

Project 2 Fun with frequencies!

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Computational Photography
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Part 0: Unsharp masking

For this part of the project, we sharpened a gray scale image using the unsharp masking technique we covered in class. See figure 1 for our results. We used a gamma value of XXX and a sigma value of YYY.



Figure 1: Example of unsharp masking

Part 1: Magnitude vs phase angle

We found that changes in the angle/phase are more important than changes in magnitude. Magnitude changes the intensity/luminosity of the image while angle/phase warps the image.



Figure 2: Original images, pair 1



Figure 3: Magnitude of both Fourier transforms, pair 1. We interpreted this as doubling the magnitude and displaying the changes in the images.

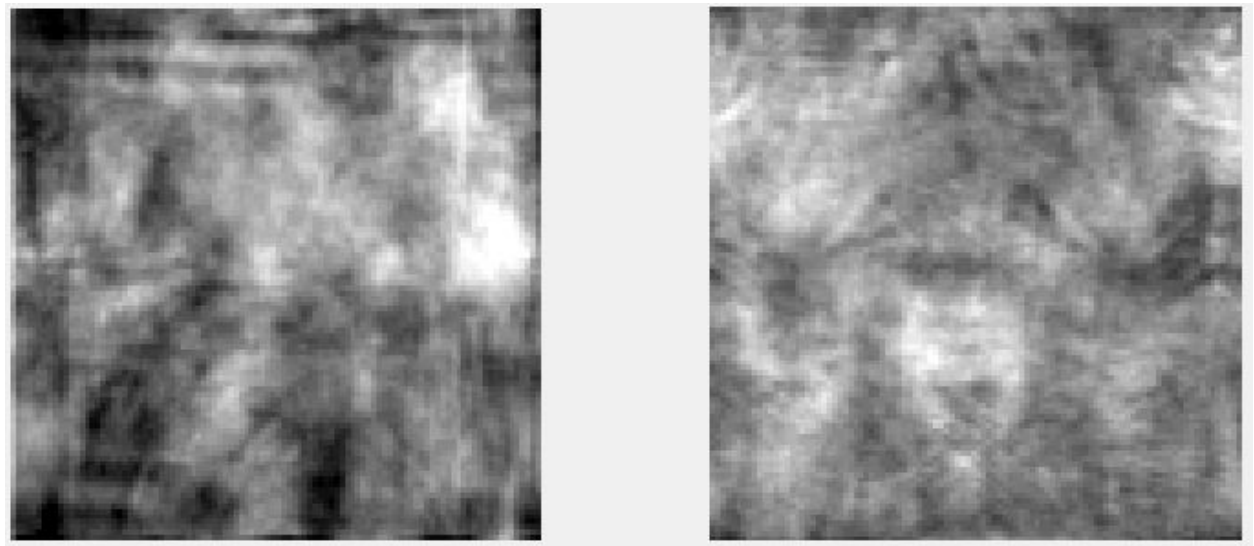


Figure 4: Phase angles of both Fourier transforms, pair 1. We interpreted this as doubling the phase angles and displaying the changes in the images.

We're not sure what this is, so we're leaving it blank for now.

Figure 5: Both swapped recombinations, pair 1



Figure 6: Original images, pair 2



Figure 7: Magnitude of both Fourier transforms, pair 2

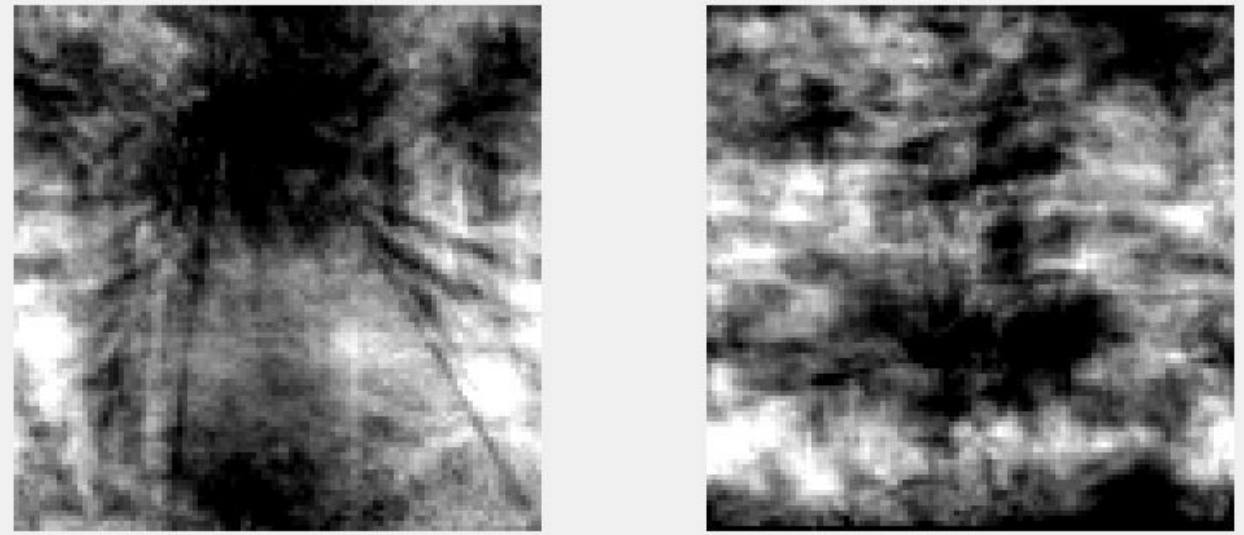


Figure 8: Phase angles of both Fourier transforms, pair 2

We're not sure what this is, so we're leaving it blank for now.

