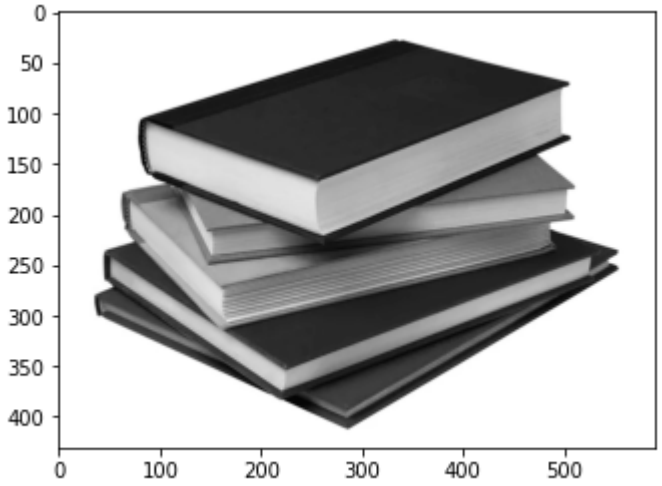
● *SIFT*

- ***Image-1 (Books)***

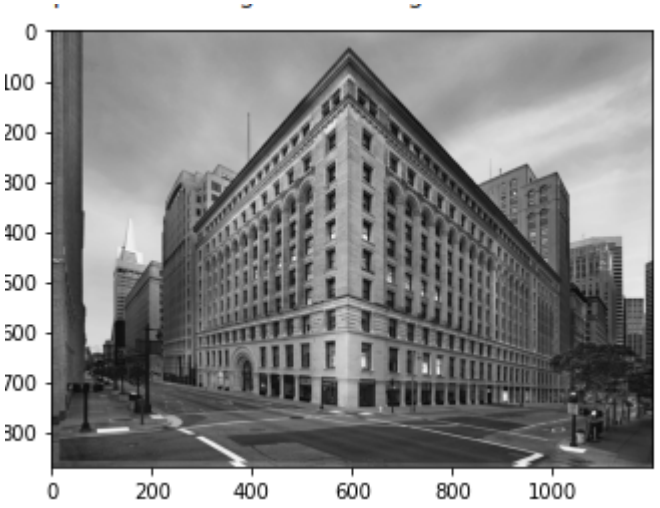
Original Image



Original Gray scale image

- ***Image-2 (Building)***

Original Image



Original Grayscale image

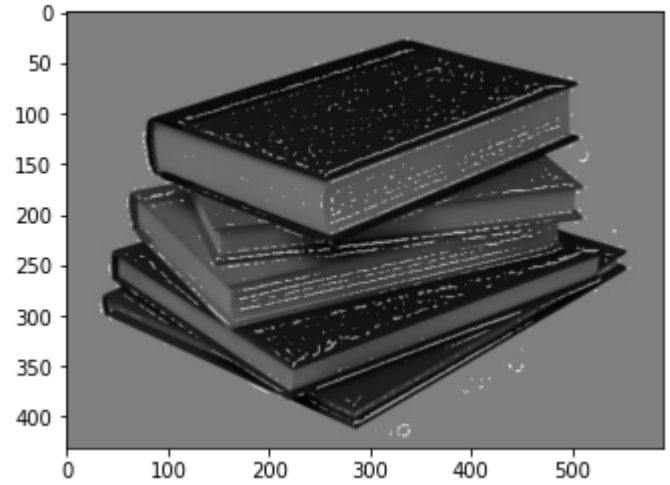
Input Parameter to the model:

Number of octaves = 1
Number of scales = 5
Sigma = 1.6

Outputs:

1. SIFT scale space extrema output for original grayscale image

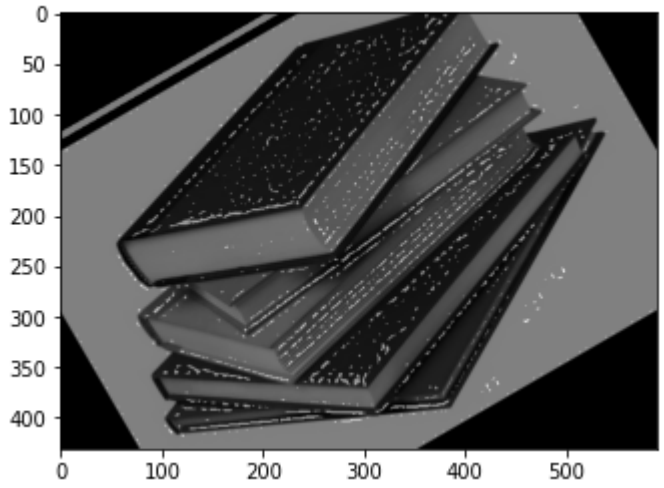
```
Number of extrema points = 7494.0
```



