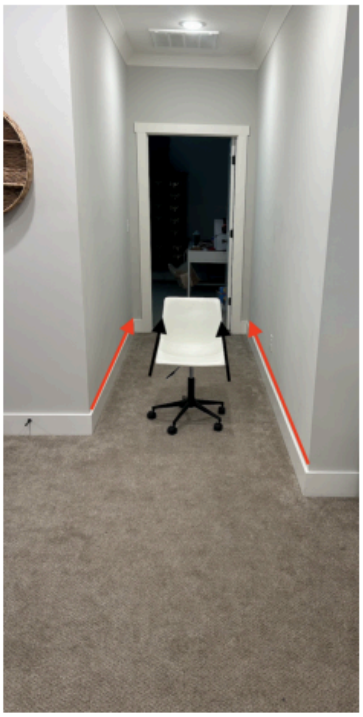
Part 1: Perspective and orthographic projections

Question 1

Perspective Image

Close to Orthographic Image



The perspective image distorts the chairs dimensions, by zooming out and we can almost get an orthographic image of the chair.

Quick Example

In the perspective image, the chair's bottom leg (touching the bottom border) appears significantly larger than the chair's leg 90 degrees to the left of it. While in the orthographic image the chair's legs appear the same length.

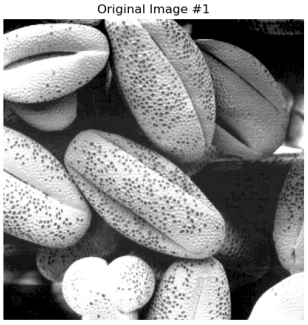
Part 2: Histogram Manipulation & Linear Filtering

(a) Histogram Equalization on Provided Images (required)

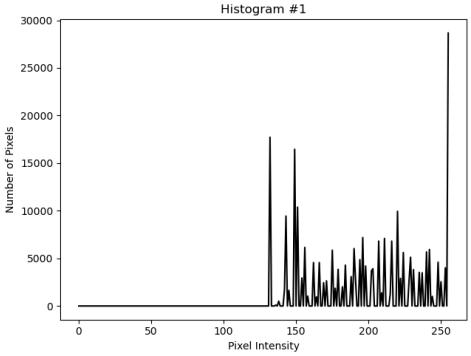
Question 1:

