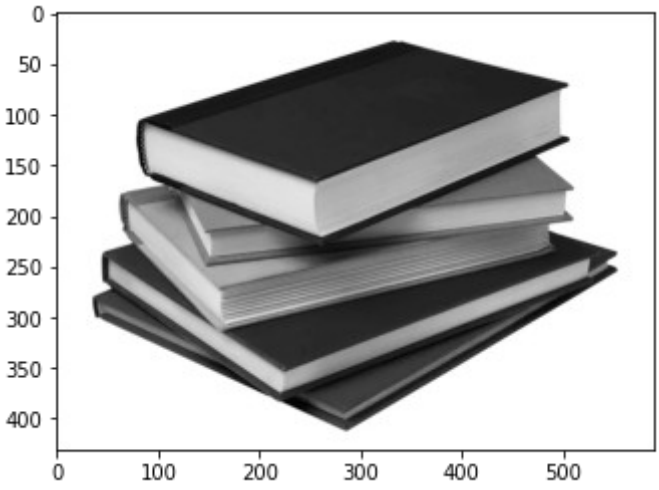
Q1) Scale Space Extrema Detection

Original Images:

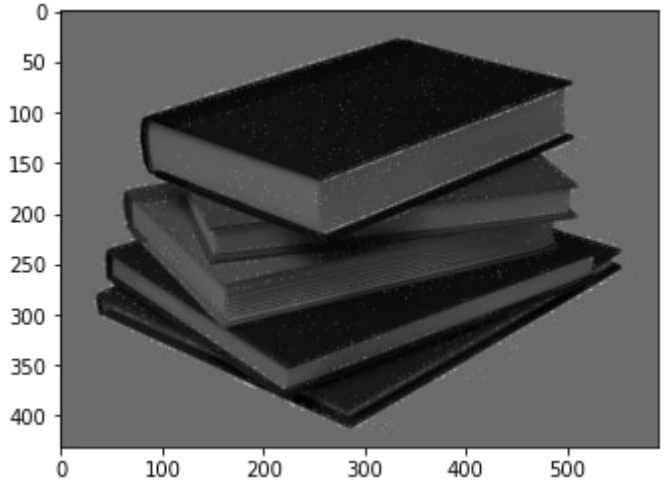
Greyscaled Images:



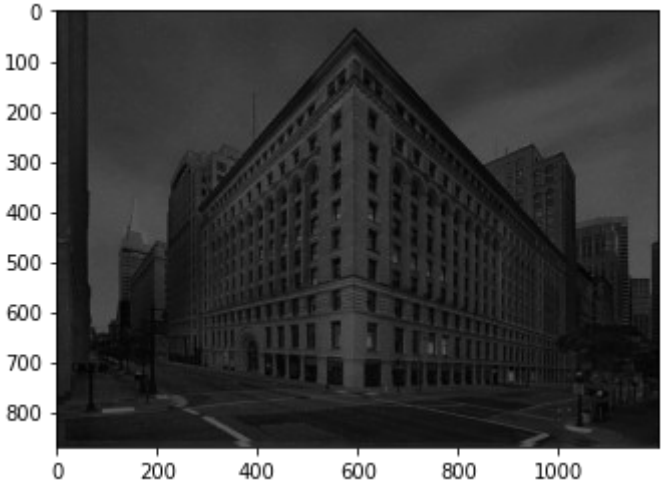
Results:

Scale Space Extrema on Normal Images:

No. of Extremas are – 1812

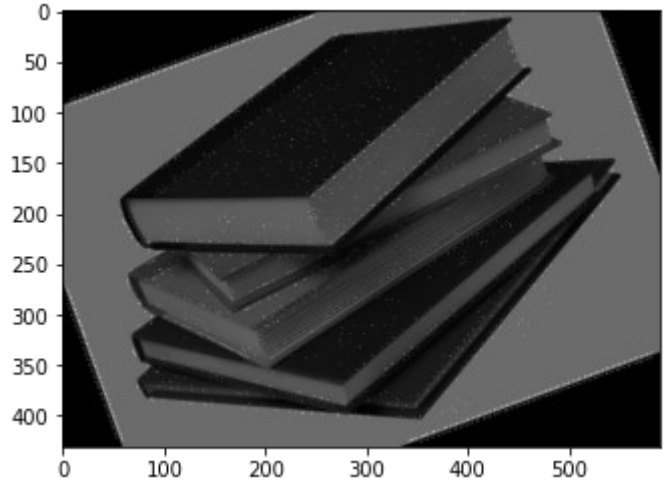


No. of Extremas are - 7114

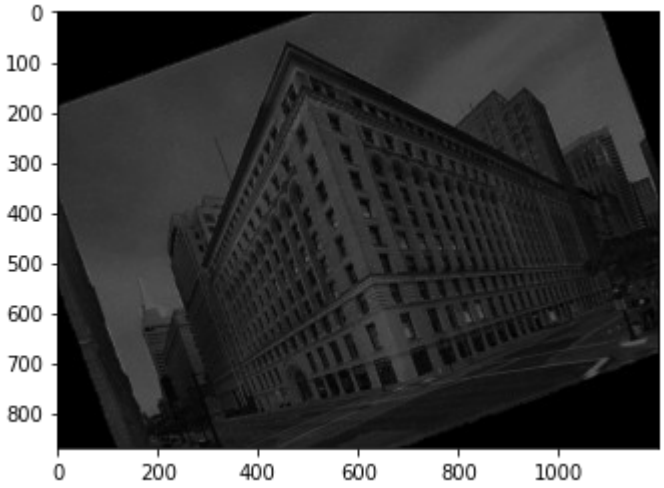


Scale Space Extrema on Images rotated by 20 degrees:

No. of Extremas are - 2413

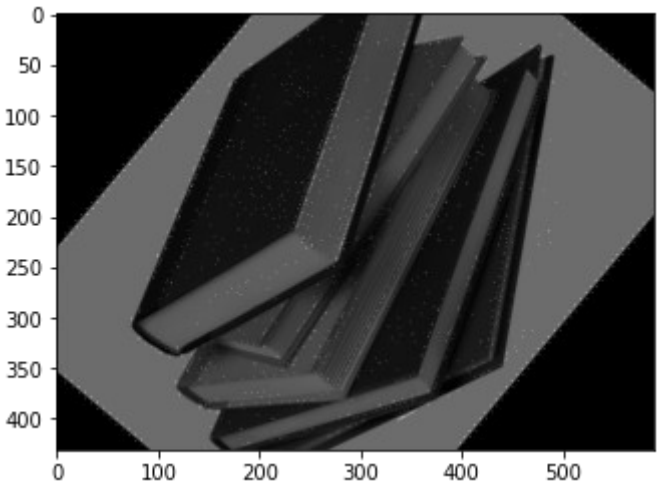


No. of Extremas are - 8770

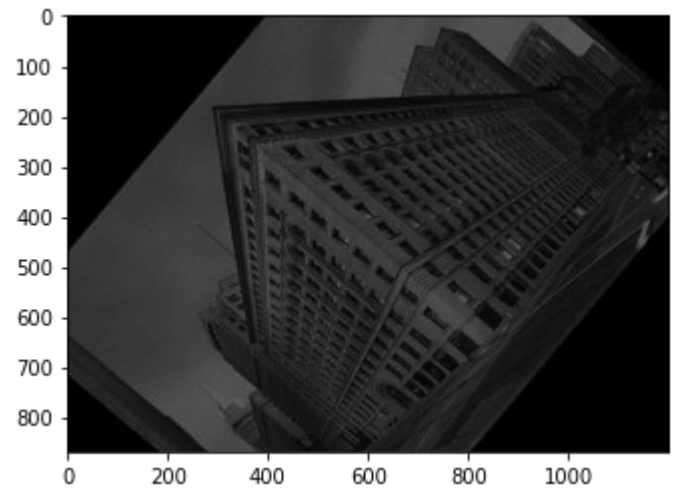


Scale Space Extrema on Images rotated by 50 degrees:

No. of Extremas are – 1709

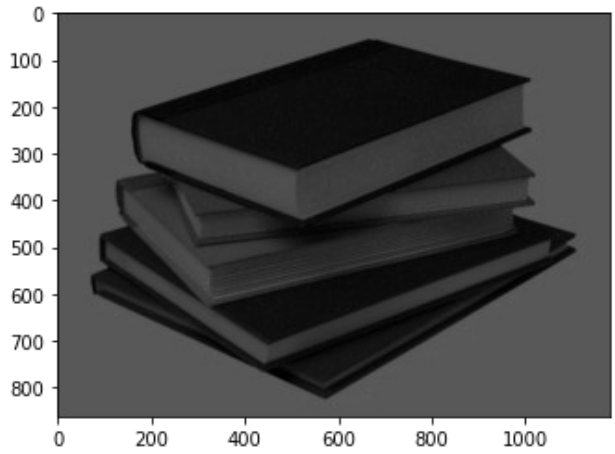


No. of Extremas are – 6521

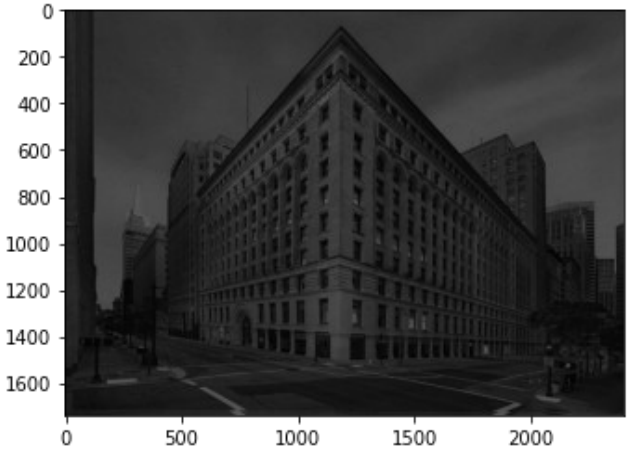


Scale Space Extrema on upscaled Images:

No. of Extremas are - 3800

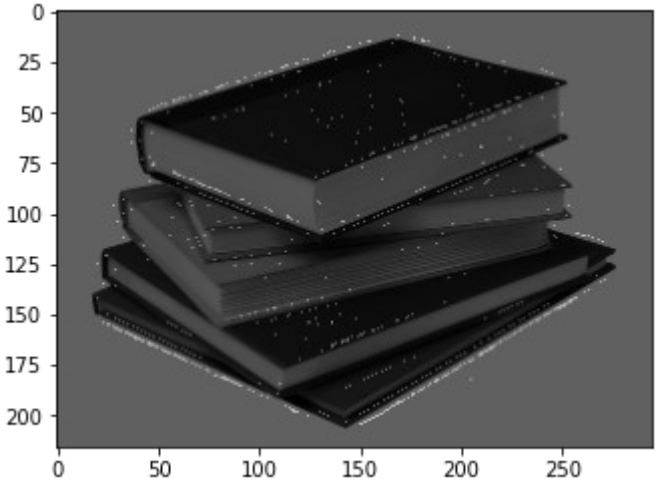


No. of Extremas are – 42377

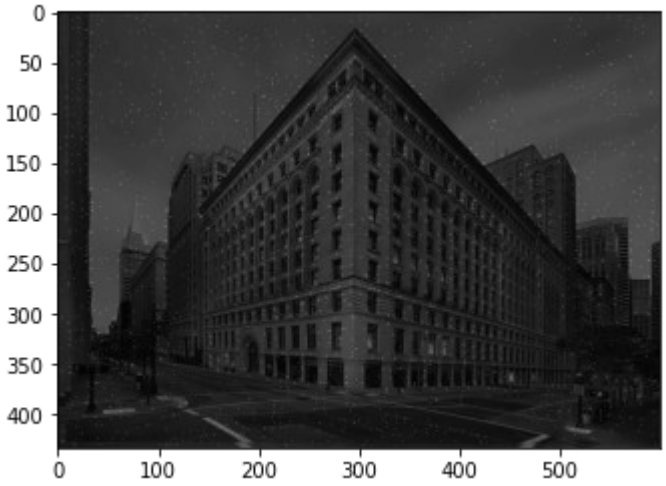


Scale Space Extrema on downscaled Images:

No. of Extremas are - 696

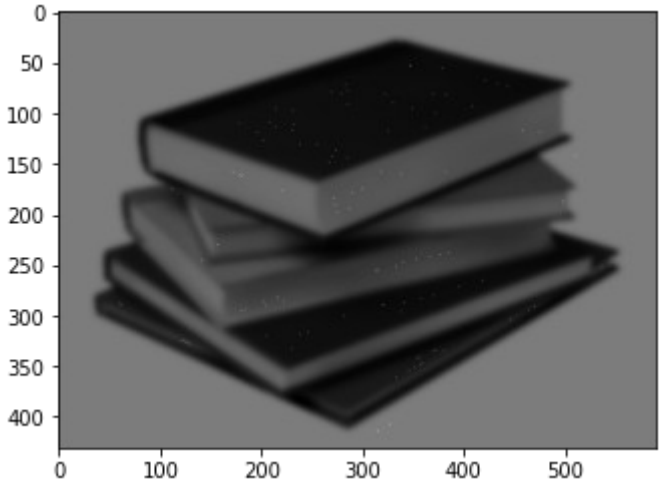


No. of Extremas are – 2017

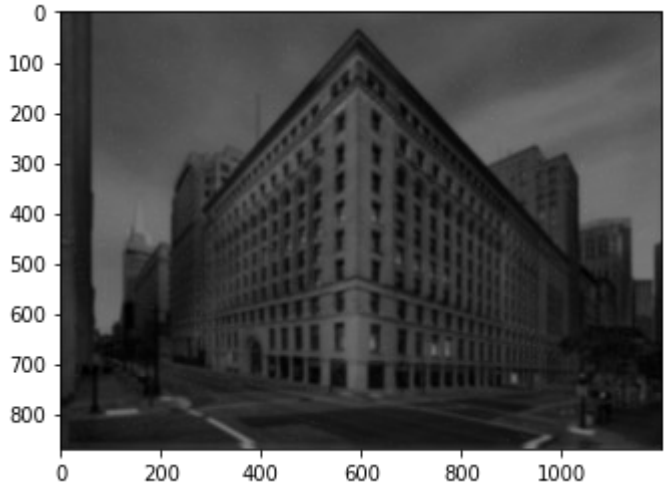


Scale Space Extremas after adding Gaussian Blur:

No. of Extremas are - 105

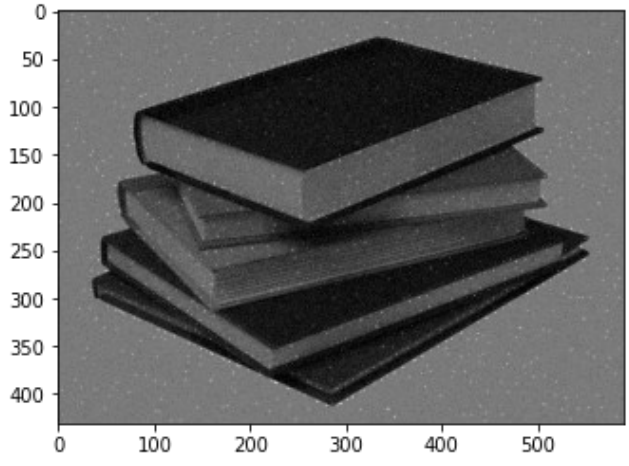


No. of Extremas are – 1911

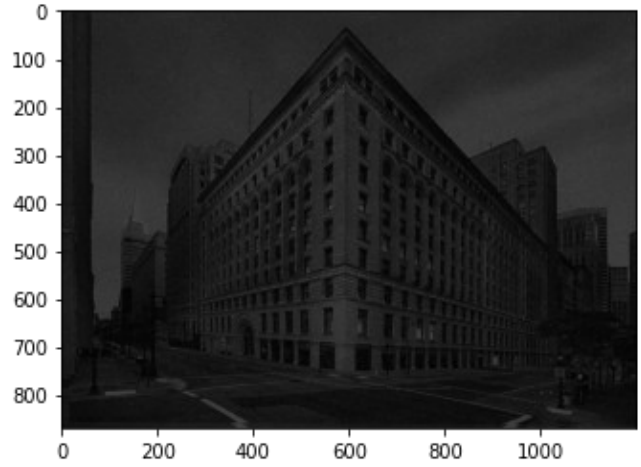


Scale Space Extremas after adding Gaussian Noise:

No. of Extremas are - 1333



No. of Extremas are - 4985



Analysis:

No. of Octaves used = 1

Sigma = 1.6

Number of Scales = 11

Transformations	No. of extremas in Books	No. of extremas in Building
Greyscaled Image	1812	7114
Rotation (20 degrees)	2413	8770
Rotation (50 degrees)	1709	6521
Downscaling	3800	42377
Upscaling	697	2017
Gaussian Blur	105	1911
Gaussian Noise	1333	4985

Greyscaled Image: No. of feautres in the building are more than that of books.. Hence the extremas are more in building compared to books

Rotation: Due to rotation , features are added in both the images and hence the extrema points increased but if the rotation angle is more, then some part of the building will be cut and the extremas will decrease

Downscaling: Downscaling leads to loss of information and hence the features are lost. Thus the no. of extrema points decreased drastically

Upscaling: Upscaling adds extra pixels to the image, which are used to ensure the image's fine details and hence the no. of features increases implying increase in extrema points

Gaussian Blur: Gaussian blur smoothens the image reducing the high frequency components i.e the variations in pixels. Hence the edges decreased implying the decrease in extrema points

Gaussian Noise: Since this is random noise, Edges may increase or decrease. Here the edges decreased and thus the extrema points

References:

1. *https://www.cs.ubc.ca/~lowe/papers/ijcv04.pdf*

2. SkImage documentation

3. Scipy documentation