Figure 9: Both swapped recombinations, pair 2

Bells and whistles

Color (up to 1 points)

We repeated the steps of part 1 but with color. Here are our results:

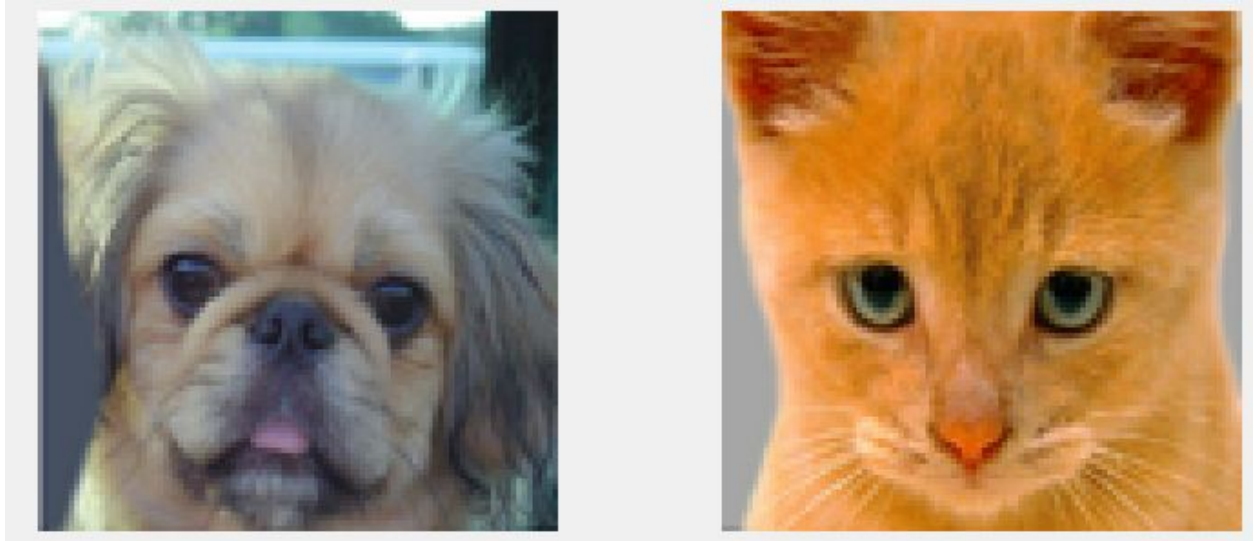


Figure 10: Original images, pair 2

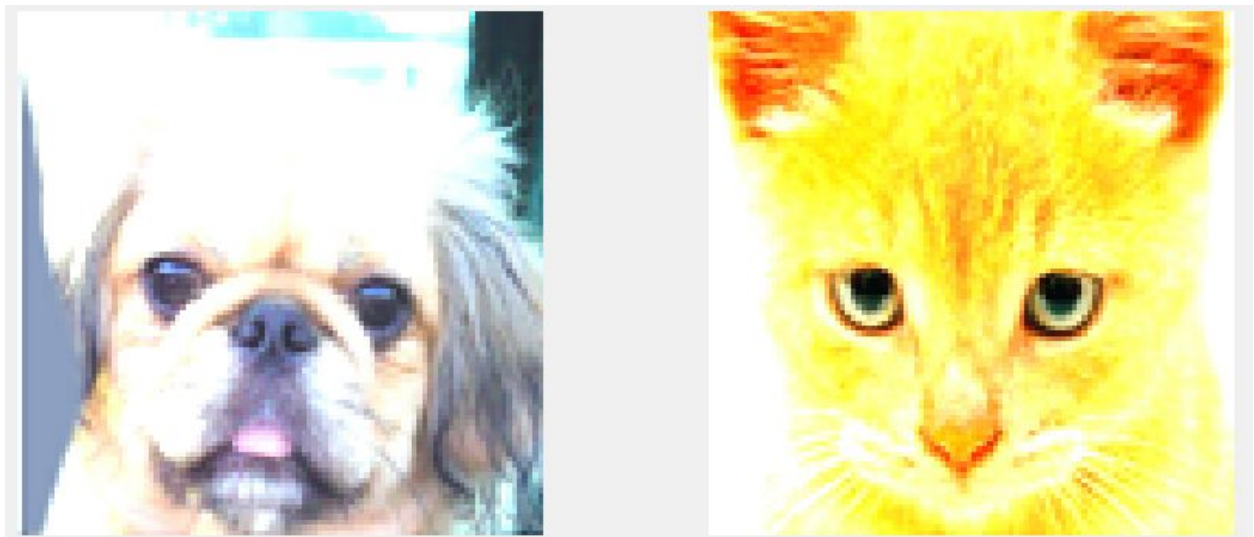


Figure 11: Magnitude of both Fourier transforms, pair 2

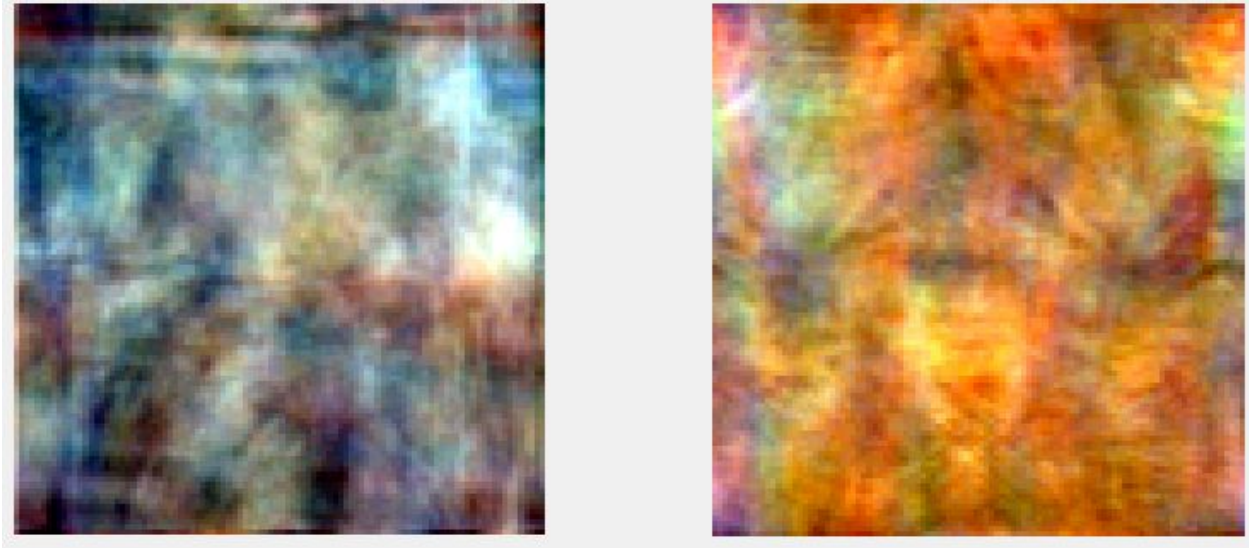


Figure 12: Phase angles of both Fourier transforms, pair 2

We're not sure what this is, so we're leaving it blank for now.

Figure 13: Both swapped recombinations, pair 2

Part 2: Hybrid frequency images

