Computational Photography- CS 445
Project 1 : Hybrid Image

by Deepti Sharma (deeptis2@illinois.edu)

Table of Contents

Part1 – Hybrid Image Creation

Inputs:

Image1 : dog.jpg
Image2: cat.jpg

Low Pass Filter

Create Gaussian2D kernel
Apply this as low pass filter to Image for Low Pass

High Pass Filter

Create Gaussian2D kernel
Apply this as low pass filter to Image for Low Pass
Now Subtract this filtered image from the Original Image

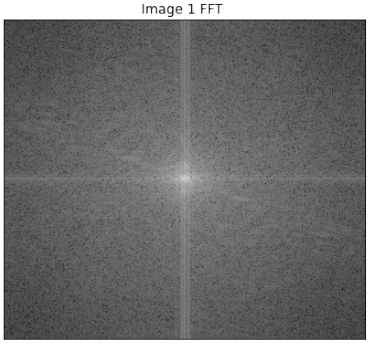
Hybrid Image

Add Low Pass Filtered and High Pass Filtered Image

RESULT 1

Image 1

Image 1 FFT



Low Pass Filtered

Image 2

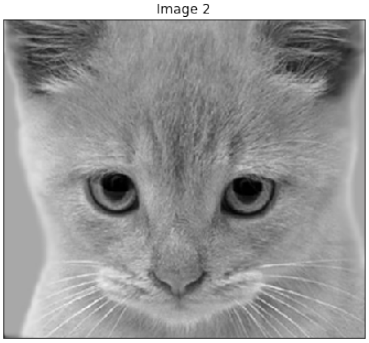
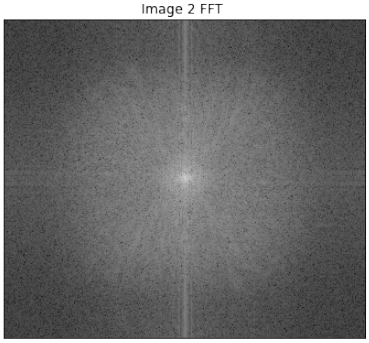


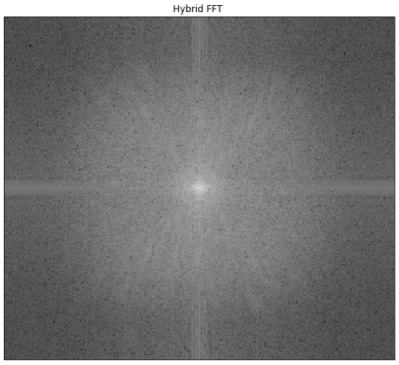
Image 2 FFT



High Pass Filtered

Hybrid

Hybrid FFT



As we can see, with reducing size, the cat gradually disappears and at 16th time reduction, we can the dog again

Hybrid=X

X/2

X/4

X/8

X/16

RESULT 2

Image 1

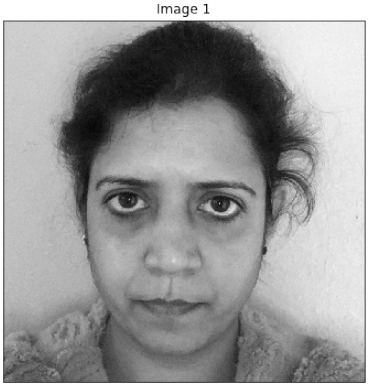
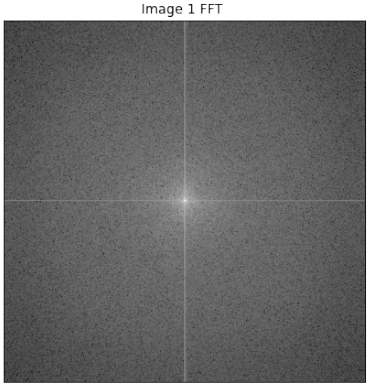


