# DIP

# Assignment-1

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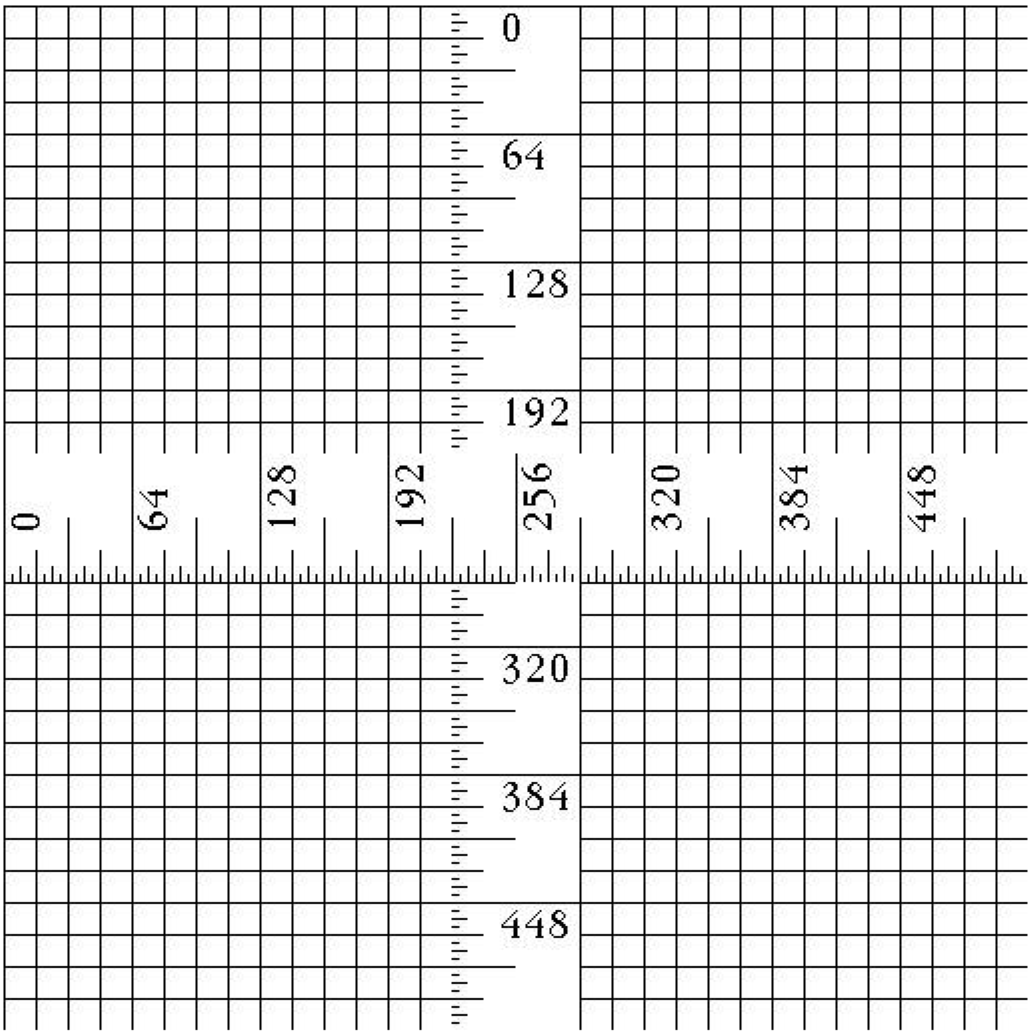
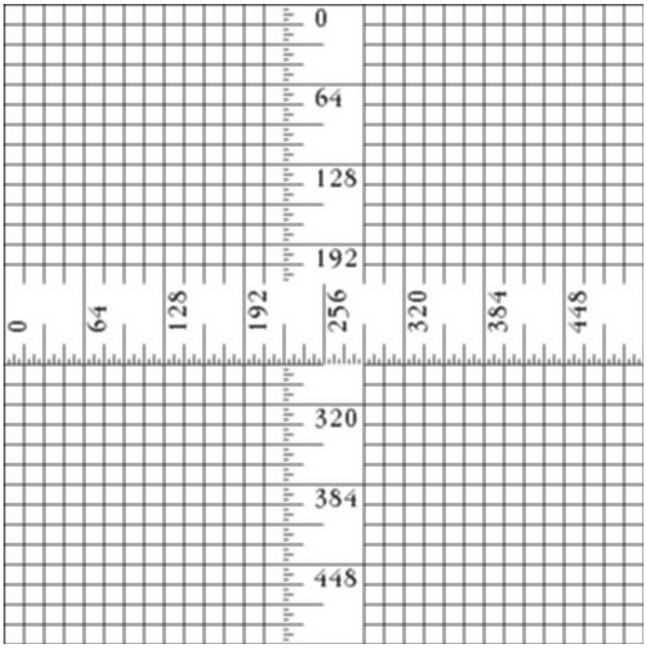
# Q1