Images & their Histograms

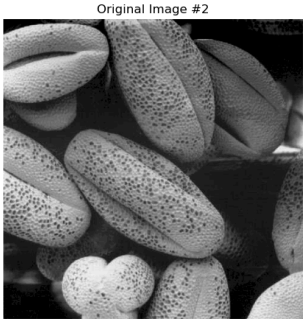
Original Image #1



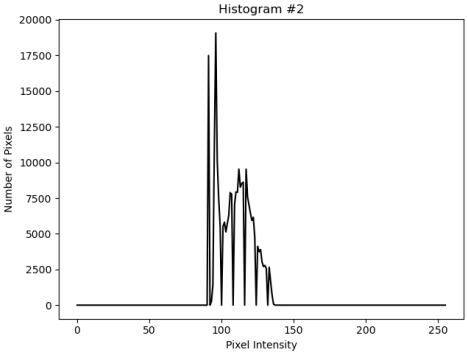
Histogram #1



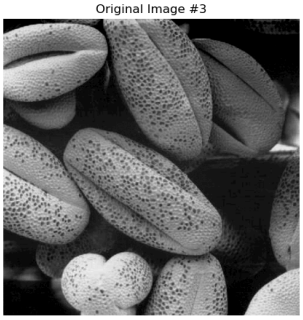
Original Image #2



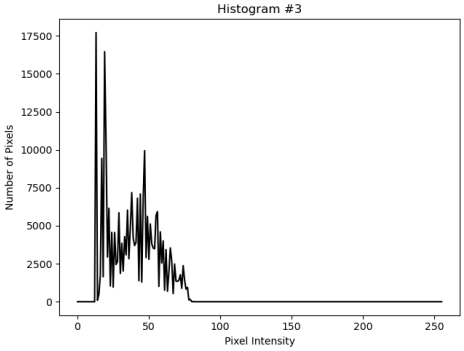
Histogram #2



Original Image #3

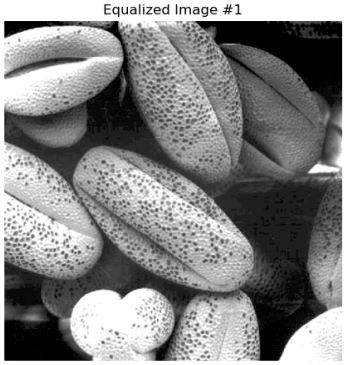


Histogram #3

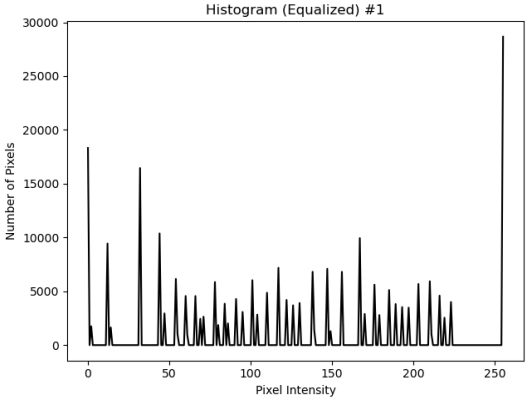


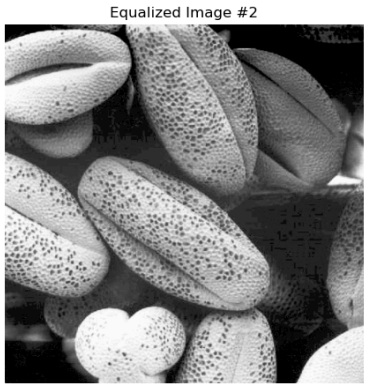
Equalized Images & their Histograms

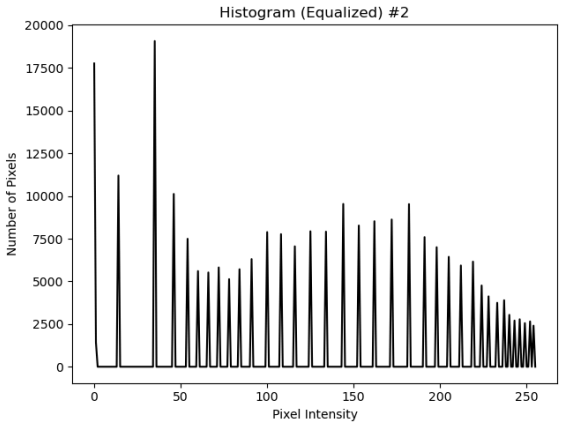
Equalized Image #1

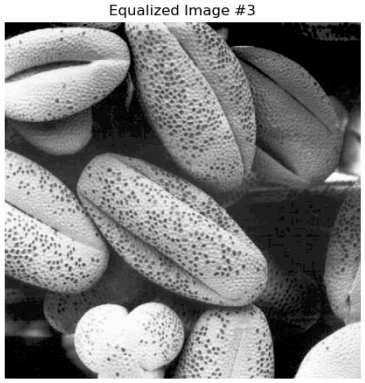


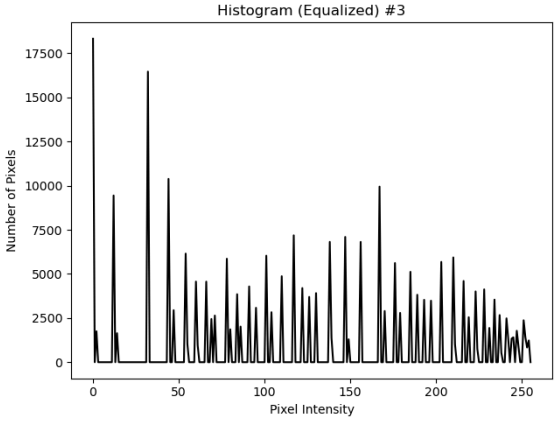
Histogram (Equalized) #1





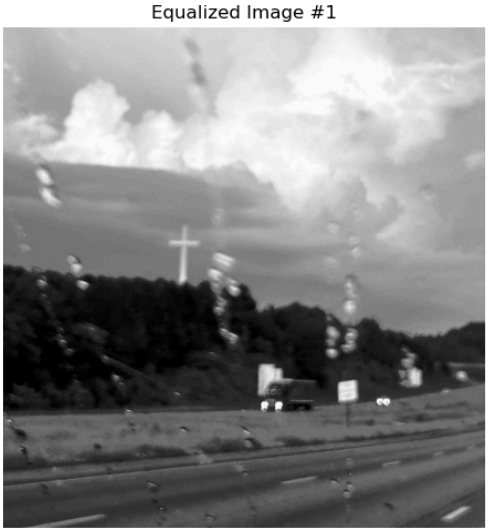


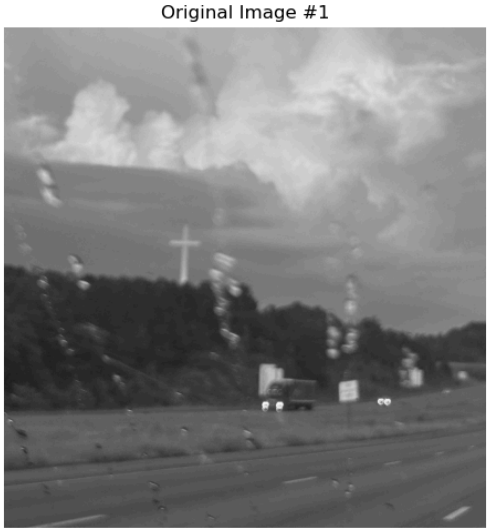




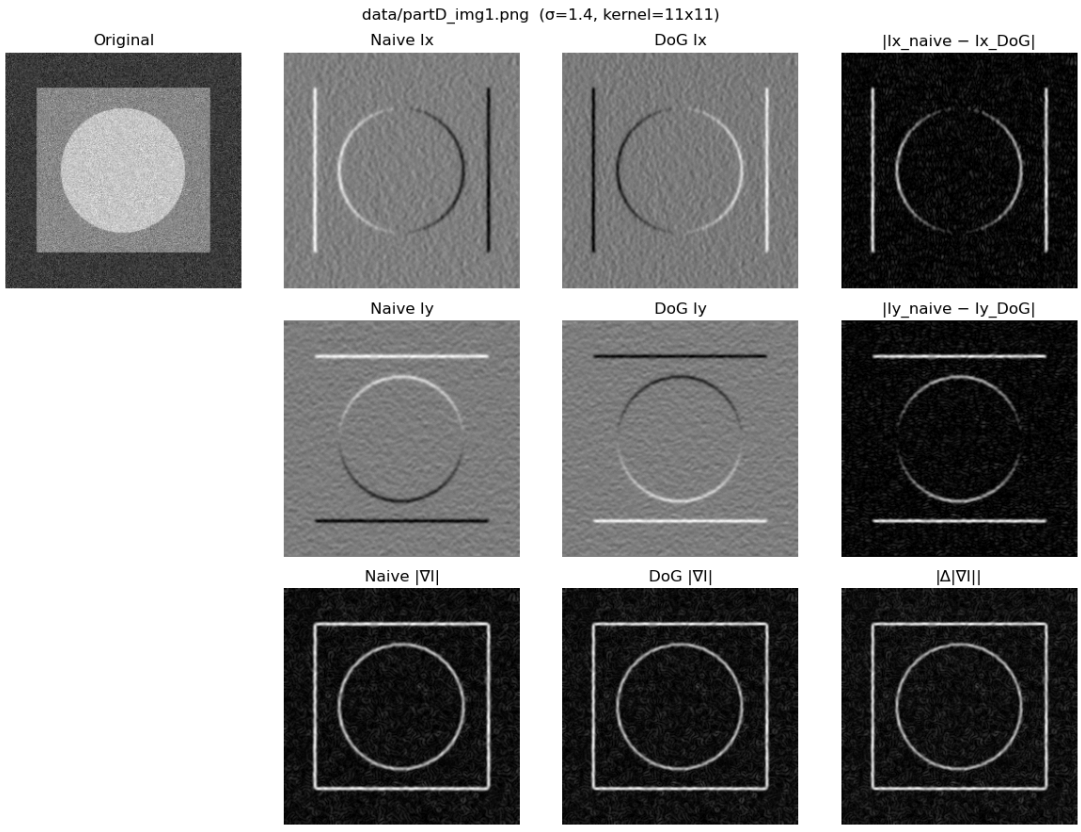
Creative Own Equalized

