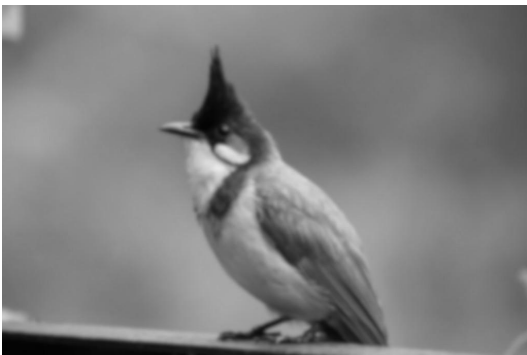# Assignment Report

Results
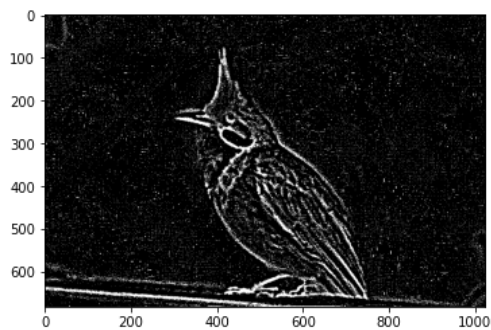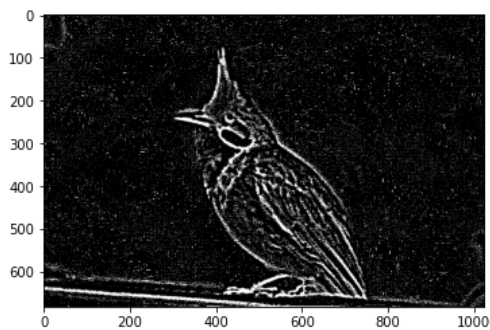
- **Original Images:**

Bird.jpg

Palace.jpg

- **Results for image "Bird.jpg":**

The DoG(difference of gaussian) is calculated by varying the value of sigma high and sigma low followed by applying oriented filters and obtaining the superimposed image. The following observations are made by varying the value of sigma:
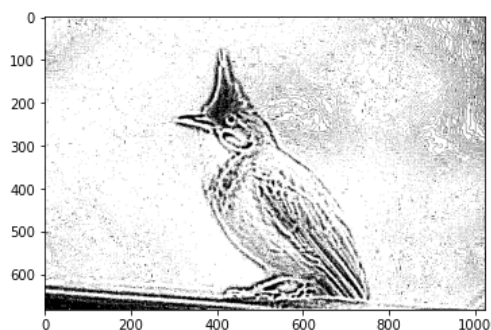
  - **DoG Output:**

$\sigma_{low} = 1$ and $\sigma_{high} = 2$
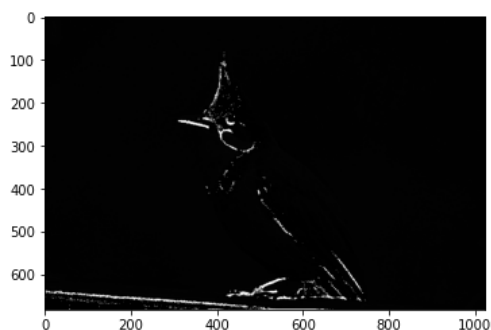
$\sigma_{low} = 1$ and $\sigma_{high} = 2.5$

$\sigma_{low} = 1$ and $\sigma_{high} = 3$
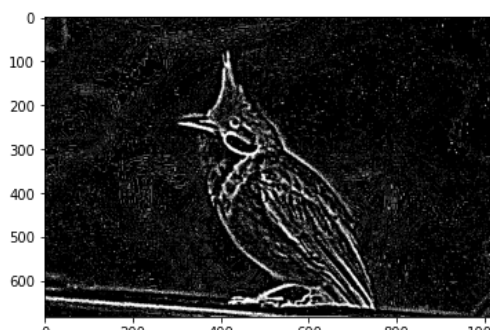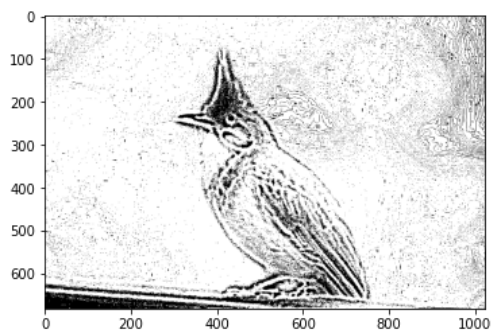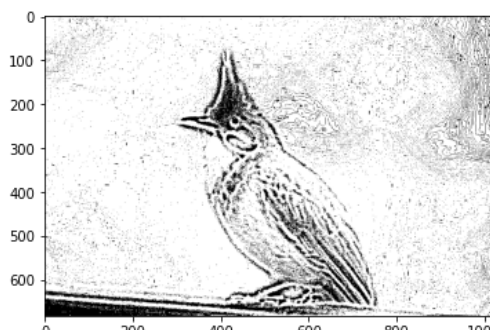
$\sigma_{low} = 2$ and $\sigma_{high} = 4$