**Original Image:-**

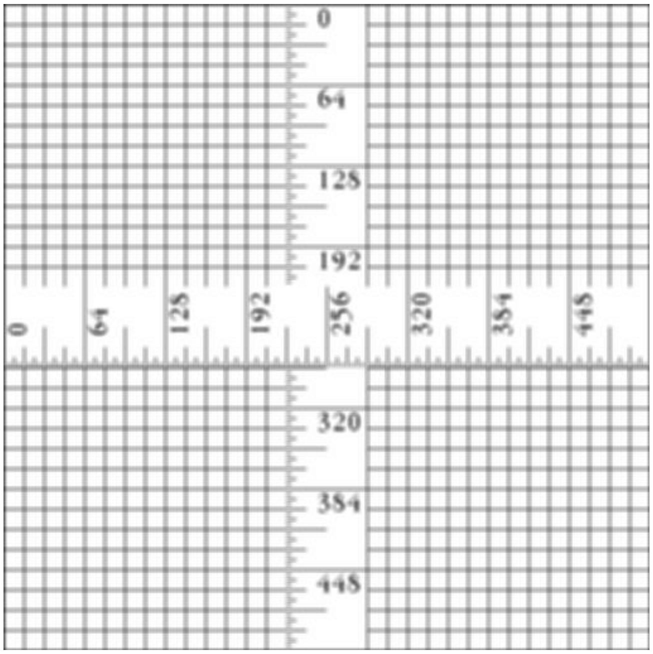


# Gaussing Filter

**3X3 Gaussian Filter:**

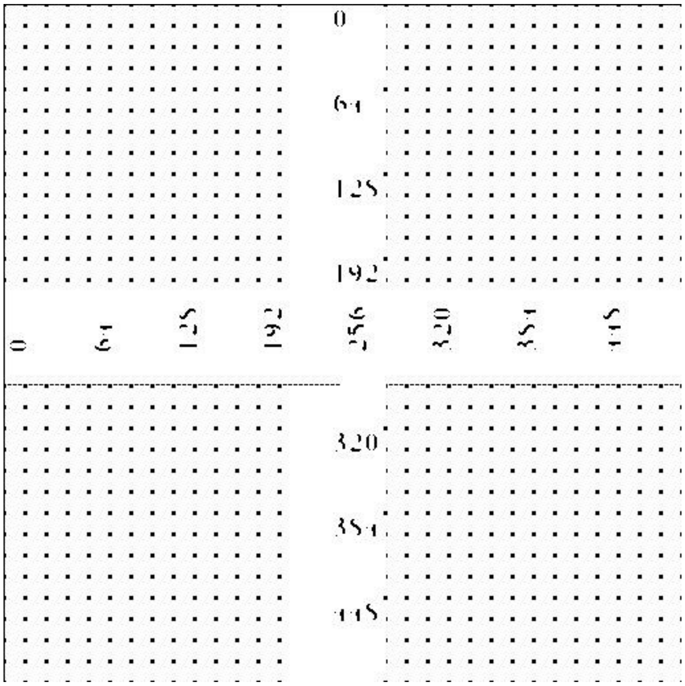



**5X5 Gaussian Filter:**

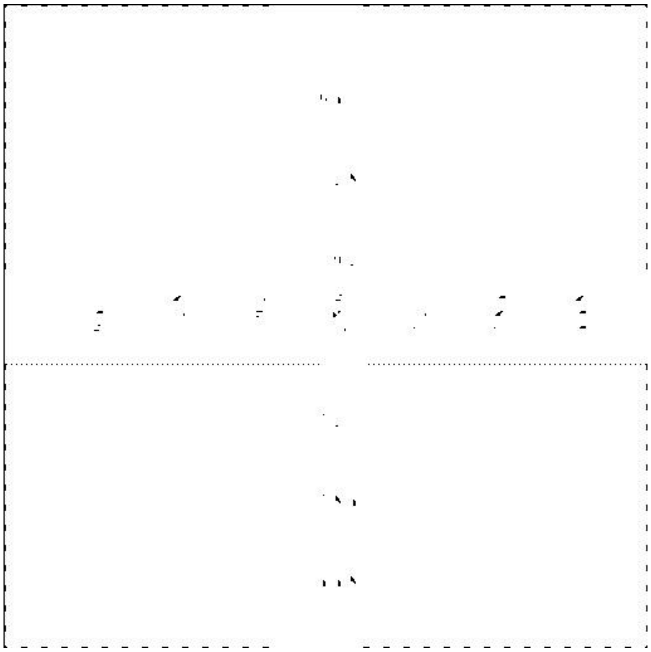


# Median Filter

### 3X3 Median Filter:




### 5x5 Median Filter:



## Which one preserves the edges of the image better?

**Ans:- Median Filter**

- The median filter, on the other hand, replaces each pixel value with the median value of pixel values within a local neighbourhood.
- The median filter is excellent at noise reduction while preserving edges because it's robust to outliers. When applied to a neighbourhood containing an edge, it retains the edge's pixel values and effectively ignores the noisy values.