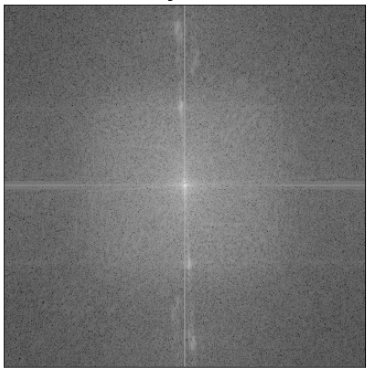
Image 1 FFT



Low Pass Filtered

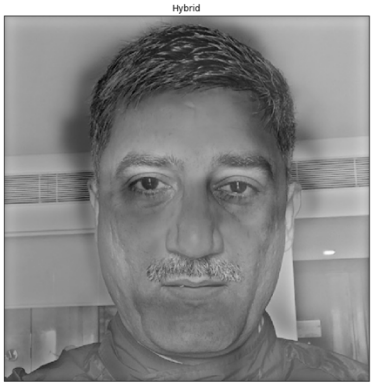
Image 2

Image 2 FFT

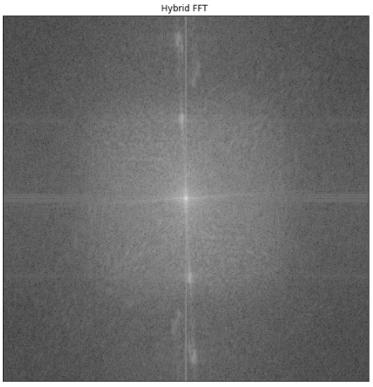


High Pass Filtered

Hybrid

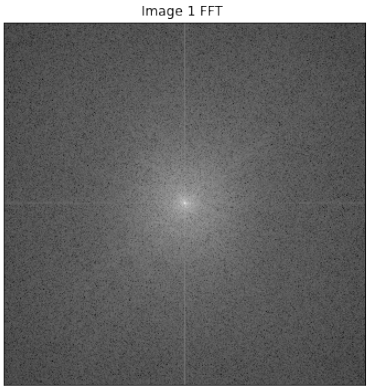


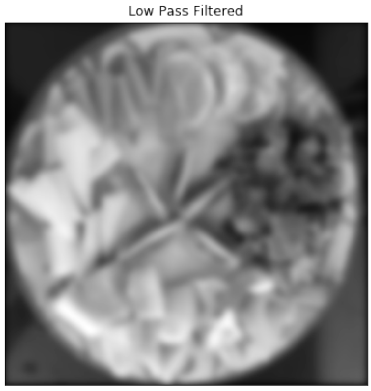
Hybrid FFT

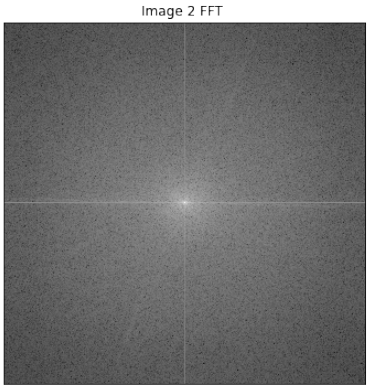


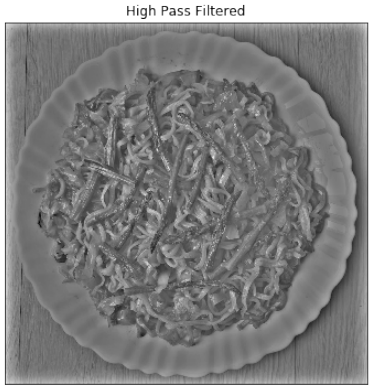
RESULT 3

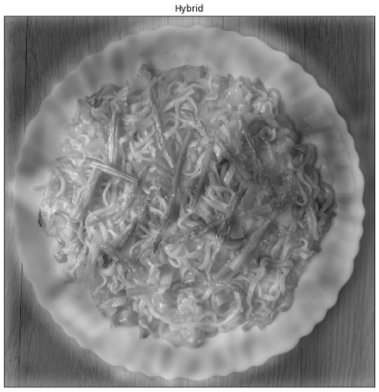
In this case both images turn out to be in same frequency range so the results were not really good.

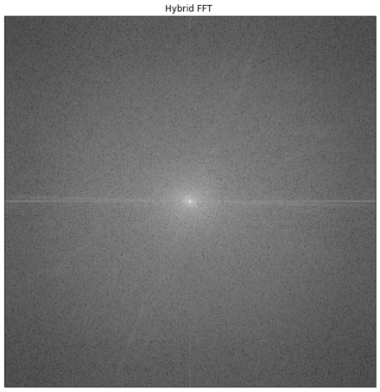










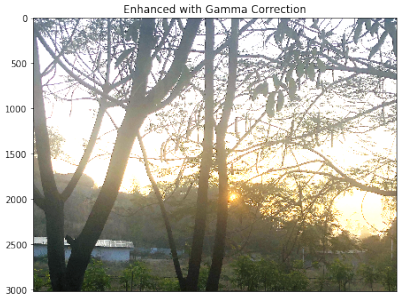


Part2 – Enhancements

Contrast Enhancement

I used Gamma Correction for Contrast enhancement of the image

For this, I first applied gain and bias adjustment to the image to adjust contrast and brightness and then applied gamma correction to smooth the colors. As you can see in the final image, green is much prominent than the original image.



Color Enhancement

For color enhancement, tried Histogram Equalization and Adaptive Histogram Equalization. The later one gave much better results

Color Shift

Enhance Red

- Converted to Lab & applied Adaptive Histogram Equalization to the A channel. This channel color component ranges between Green to Magenta

Reduce Yellow

- Converted to Lab & applied Adaptive Histogram Equalization to the B channel. This channel color component ranges between Blue to Yellow

Bells and Whistles

- Illustrate the hybrid image process by implementing Gaussian and Laplacian pyramids and displaying them for your favorite result. (15 pts)
    - Done with Gaussian pyramid, though used only Open CV2 library to do the same
- Do all three image enhancement tasks. (10 pts)
    - All three tasks completed