Our results worked well because experimented with the `hsize` and `sigma` parameters for a long time. The main clever thing we did was implement the `ginput` bell and wistle for alignment.

Here's the results from our favorite results and a failed result:

Parameters for favorite result #1:

```
hsize <- 29
```

```
sigma <- 7
```

```
and
```

```
hsize <- 9
```

```
sigma <- 2
```


Parameters for favorite result #2:

hsize <- 29

sigma <- 7

and

hsize <- 9

sigma <- 2

Parameters for failed result:

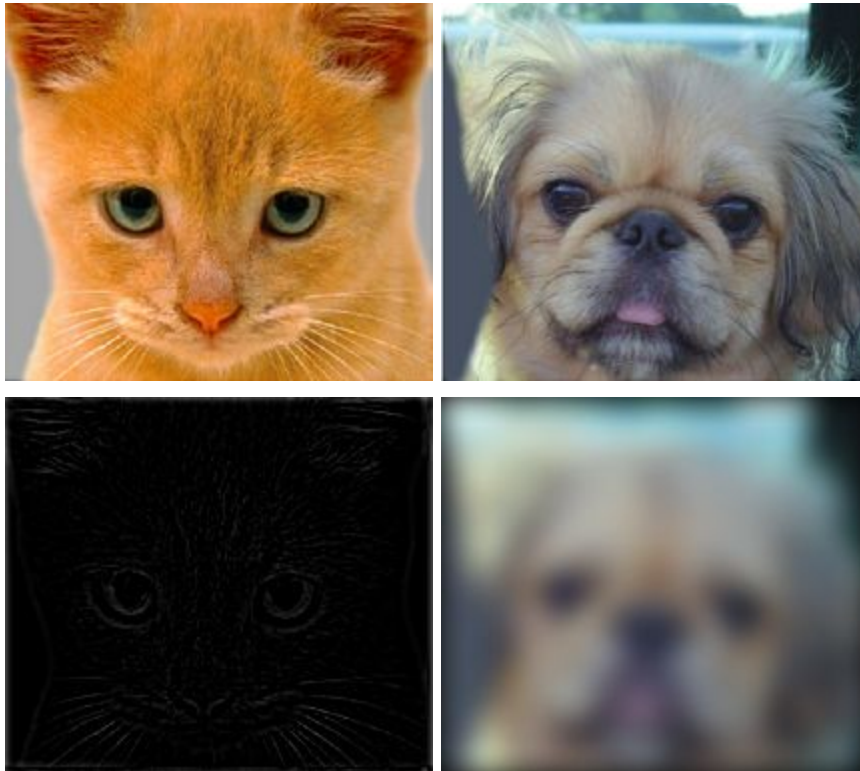
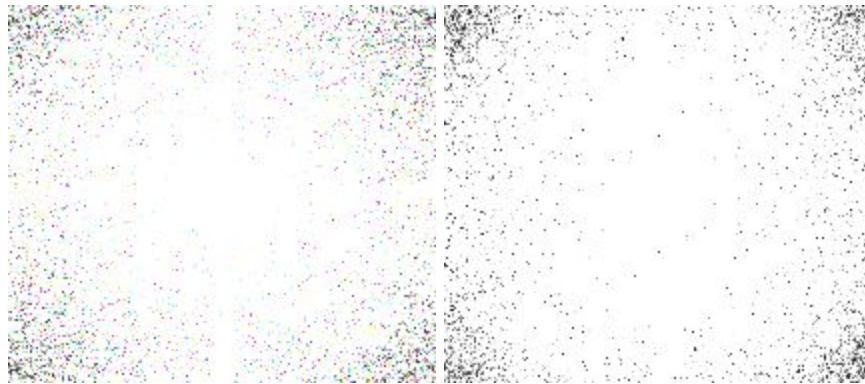