- By replacing each pixel with the median value, the median filter naturally preserves sharp transitions, such as edges.

While the Gaussian filter is effective at reducing noise and smoothing the image, it also blurs the edges and fine details in the process. This blurring effect is due to the nature of the Gaussian kernel, which gives equal importance to all pixel values within the neighbourhood. As a result, the Gaussian filter is not ideal for edge preservation.

## Q2

**Original Image:-**

# First Order Derivative Techniques

## Sobel's Gradient [size 2x2]:-

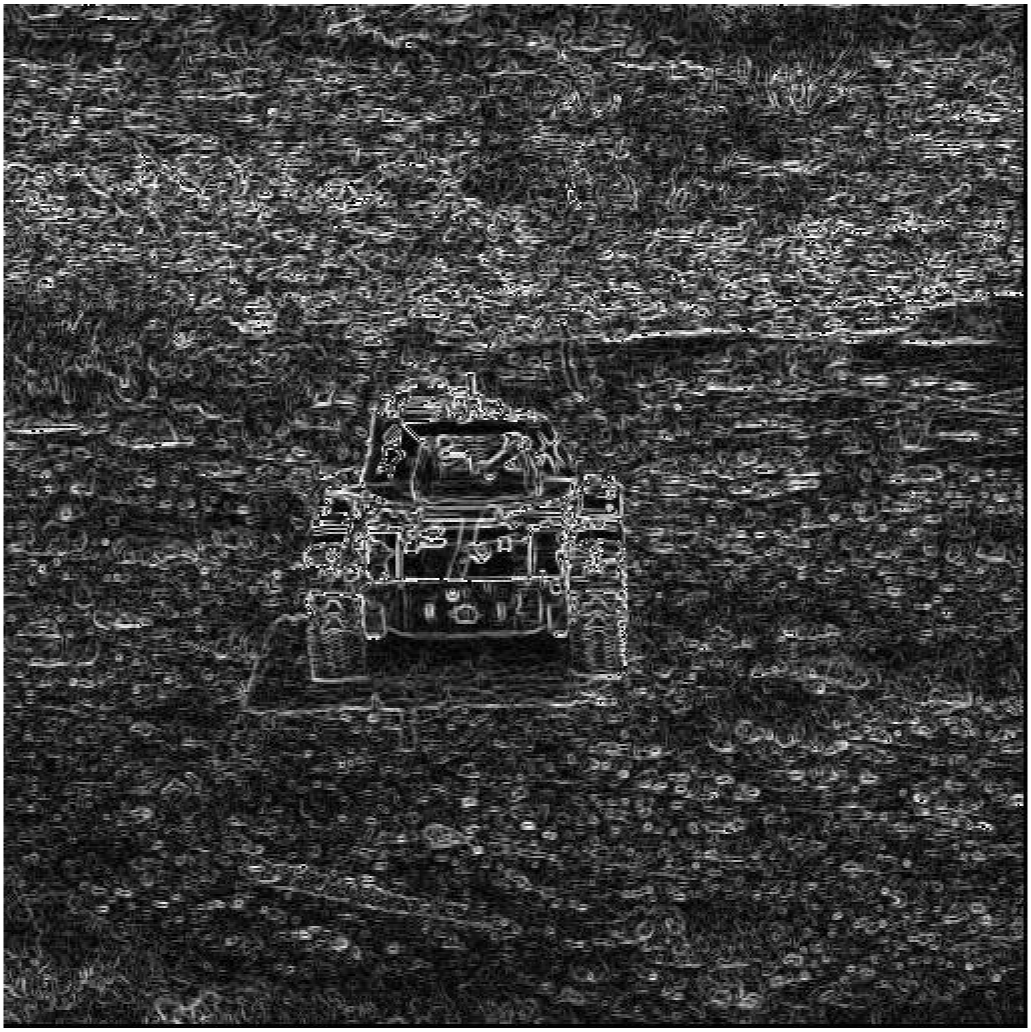
**Gx** = [ [ **-1, 0**], [ **0, 1**] ]

