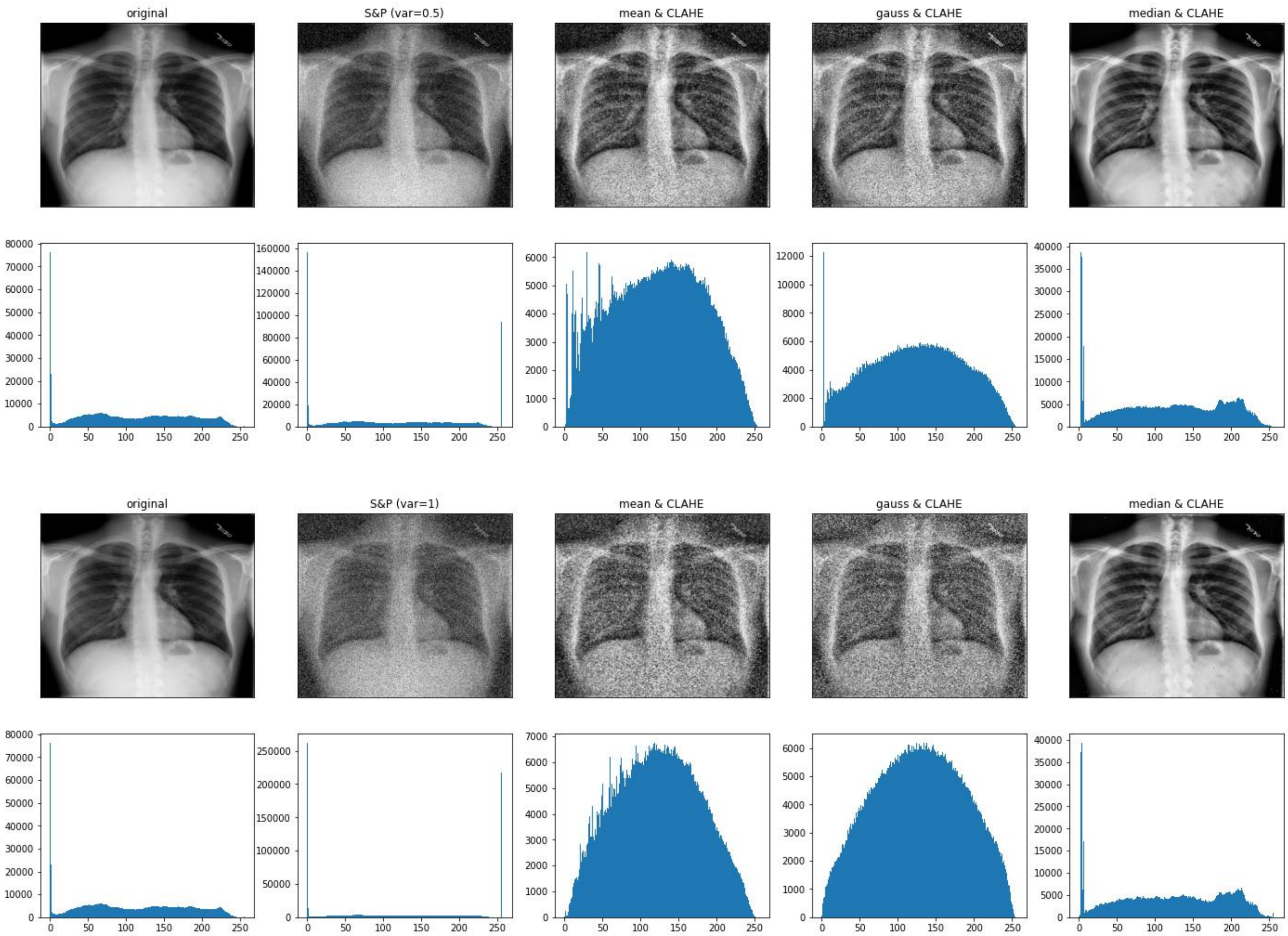
Observations:

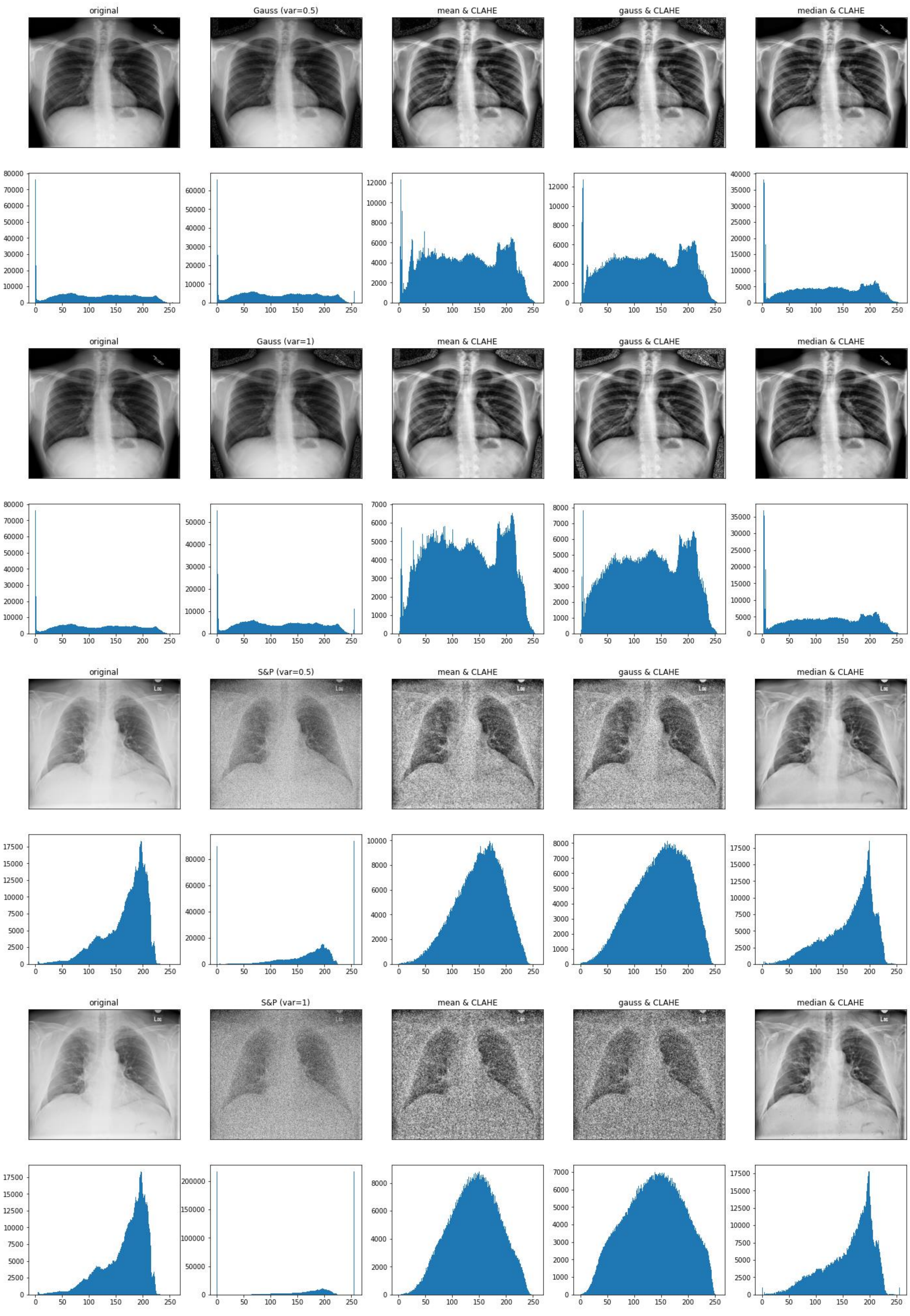
Since the first image has even histogram distribution and good contrast there is not much improvement by histogram equalization. In the second image, histogram equalization has improved the contrast and hence, the bones in the left and right sides are much more clearly visible.

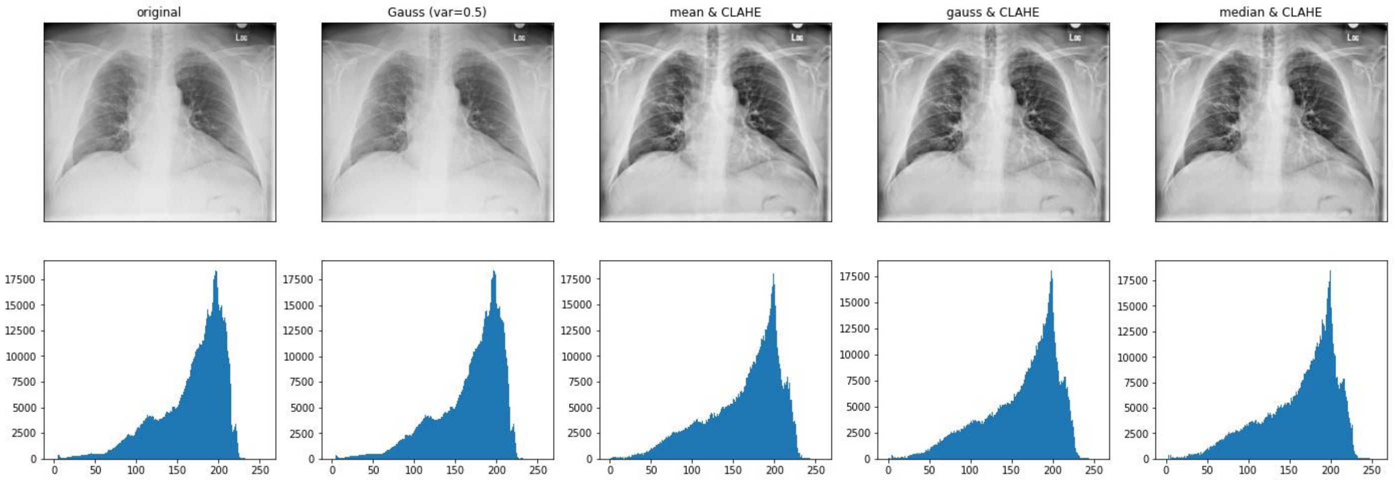
3. Brief Description:

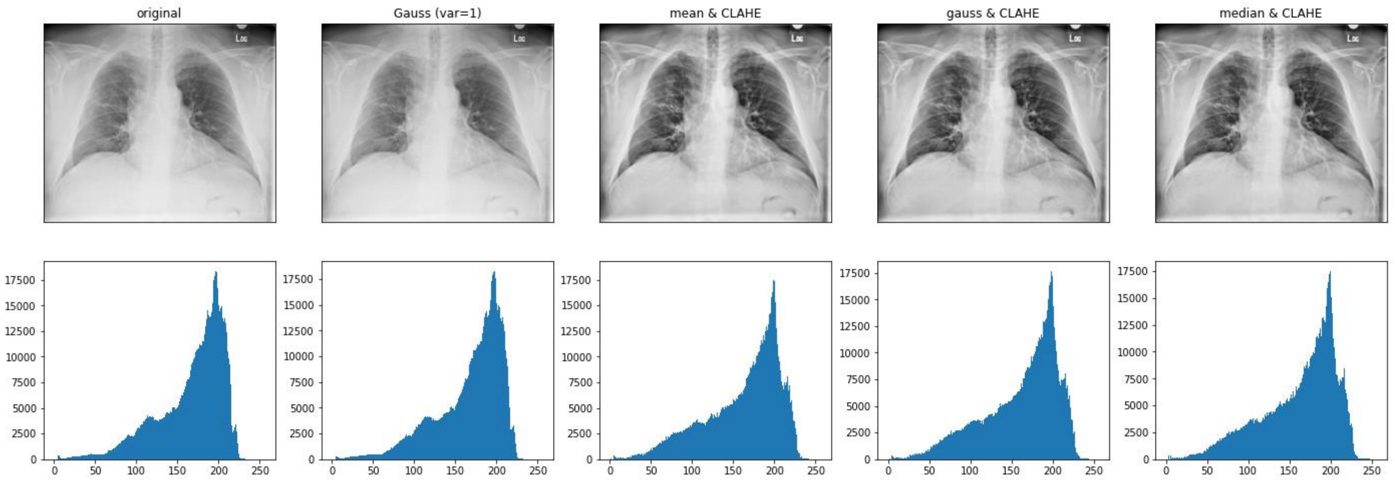
To introduce Salt and Pepper noise and Gaussian noise with two different noise variances in each, use mean, gaussian, and median filters with CLAHE, and then qualitatively analyse using PSNR

Results:




original
Gauss (var=0.5)
mean & CLAHE
gauss & CLAHE
median & CLAHE
original
Gauss (var=1)
mean & CLAHE
gauss & CLAHE
median & CLAHE
original
S&P (var=0.5)
mean & CLAHE
gauss & CLAHE
median & CLAHE
original
S&P (var=1)
mean & CLAHE
gauss & CLAHE
median & CLAHE





Image(no.)-(noise)(variance)	PSNR			
	Noisy image	Mean+CLAHE	Gaussian+CLAHE	Median+CLAHE
Image1-S&P(0.5)	12.294	16.654	14.705	21.123
Image1-S&P(1.0)	8.637	13.69	11.5	20.676
Image1-Gaussian(0.5)	22.33	19.84	18.92	21.15
Image1-Gaussian(1.0)	19.152	18.37	16.96	21.132
Image2-S&P(0.5)	12.85	16.89	15.46	23.06
Image2-S&P(1.0)	9.07	13.75	12.205	22.54
Image2-Gaussian(0.5)	55.78	22.99	22.98	23.08
Image2-Gaussian(1.0)	51.43	22.98	22.97	23.08

Observations:

When comparing the Salt & Pepper noise with Gaussian noise of same variances, the Salt & Pepper noise is much more visible, resulting in lower PSNR values when compared to Gaussian noise images. In all the filtered images, the median filter seems to work the best along with CLAHE. Using a Mean or Gaussian filter with CLAHE enhances the noise resulting in low PSNR values and hence, CLAHE should not be used with those filters. I have used here a 5X5 sized filters for Mean and Gaussian filtering.