$\sigma_{low} = 2$ and $\sigma_{high} = 5$

$\sigma_{low} = 2$ and $\sigma_{high} = 6$

$\sigma_{low} = 4$ and $\sigma_{high} = 8$

$\sigma_{low} = 4$ and $\sigma_{high} = 10$

σ_{low} = 4 and σ_{high} = 12

○ **Oriented Filter Output:**

The oriented filters output is shown below for the values of sigma's as σ_{low} = 1 and σ_{high} = 2.

Filter orientation = 0^0

Filter orientation = 45^0

Filter orientation = 90^0

Filter orientation = 135^0

○ **Superimposed Edge Images:**

σ_{low} = 1 and σ_{high} = 2

σ_{low} = 1 and σ_{high} = 2.5

σ_{low} = 1 and σ_{high} = 3

σ_{low} = 2 and σ_{high} = 4

σ_{low} = 2 and σ_{high} = 5

σ_{low} =2 and σ_{high} = 6

σ_{low} = 4 and σ_{high} = 8

σ_{low} = 4 and σ_{high} = 10

σ_{low} = 4 and σ_{high} = 12
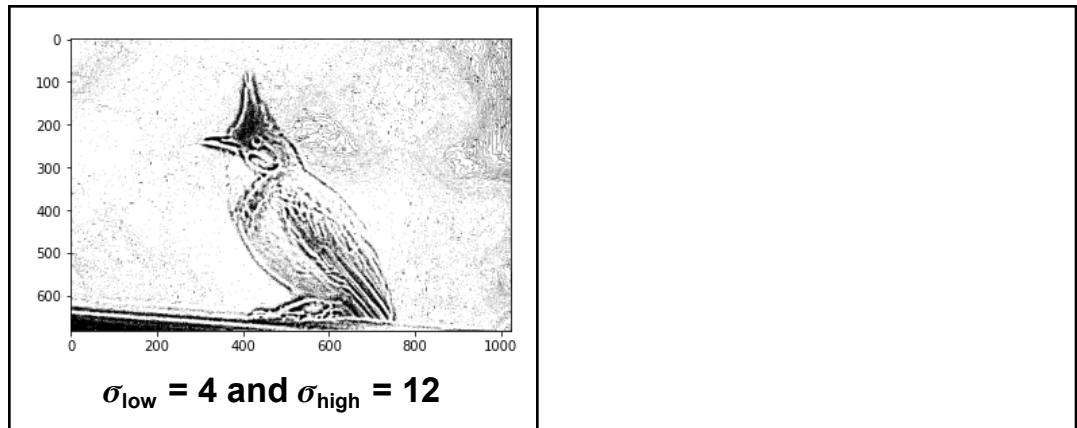
- **Results for image "Palace.jpg":**