**Gx** = [ [ **0, -1**], [ **1, 0**] ]]

## Robert’s Gradient [size 3X3]

**Gx** = [ [ **-1, -2, -1**], [**0, 0, 0**], [**1, 2, 1**]]

**Gy** = [ [**-1, 0, 1**], [**-2, 0, 2**], [**-1, 0, 1**]



## Prewitt's Gradient [size 3X3]

**Gx** = [[**1**, **1**, **1**], [**0**, **0**, **0**], [**-1**, **-1**, **-1**]]

**Gy** = [[**-1**, **0**, **1**], [**-1**, **0**, **1**], [**-1**, **0**, **1**]]

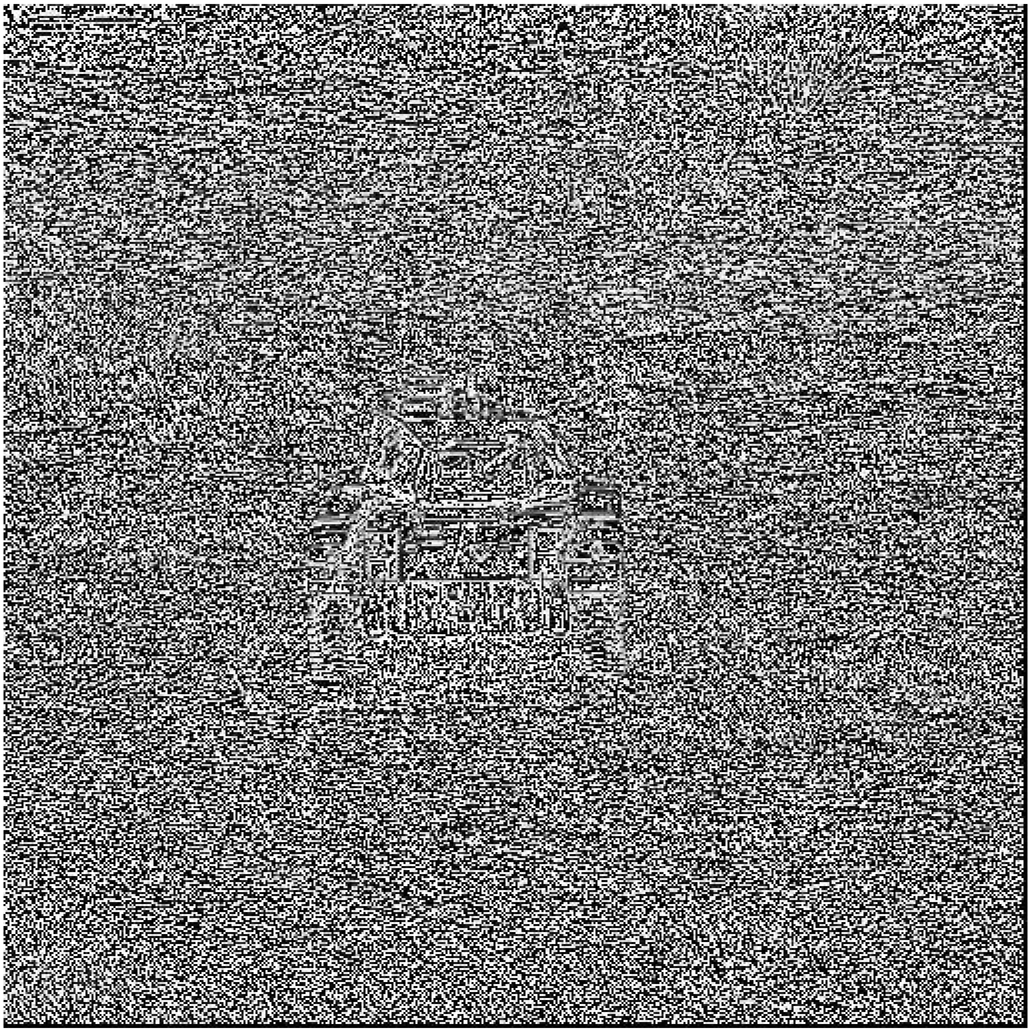
## Second Order Derivative Techniques

### Laplacian c = -1 [size 3X3]

**Filter** = [ [0, 1, 0], [1, -4, 1], [0, 1, 0]]

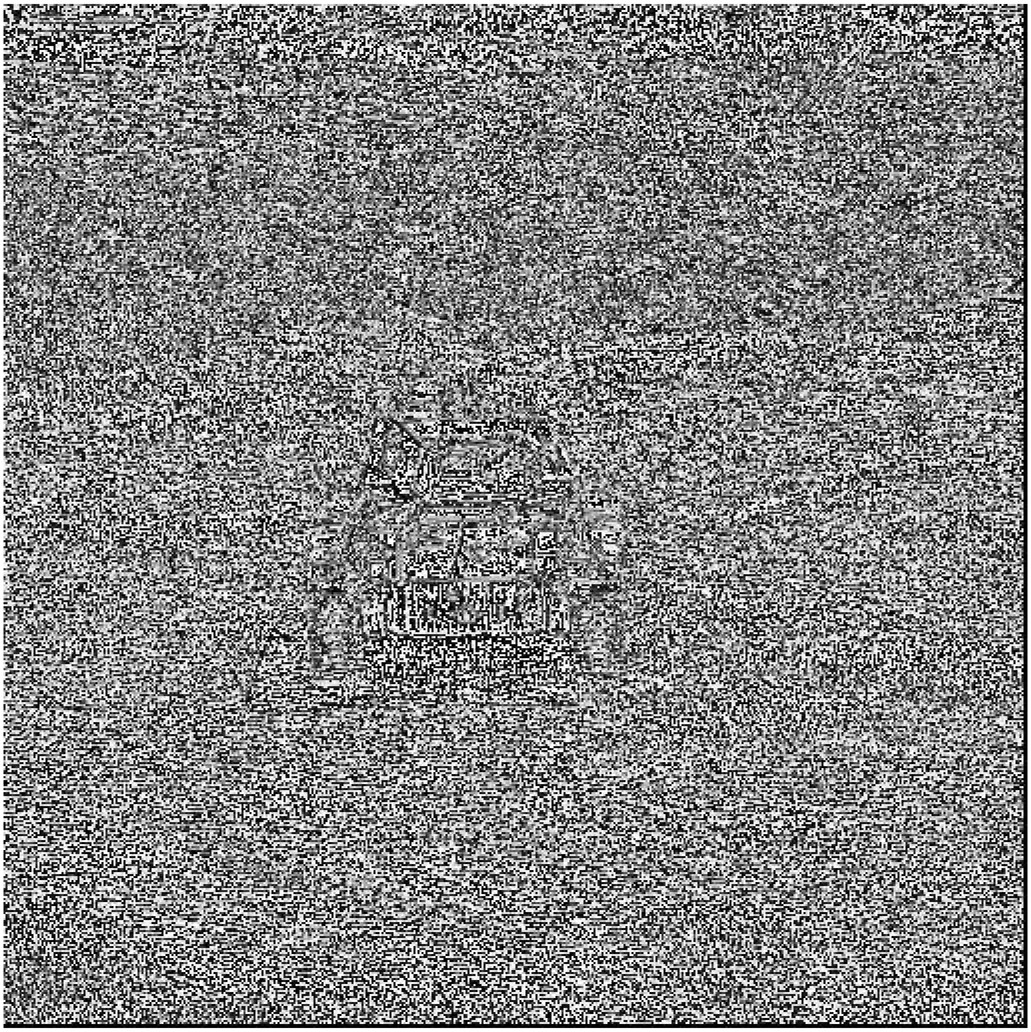
## Laplacian c= +1 [size 3X3]