‘the train in image 1 looks much sharper on the left which is equalized'



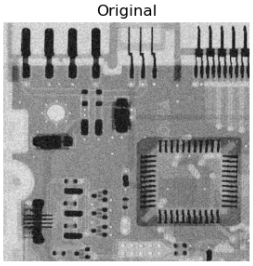


Question 4: Derivative of Gaussian

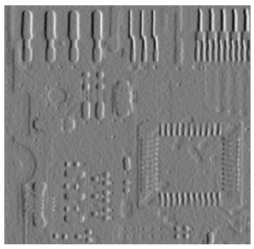


data/partD_img2.png (σ=1.4, kernel=11x11)

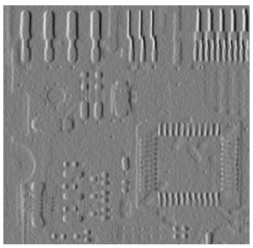
Original



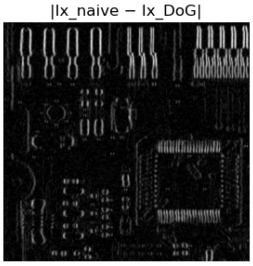
Naive Ix



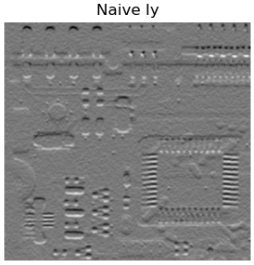
DoG Ix



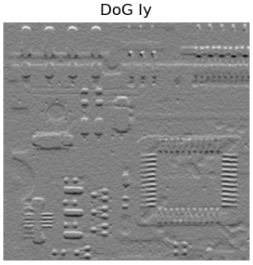
|Ix_naive − Ix_DoG|



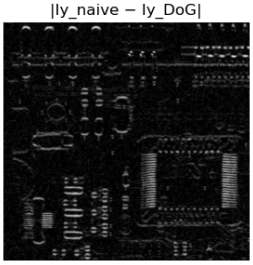
Naive Iy



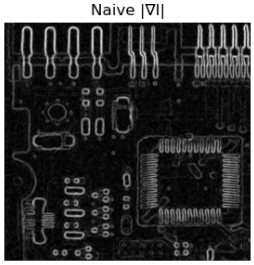
DoG Iy



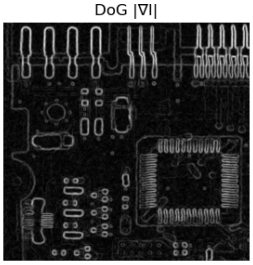
|Iy_naive − Iy_DoG|



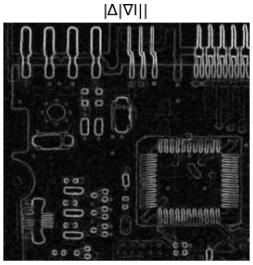
Naive |∇I|



DoG |∇I|

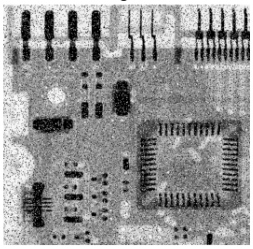


|Δ|∇I||

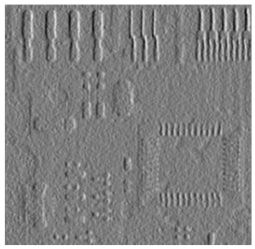


data/partD_img3.png (σ=1.4, kernel=11x11)