Figure 18: Original and filtered images, favorite result #1

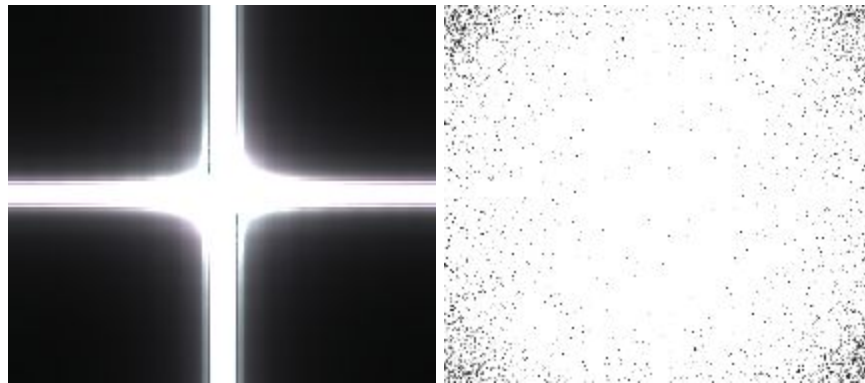


Figure 19: The hybrid image, favorite result #1



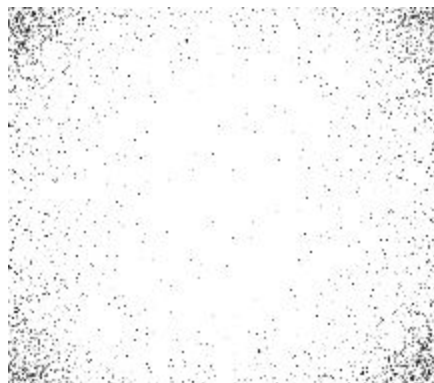
Dog Original

Cat Original



Dog Filtered

Cat Filtered



Hybrid Image

Figure 20: The FFT magnitudes for the original, filtered, and hybrid images from favorite result #1

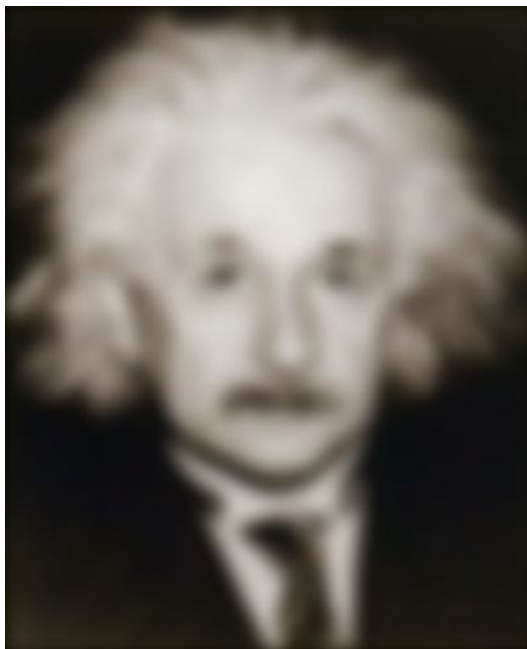
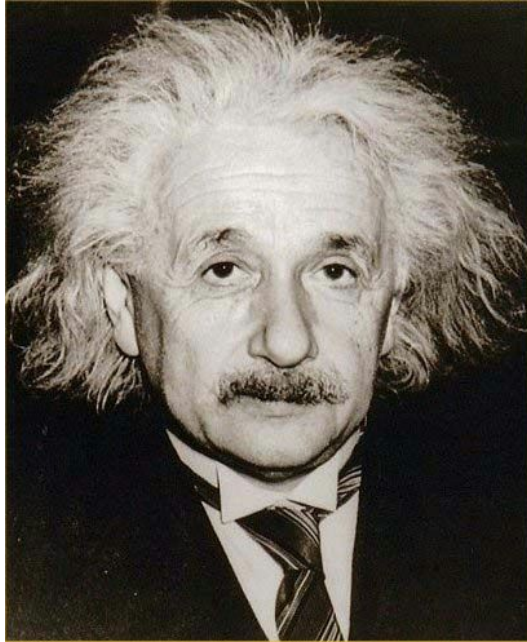
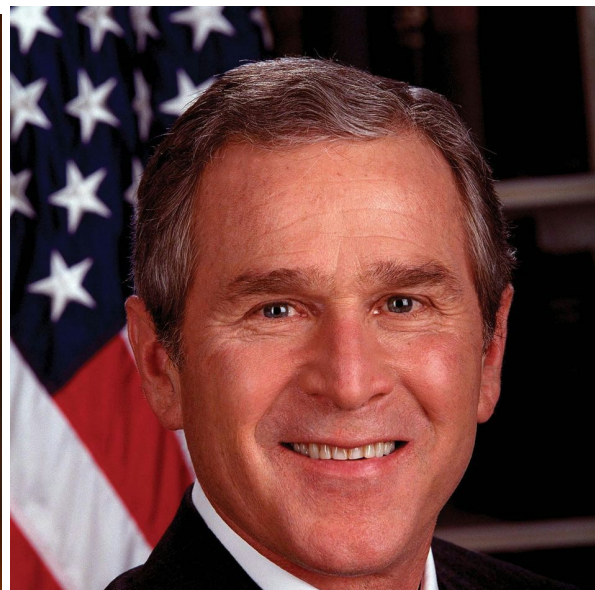