  - **DoG Output:**
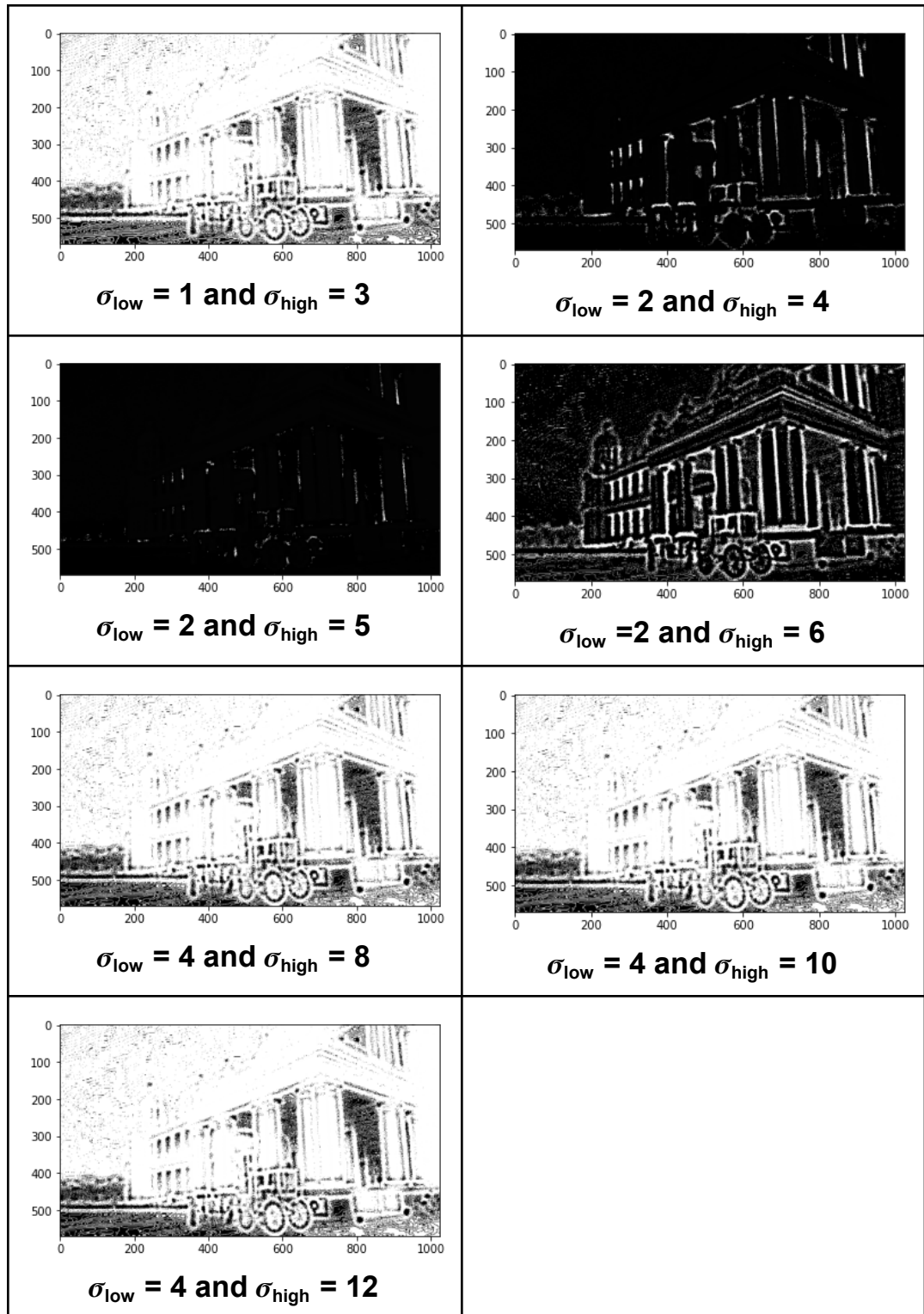
σ_{low} = 1 and σ_{high} = 2