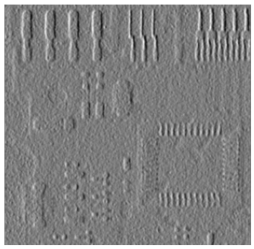
Original



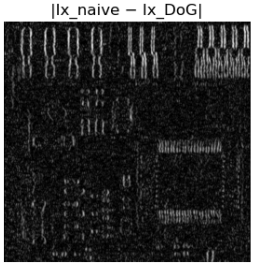
Naive Ix



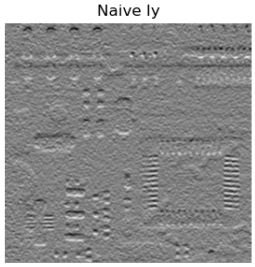
DoG Ix



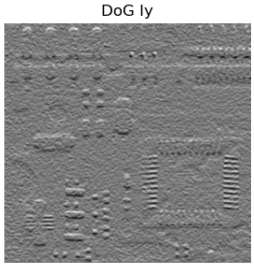
|Ix_naive − Ix_DoG|



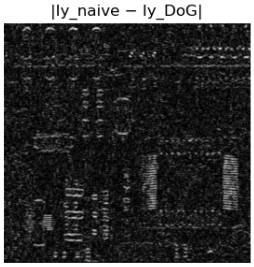
Naive Iy



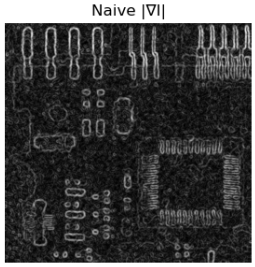
DoG Iy



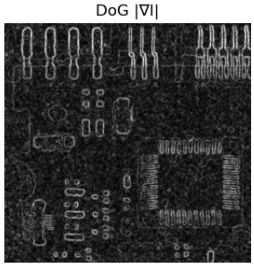
|Iy_naive − Iy_DoG|



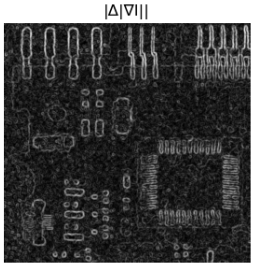