**Filter** = [ [0, -1, 0], [-1, 4, -1], [0, -1, 0]]



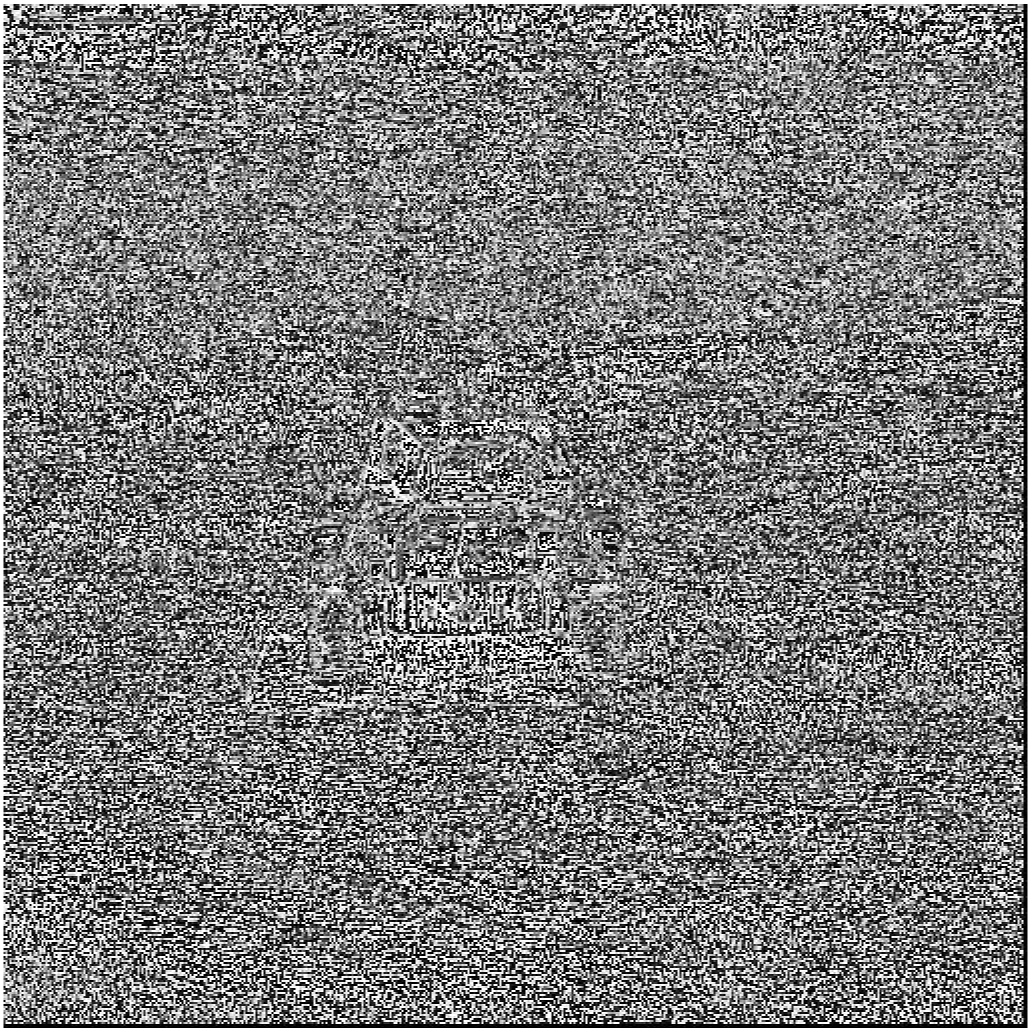
## Enhanced Laplacian c= -1 [size 3X3]