σ_{low} = 1 and σ_{high} = 2.5

σ_{low} = 1 and σ_{high} = 3

σ_{low} = 2 and σ_{high} = 4

σ_{low} = 2 and σ_{high} = 5

σ_{low} =2 and σ_{high} = 6

σ_{low} = 4 and σ_{high} = 8

σ_{low} = 4 and σ_{high} = 10
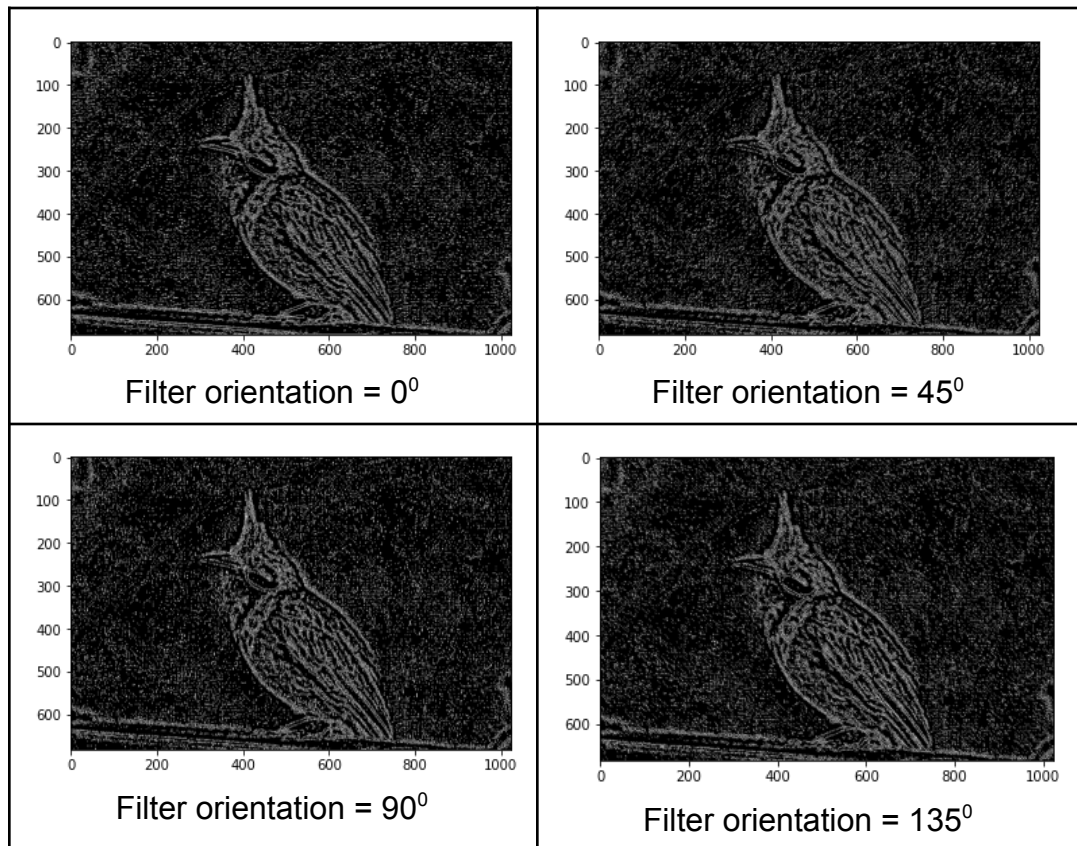