Naive |∇I|



DoG |∇I|

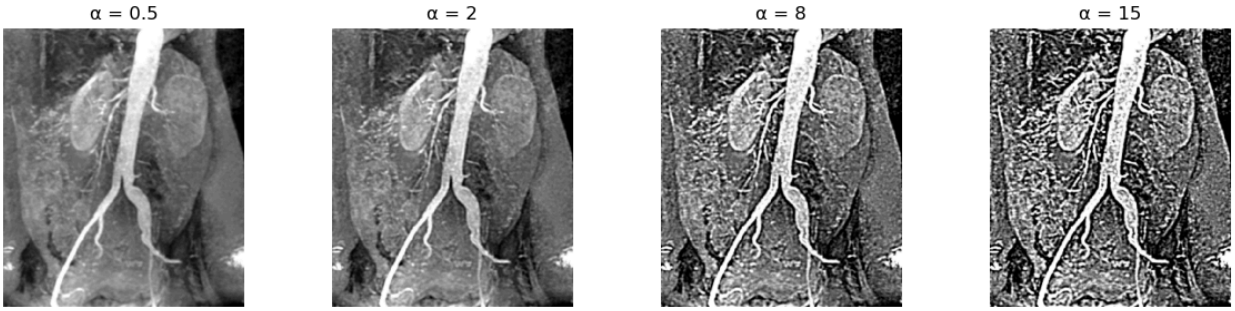


|Δ|∇I||

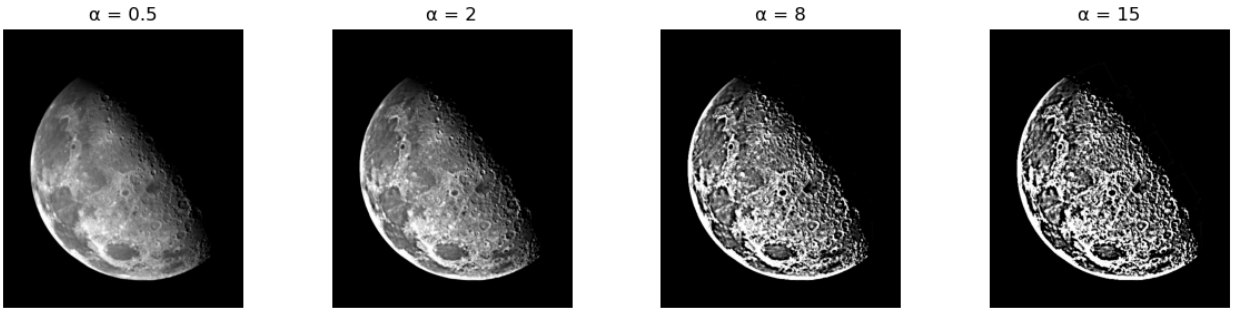


Question 5: Creative Task: Image Sharpening

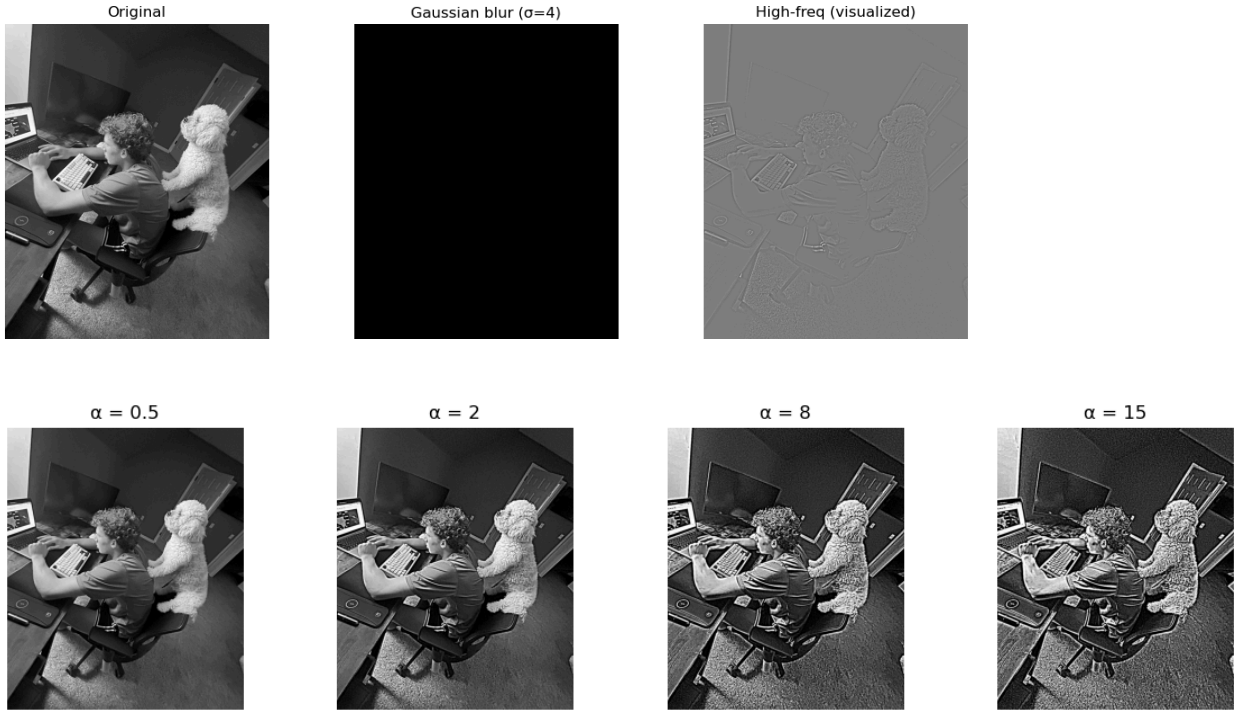
Heart



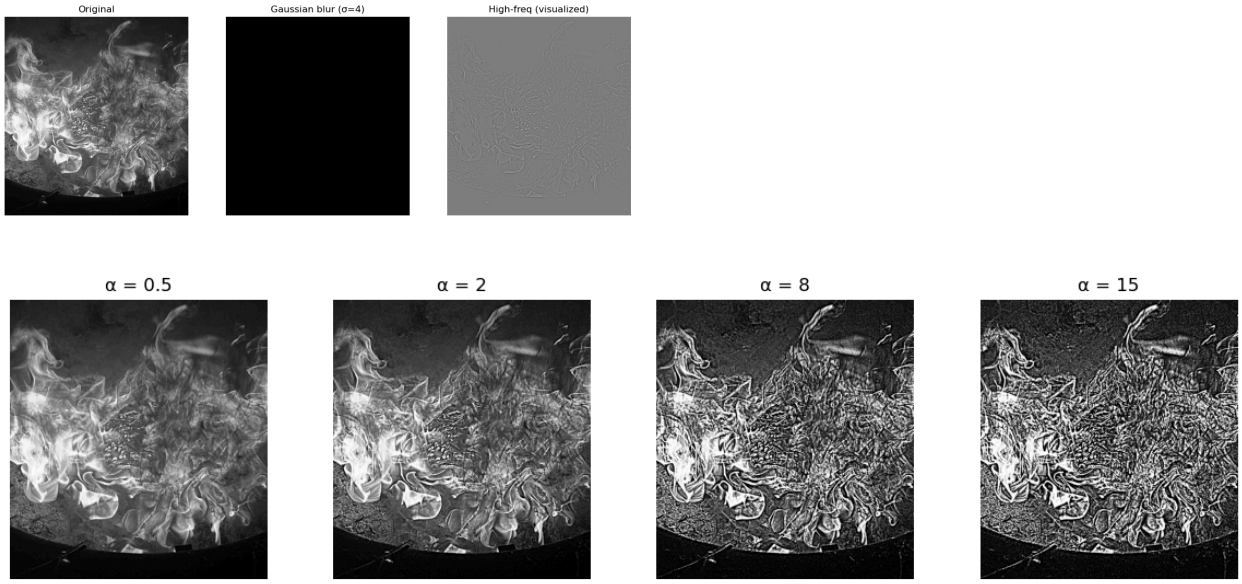
Moon



Creative-better — The image of me and the dog increases in quality as sharpness is increased, details are made more clear in the image.