**Filter** = [ **[1, 1, 1]**, **[1, -8, 1]**, **[1, 1, 1]**]



## Enhanced Laplacian c= +1 [size 3X3]

**Filter** = [ **[-1, -1, -1]**, **[-1, 8, -1]**, **[-1,-1, -1]**]

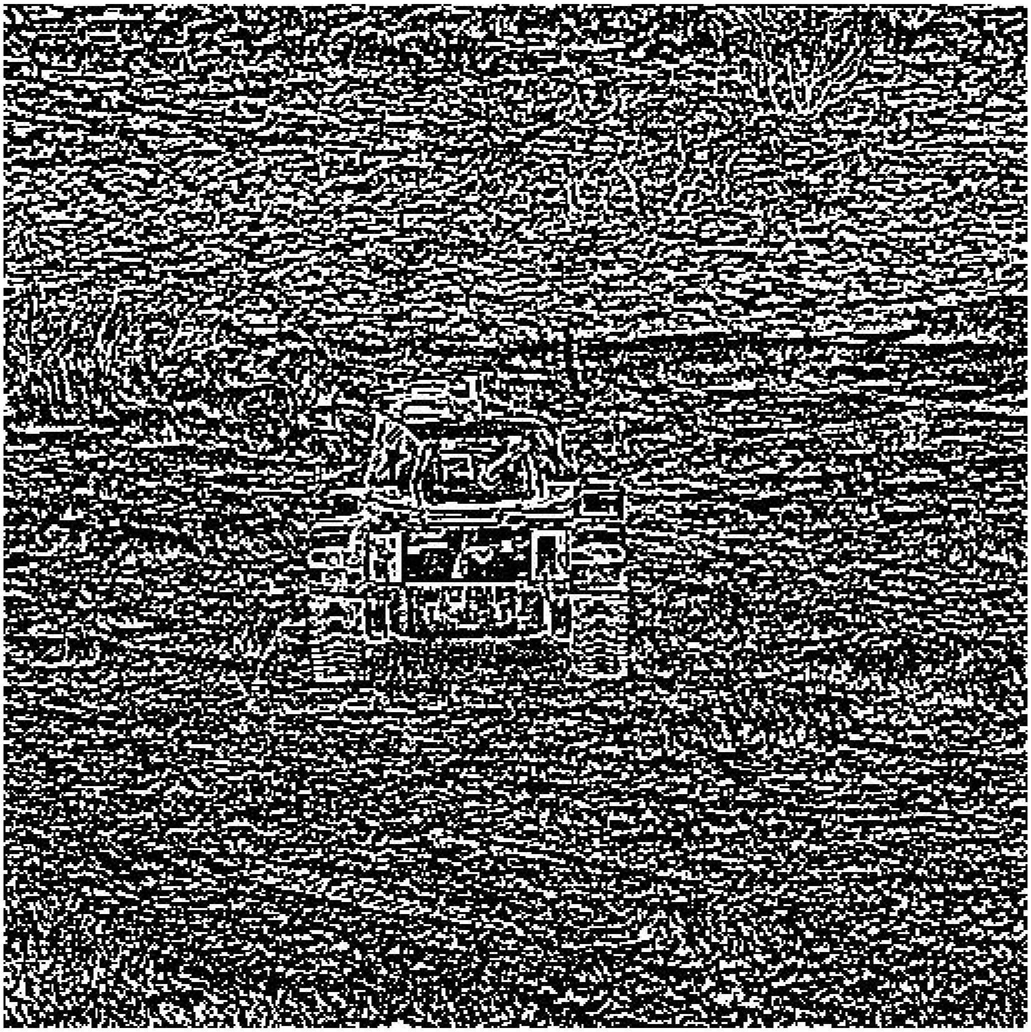


## High Boost

2*Image + (image - blurred Image)

## Difference of Gaussian

**Gaussian Blur [3X3] - Gaussian Blur [5X5]**



## Canny Edge Operator [size 3x3]

**Fx** = [ [ **-1, 0, 1**], [**-2, 0, -2**], [**-1, 0, 1**]]

**Fy** = [ [**1, 2, 1**], [**0, 0, 0**], [**-1, -2, -1**]]