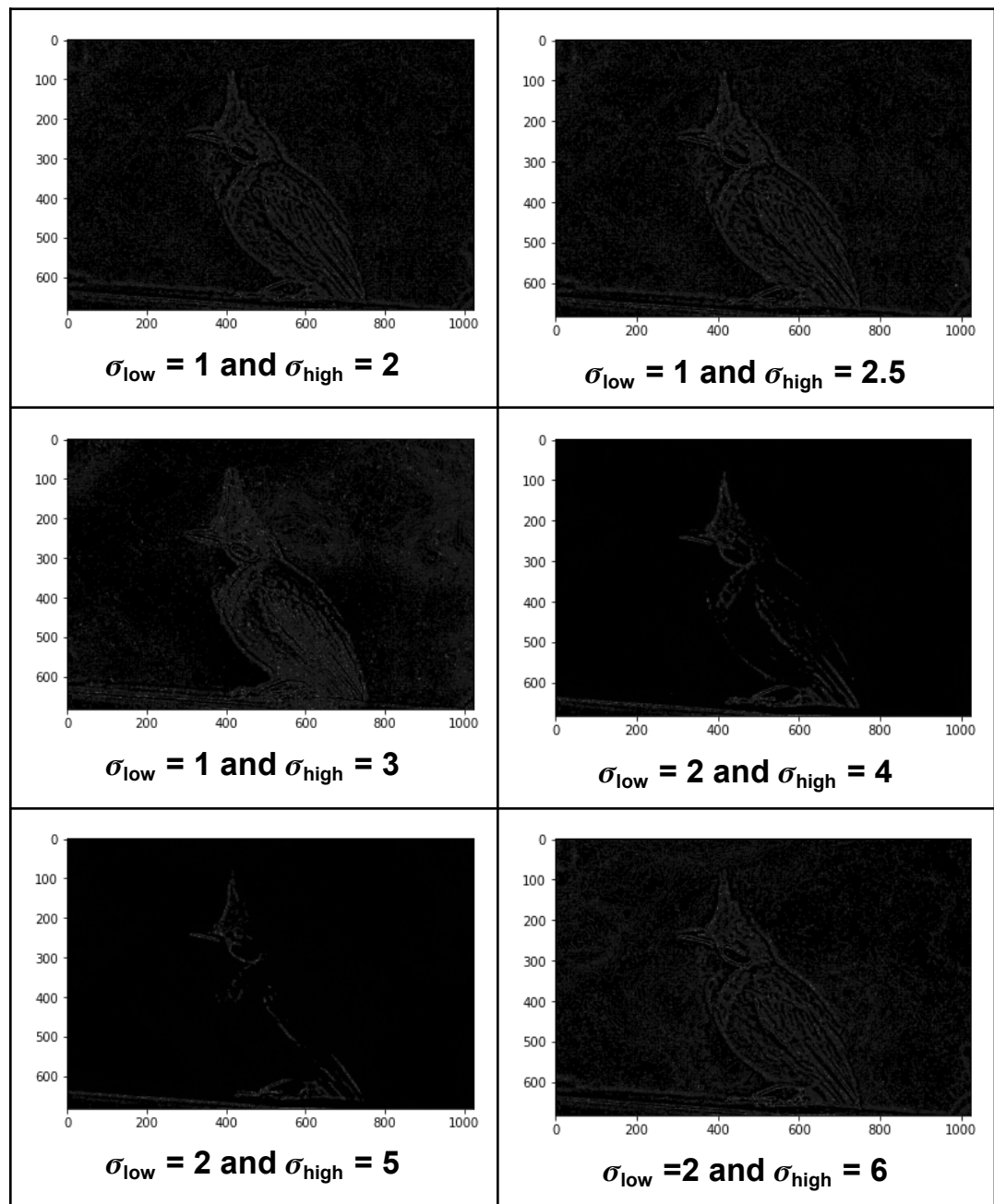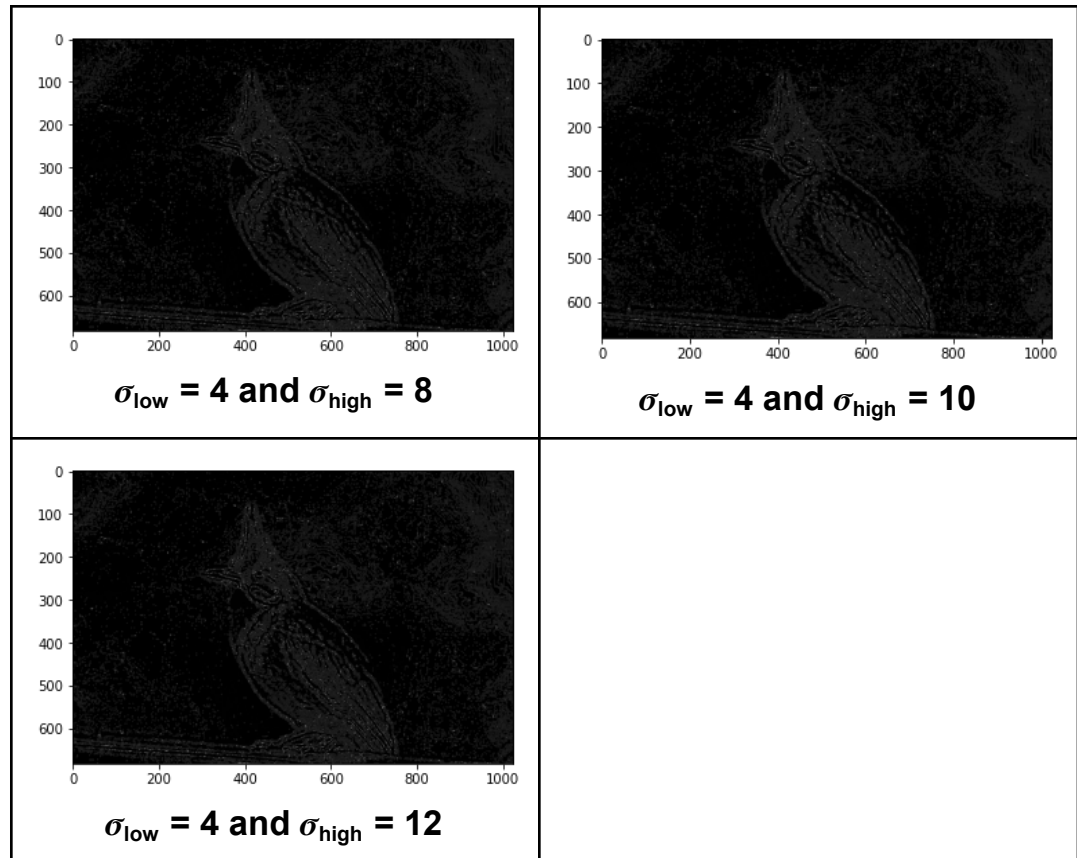
σ_{low} = 4 and σ_{high} = 12