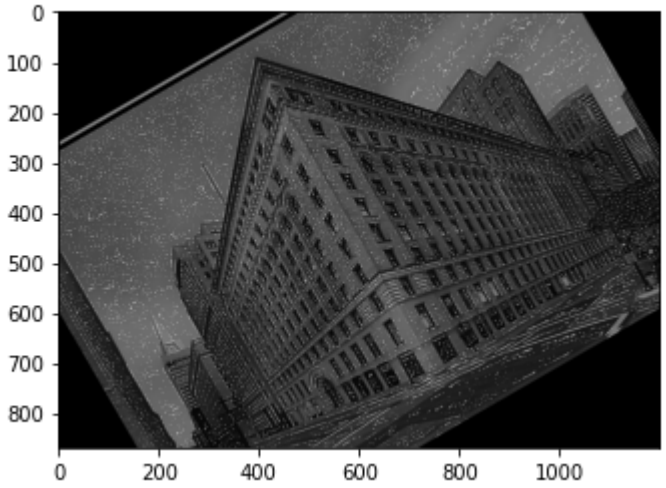

```
Number of extrema points = 48072.0
```

2. SIFT scale space extrema output for rotated grayscale image (30 degree rotation)

```
Number of extrema points = 7869.0
```

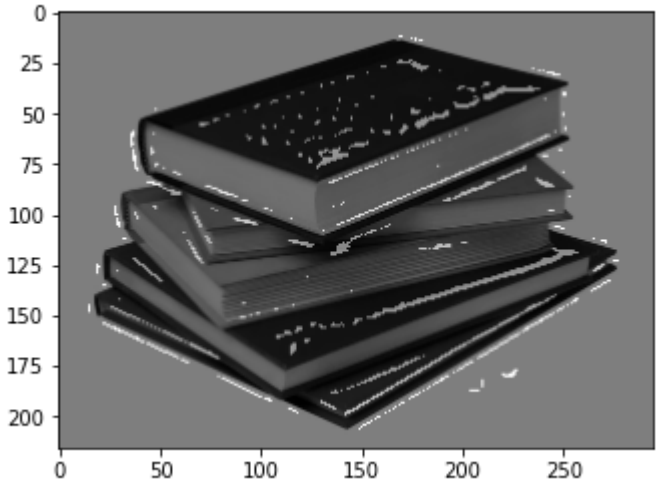



```
Number of extrema points = 41023.0
```

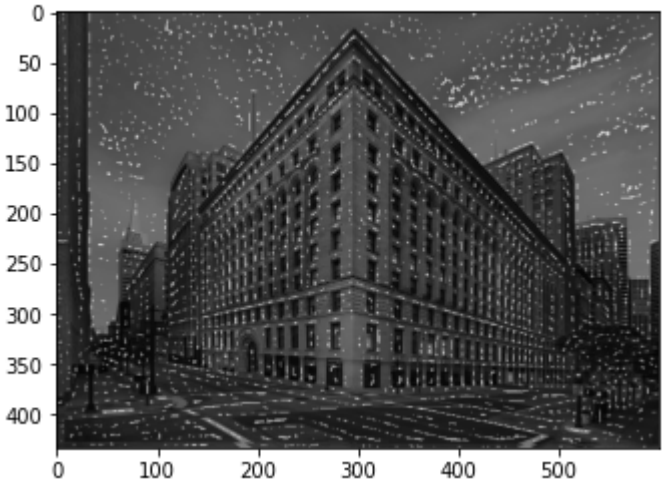


3.SIFT scale space extrema output for downscaled grayscale image (downscaling factor - 0.5)

```
Number of extrema points = 1876.0
```