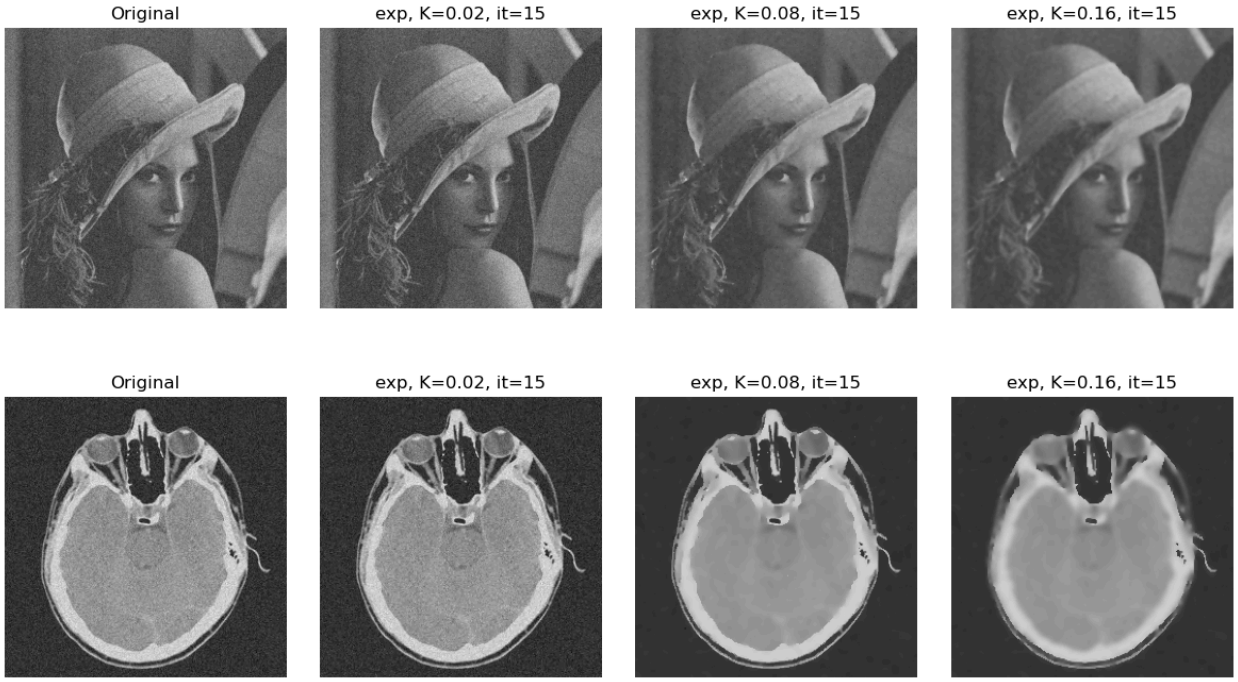
Creative-worse — In last set, of a fire pit, the original texture of the fire is lost, it is slightly harder to tell it is a fire after sharpening



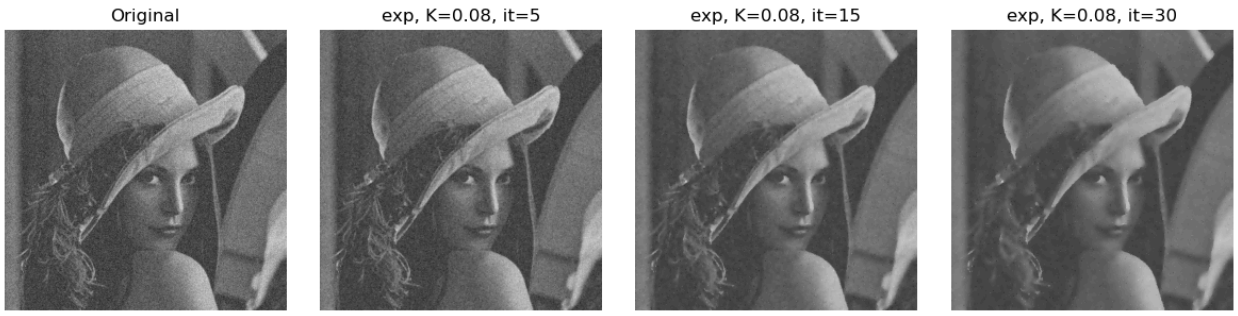
Part 3: Anisotropic Diffusion (Graduate Students)

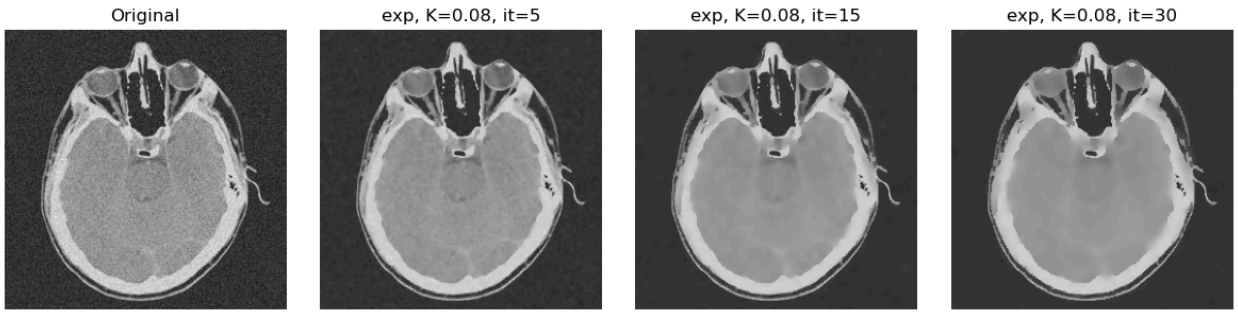
- **Question 1:** Implementation of Anisotropic Diffusion