○ **Oriented Filter Output:**

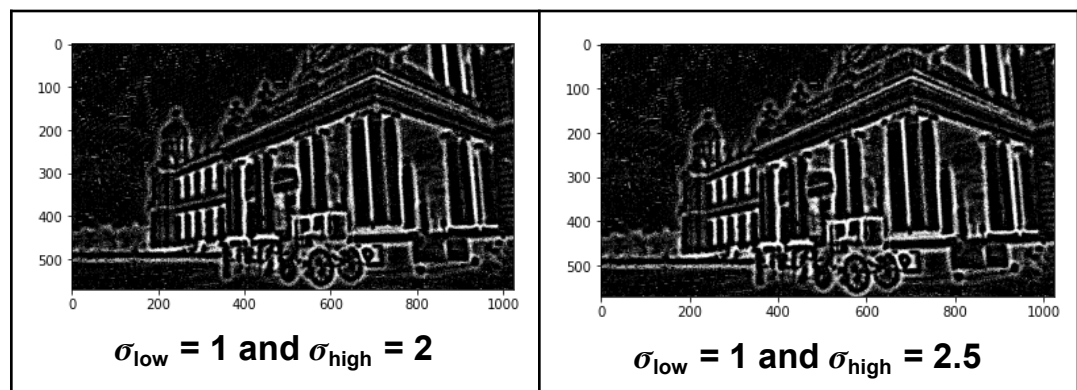The oriented filters output is shown below for the values of sigma's as σ_{low} = 1 and σ_{high} = 2.
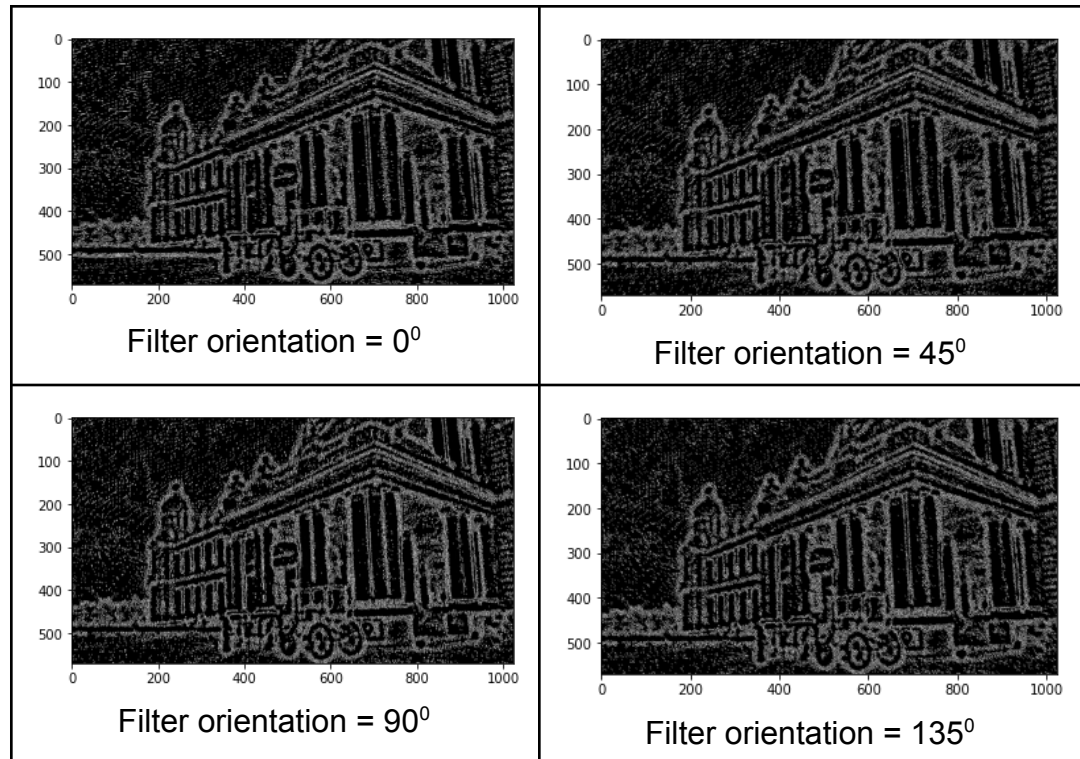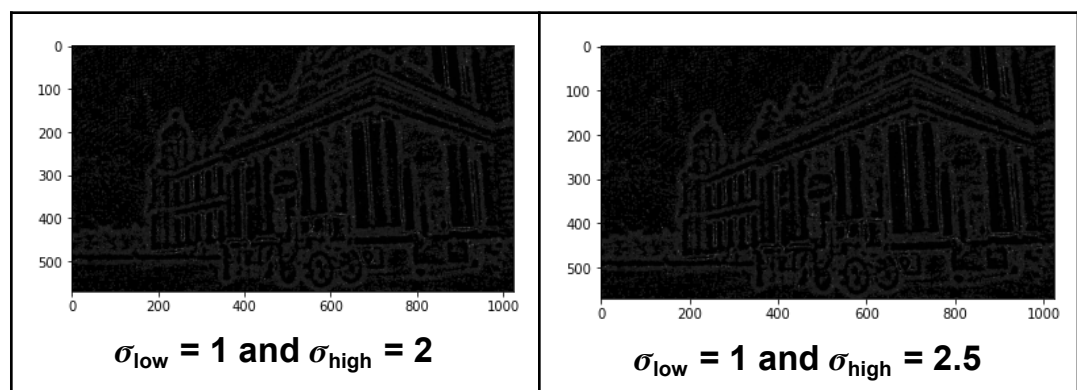