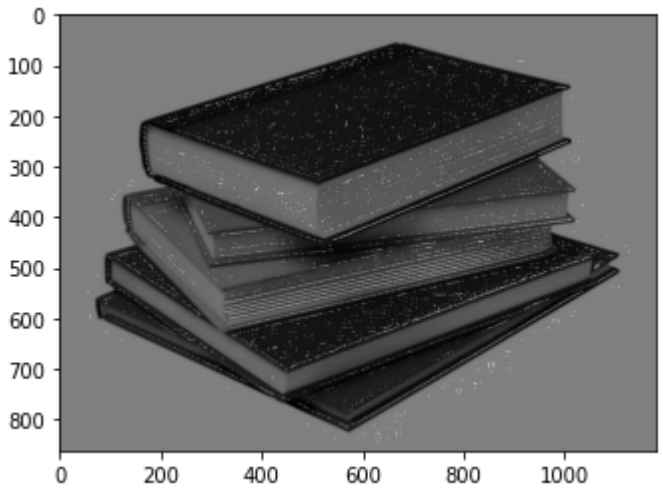



```
Number of extrema points = 11307.0
```

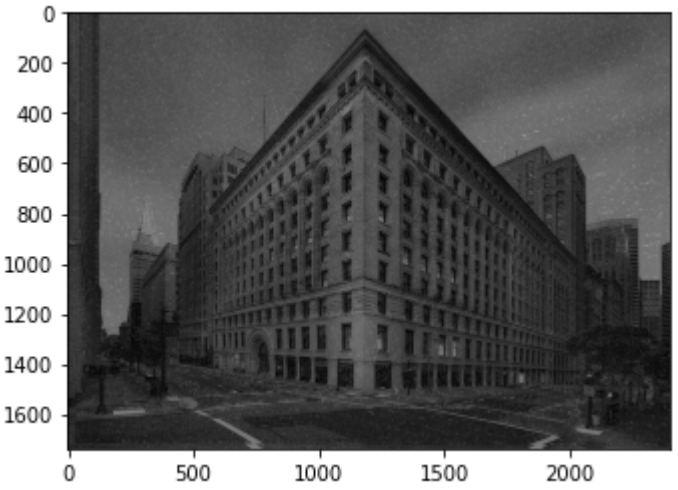


4. .SIFT scale space extrema output for upscaled grayscale image (upscaling factor - 2)

```
Number of extrema points = 20602.0
```

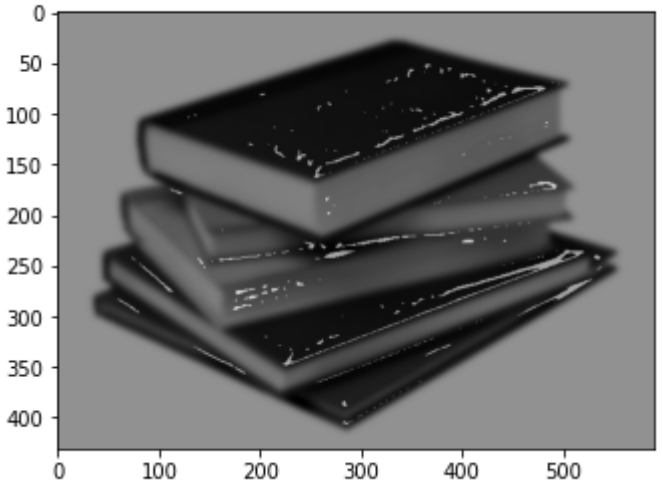


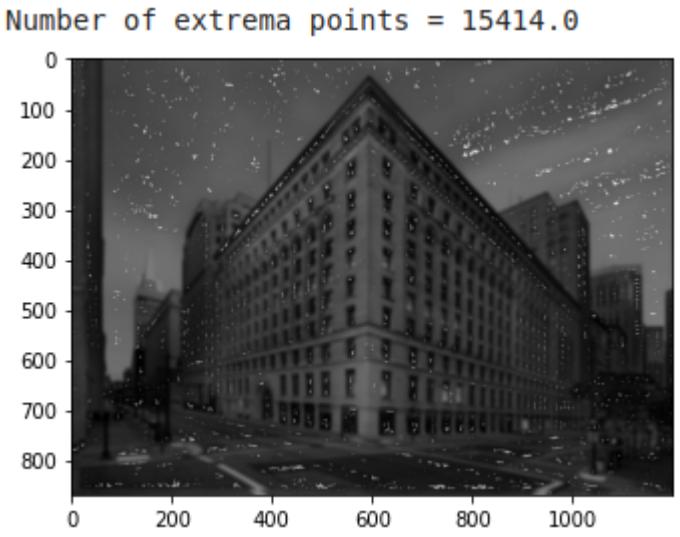

```
Number of extrema points = 156643.0
```