  Exponential Implementation
  Varying K



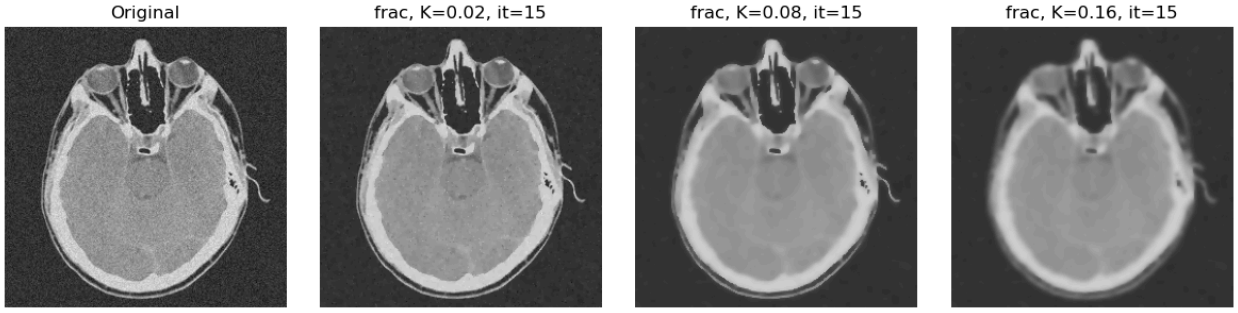
  Varying Iterations



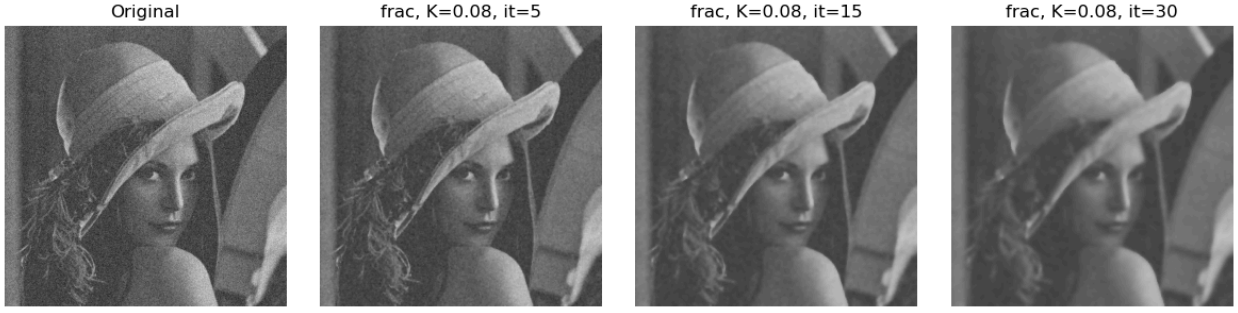


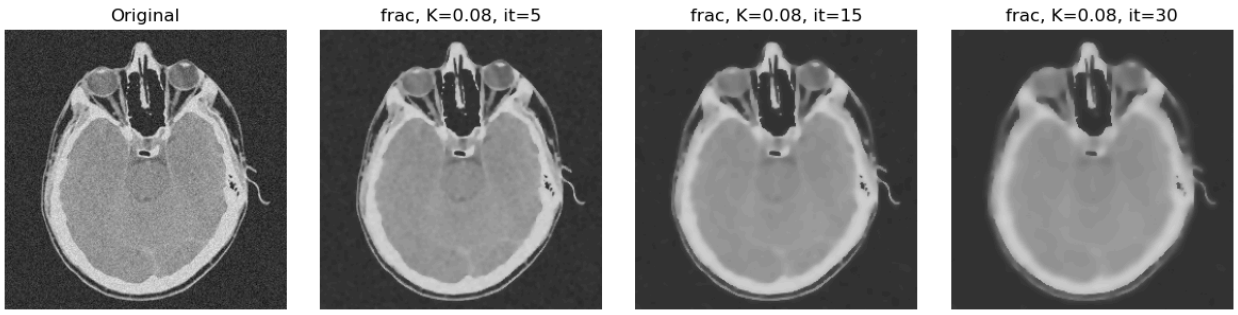
Fraction Implementation

Varying K



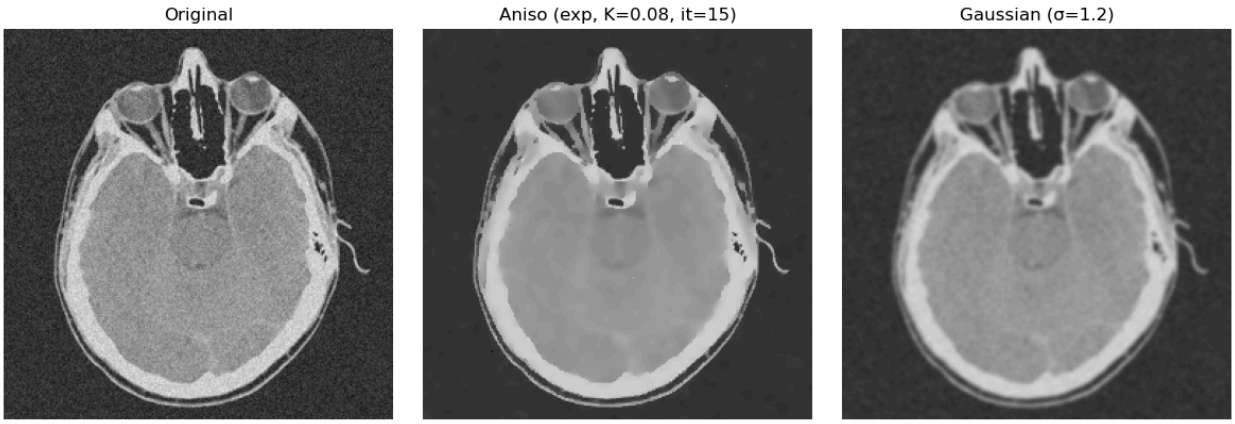
Varying Iterations



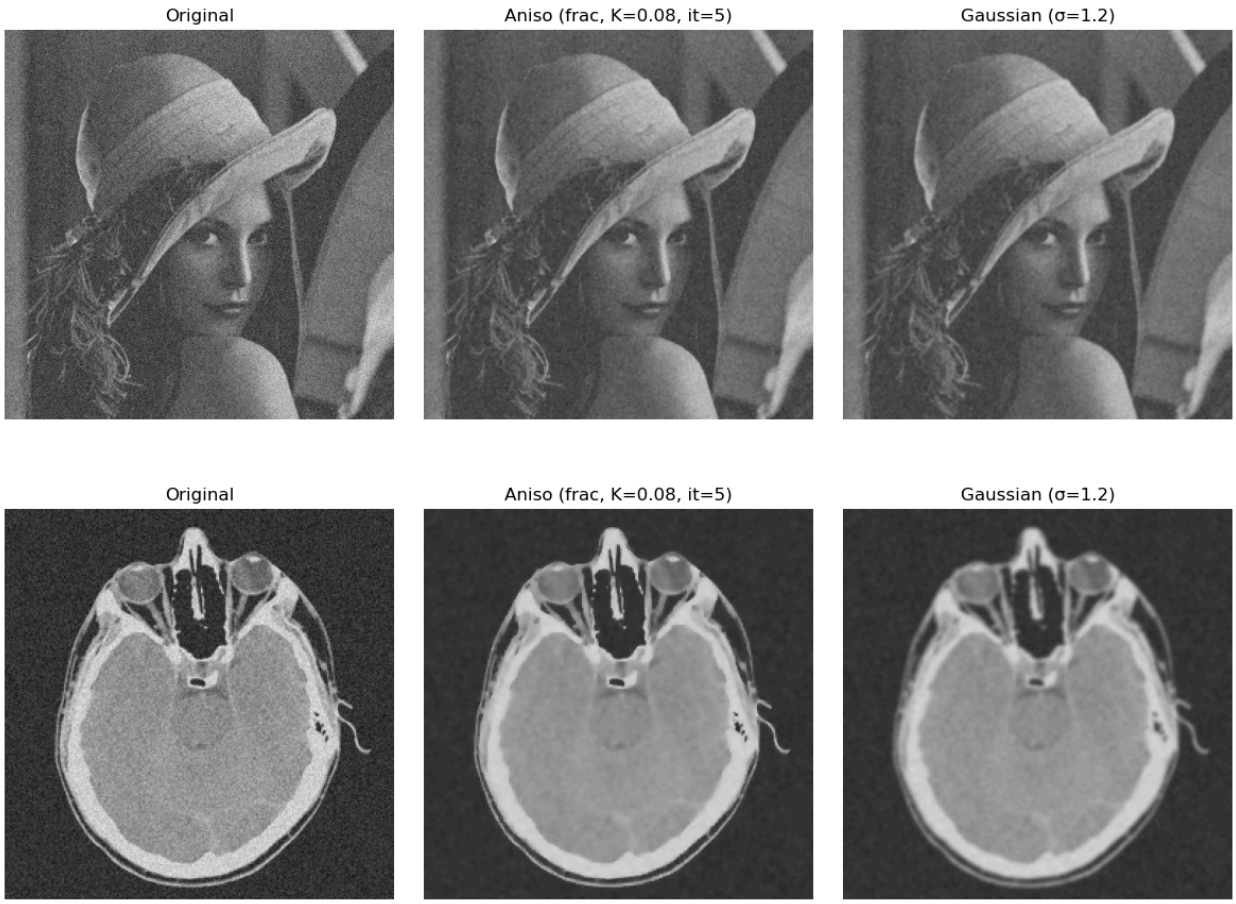


- **Question 2:** Comparison with Gaussian Smoothing

  Exponential Implementation



Fraction Implementation



Findings

When k's value is increased sharpness is slowly lost and as iterations are increased sharp edges are lost, I noticed that both of these effects are much more apparent in the fraction implementation

Anisotropic diffusion performs image filtering without losing sharp edges, in image two, the MRI holds the sharp lines much better in both Anisotropic methods in comparison to gaussian smoothing.

In both images the superior method appears to be the exponent implementation.