Filter orientation = 0^0

Filter orientation = 45^0

Filter orientation = 90^0

Filter orientation = 135^0

○ **Superimposed Edge Images:**

σ_{low} = 1 and σ_{high} = 2

σ_{low} = 1 and σ_{high} = 2.5

$\sigma_{low} = 1$ and $\sigma_{high} = 3$

$\sigma_{low} = 2$ and $\sigma_{high} = 4$

$\sigma_{low} = 2$ and $\sigma_{high} = 5$

$\sigma_{low} = 2$ and $\sigma_{high} = 6$

$\sigma_{low} = 4$ and $\sigma_{high} = 8$

$\sigma_{low} = 4$ and $\sigma_{high} = 10$

$\sigma_{low} = 4$ and $\sigma_{high} = 12$
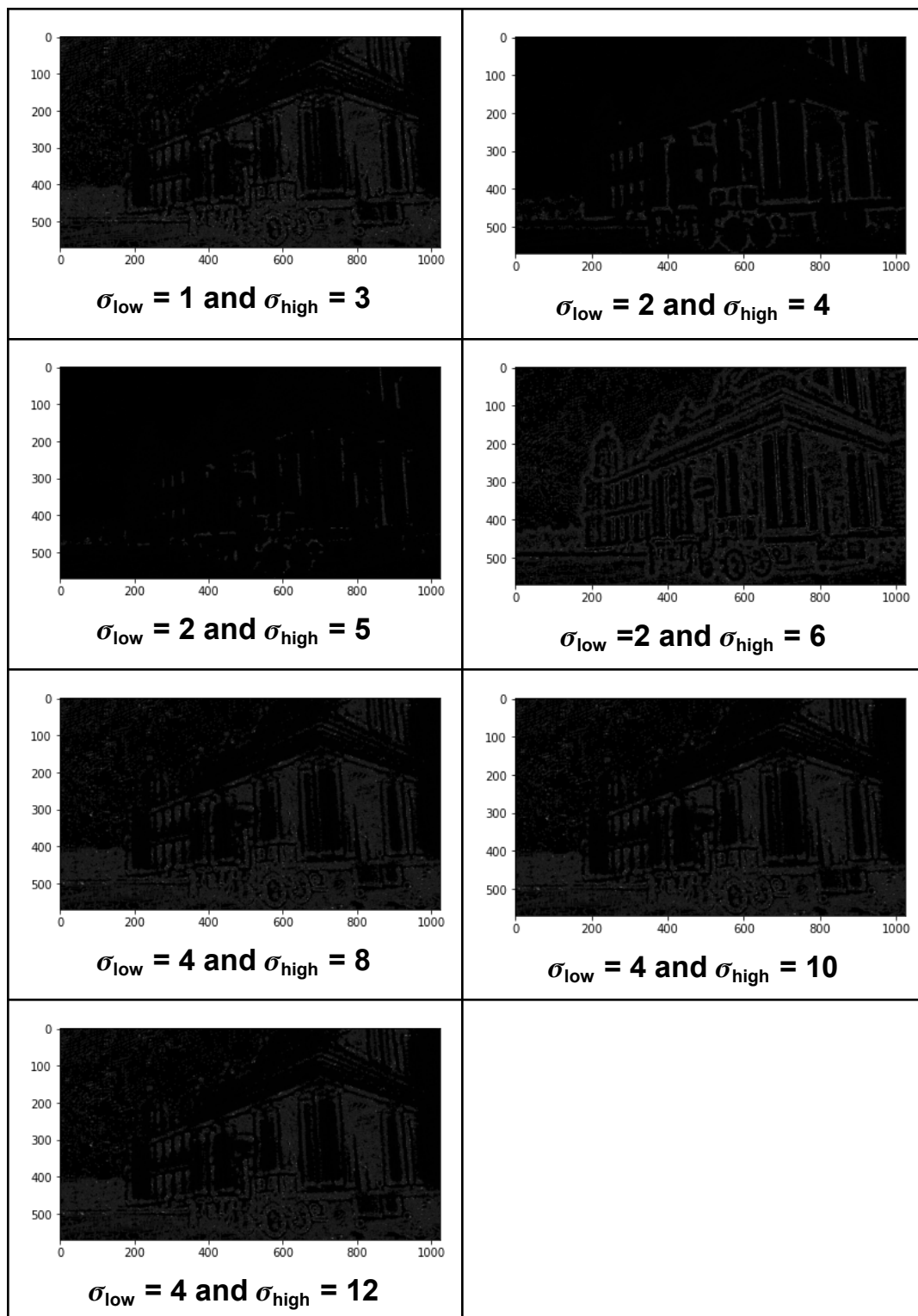
- **Observations:**

  - When the lower standard deviation is very low (for e.g. σ_{low} = 1) then the optimal DoG output is occurred when the difference between higher standard deviation and lower standard deviation is less (in the above two cases the optimal DoG output occurs at σ_{low} = 1, σ_{high} = 2 and σ_{high} - σ_{low} = 1).

  - As the value of lower sigma increases, the optimal DoG output occurs at comparatively more difference between higher standard deviation and lower standard deviation. For e.g when σ_{low} = 1 then the optimal DoG output occurred at σ_{high} = 2 (difference = 2) but when σ_{low} = 2 then the optimal DoG output occurred at σ_{high} = 6 (difference = 4).

  - For a good DoG output, the superimposed images are better than the others i.e showing edges clearly. The superimposed edged images for inappropriate values of lower standard deviation and higher standard deviation are noisy.

- **Conclusion:**

The difference of gaussian output and superimposed images are sensitive to the choice of hyper-parameters: lower standard deviation and higher standard deviation.

- **Google Colab Link:**

  https://colab.research.google.com/drive/1TYLwBZU_v7t5SapTUDfy7WJGnLLy_0el#scrollTo=qcB-3tXF1yG2