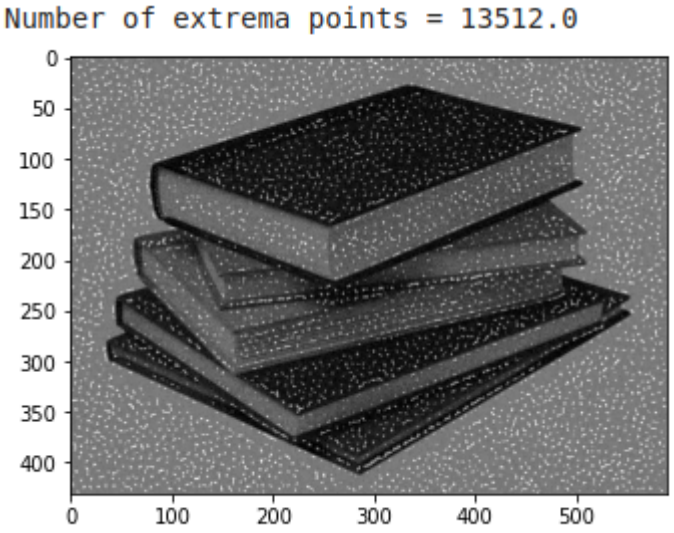
5. SIFT scale space extrema output for gaussian blurred grayscale image

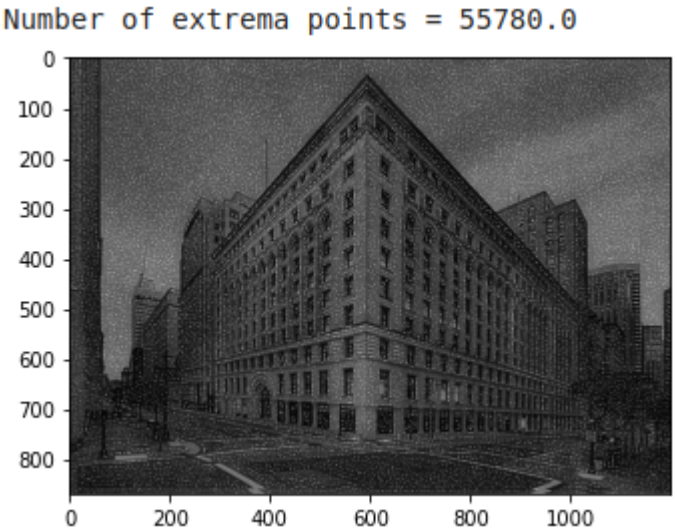
```
Number of extrema points = 3054.0
```





6.SIFT scale space extrema output for gaussian noisy grayscale image





Qualitative Analysis of The Outputs:

Number of Extrema Points:

Image without transformation:
Book Image: 7494
Building image: 48072

Image with Rotation:
Book Image: 7869
Building image: 41023
Reason for Variation : Due to rotation extra edges are coming, these might Be a reason for increase in case of books, but in case Of building some part of the building is cut due to Rotation which might be the cause for decrease.

Image with Down Scaling:
Book Image: 1876
Building image:11703
Reason for variation: Downsampling involves loss of information in the Image, this leads to decrease in number of extrema points

extrema points
Image with Up Scaling:
Book Image: 20602
Building image:156643
Reason for variation:In upscaling more pixels are added to image, this may May lead increase of extrema points

Image with Gaussian Blur:
Book Image: 3054
Building image:15414
Reason for variation: Gaussian blur is a type of smoothing operation that reduces the high frequency components of the image, this leads to Decrease in extrema points

Image with Gaussian Noise:
Book Image: 13512
Building image:55780
Reason for Variation: This depends on the nature of the image.