Figure 21: Original and filtered images, favorite result #2



Figure 22: The hybrid image, favorite result #2

Figure 23: The FFT magnitudes for the original, filtered, and hybrid images from favorite result #2



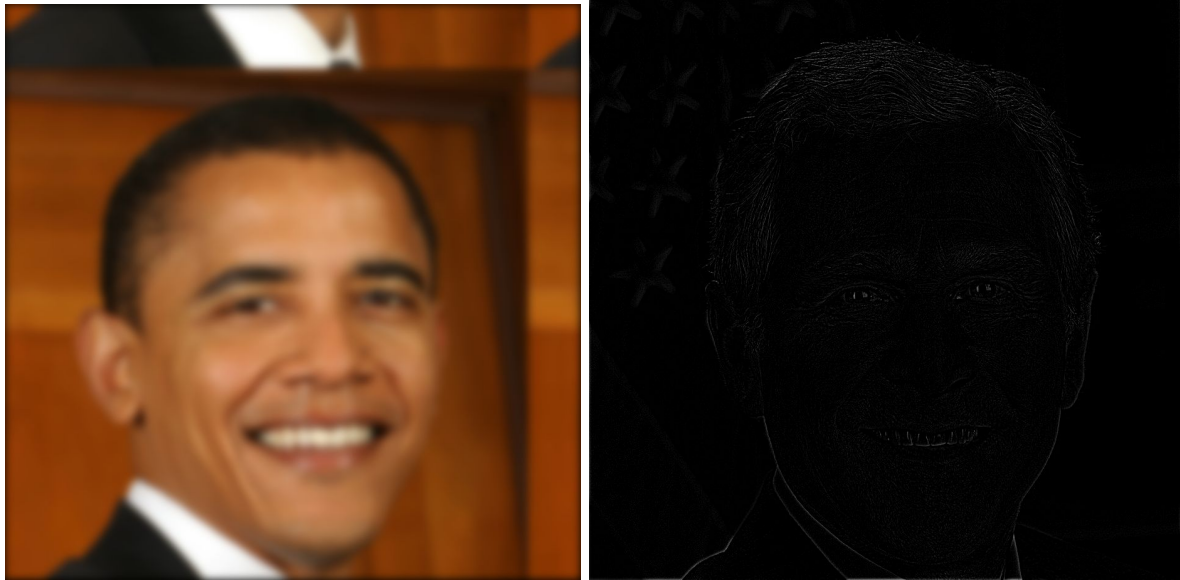


Figure 24: Original and filtered images, failed result



Figure 25: The hybrid image, failed result

Figure 26: The FFT magnitudes for the original, filtered, and hybrid images from failed result

Bells and whistles

Color (up to 5 points)

We used color to enhance the effect. We personally think it works better. We just made the images in the first part of the section color to reduce redundancy.

Alignment (up to 2 points)

We combined the faces of a cat and a dog using *ginput*. Check out our code, it works really well!

Part 3: Gaussian and Laplacian Pyramids

We implemented Gaussian and Laplacian stacks as described in class.

Here's our favorite result:

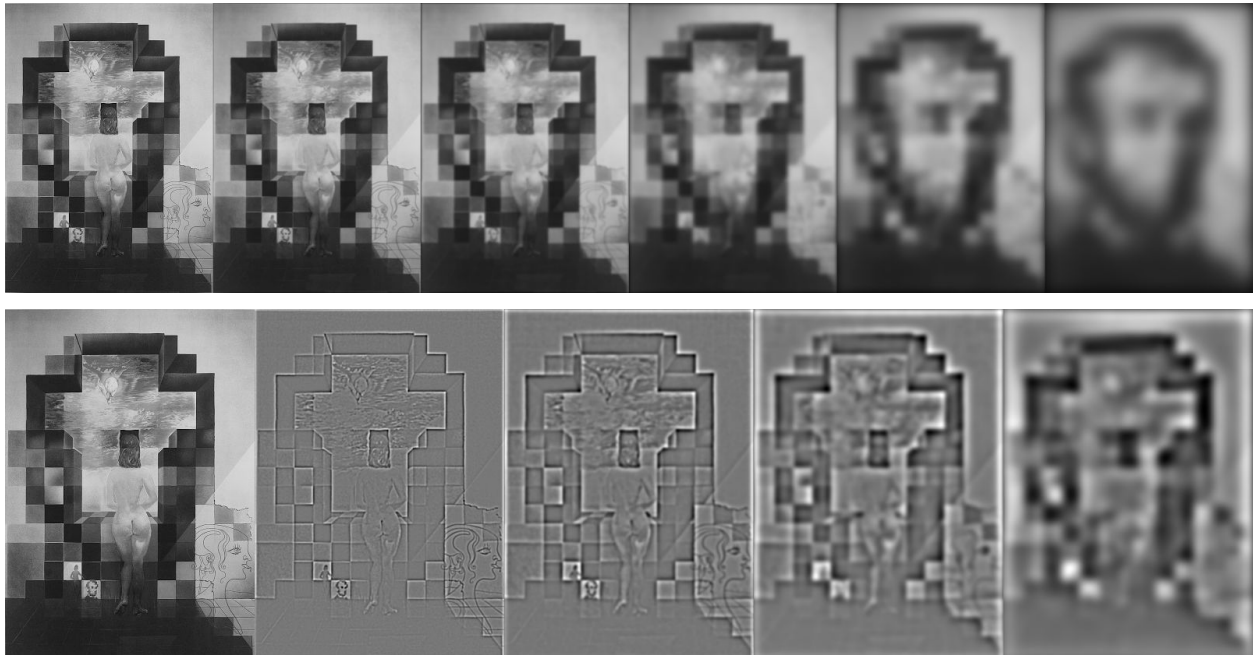


Figure 27: Favorite image

Here's our favorite multiresolution analysis of your favorite hybrid image result from Part 2:

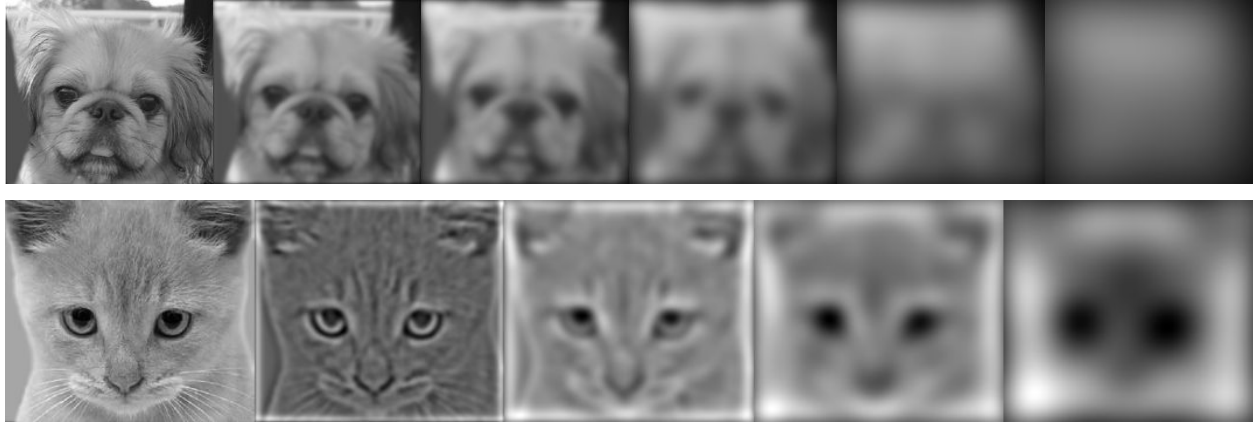
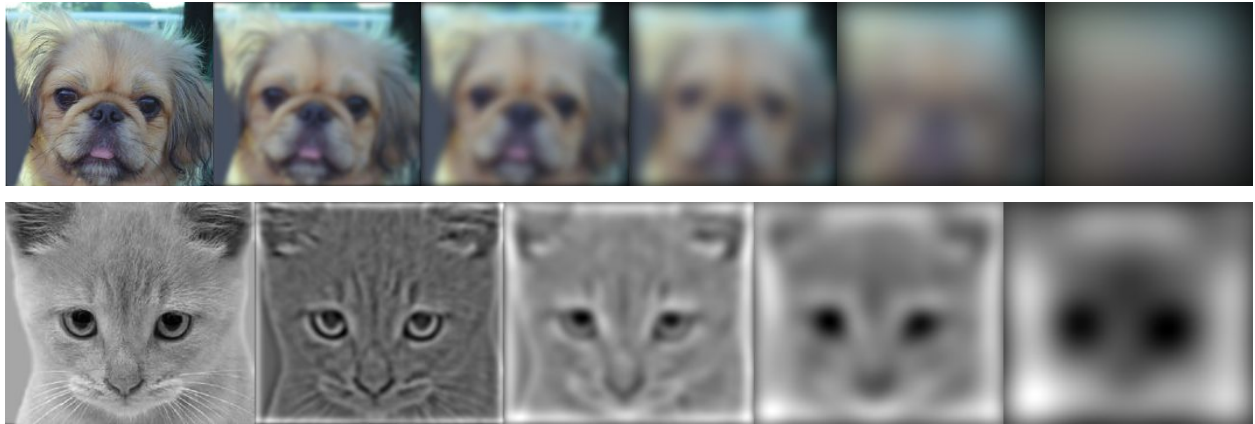


Figure 28: Favorite image

Bells and whistles

Color (up to 1 points)

We implemented this with the stack instead of the pyramid, since we opted not to use the pyramid. See our implementation in the function associated with part 3.



Part 4: Multi-resolution Blending

Here's our favorite result:



Figure 29: Original images

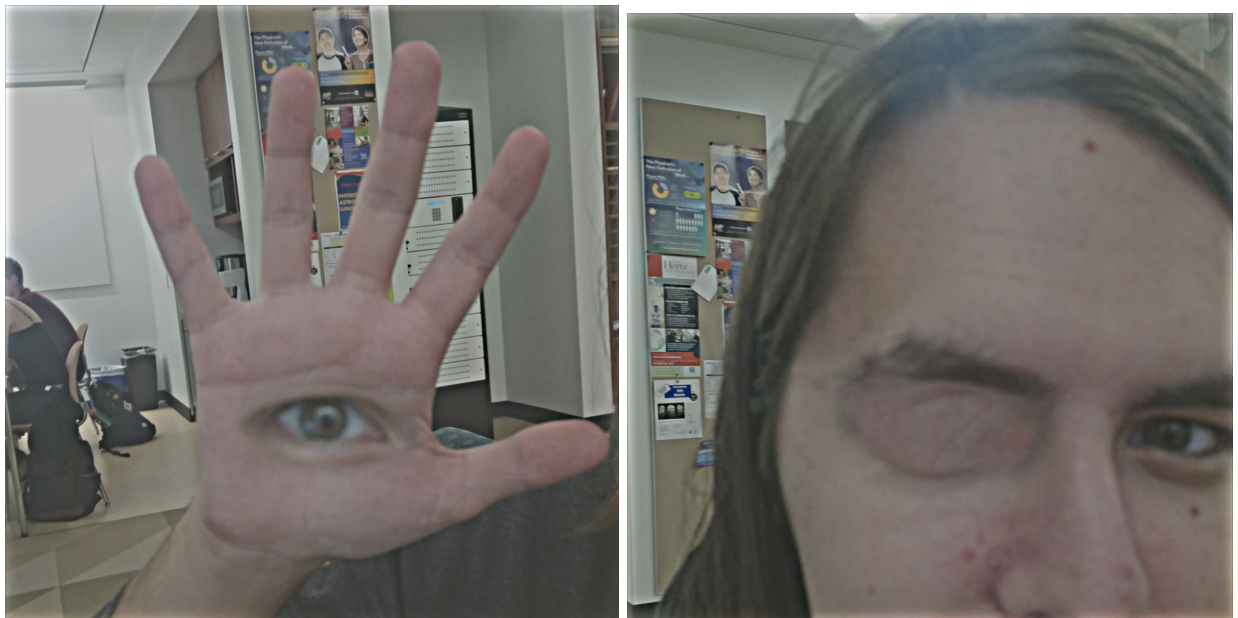


Figure 30: Blended image



Figure 31: Stack analysis

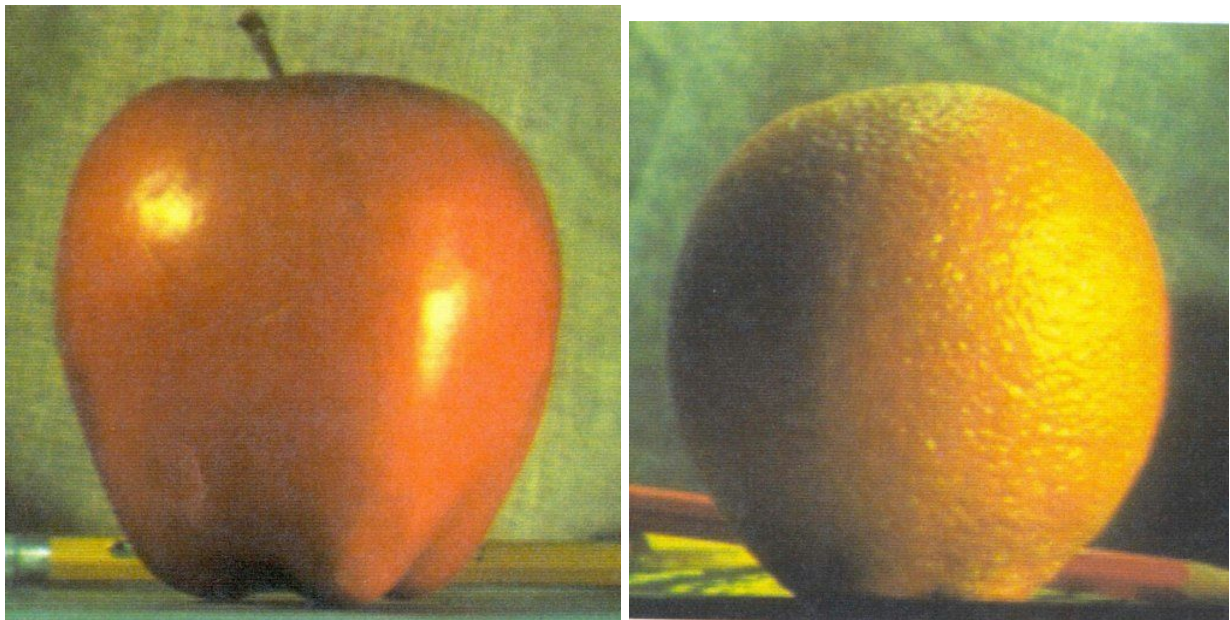


Figure 32: Original images

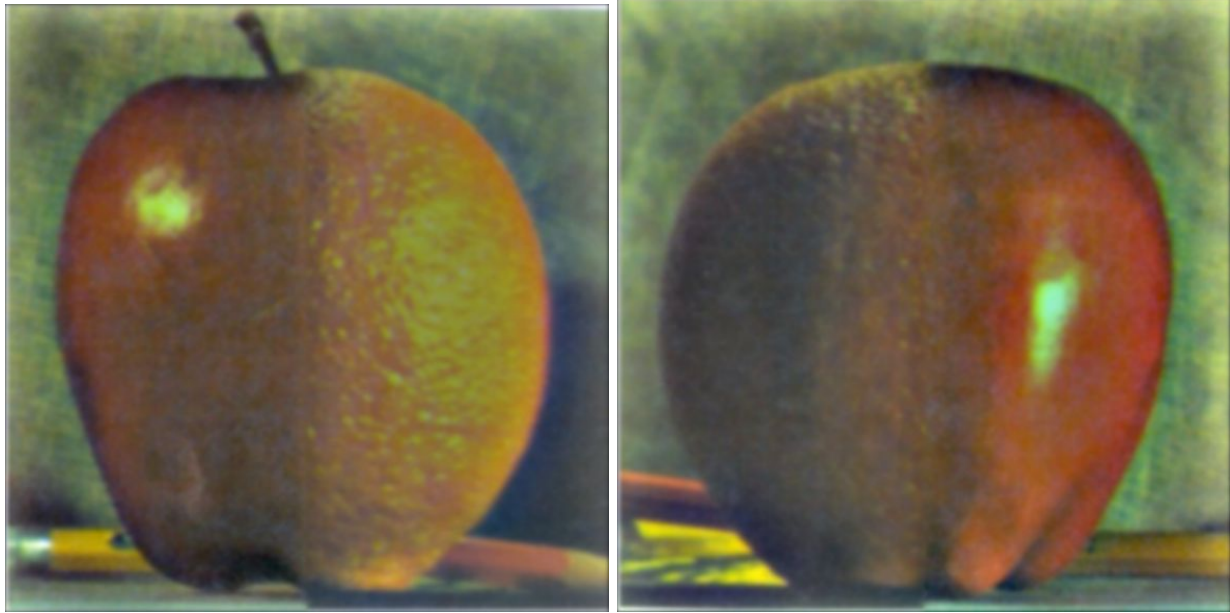


Figure 33: Blended images

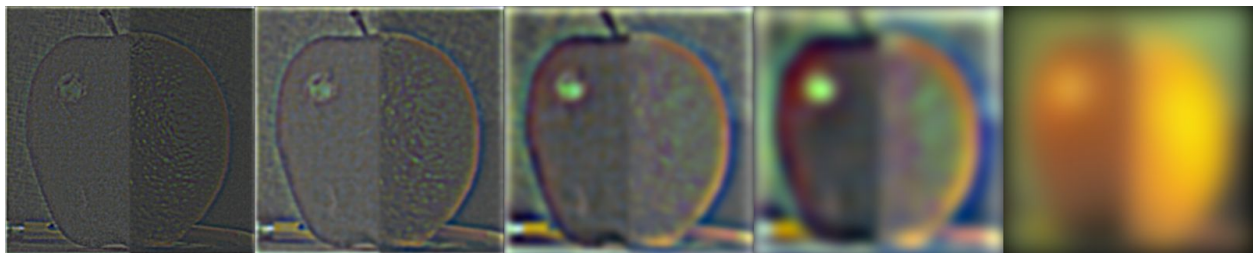


Figure 34: Stack analysis

Bells and whistles

Color (up to 5 points)

We used color to enhance the effect. We personally think it works better than the greyscale version. We thought that the color for both high-freq and low-freq looked worse than both. We just made the images in the first part of the section color to reduce redundancy. We didn't make any significant changes to the code for grayscale vs color, so it didn't make sense to recreate all of basically the same results.

Conclusion

The coolest thing we did for the project was also the most frustrating: multiresolution blending. We struggled to work out conceptually how the algorithm worked, this was probably because we didn't spend enough time figuring out the motivations behind the use of the Laplacian pyramids. However, when we did pick up on it conceptually, the implementation was actually pretty easy. It was definitely exciting when we first got the apple and orange to blend together, and then the classic eye in the hand.