

Image and Video Processing Laboratory | EC69211

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How to Run:

Helper codes can be found in `fft_utils.py`. To try run `exp4.ipynb` directly.

The code contains the `FFT` and `Experiment4` class which can be used making & visualising FFTs and filtering in Frequency Domain respectively.

Results:

Q1:

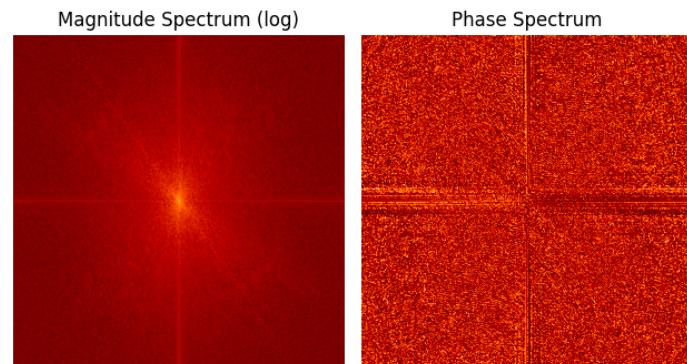
Ideal LPF:



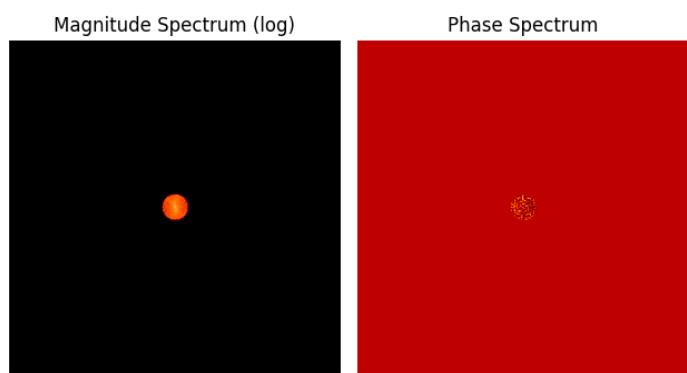
Filtered Image



Original FFT



Filtered FFT



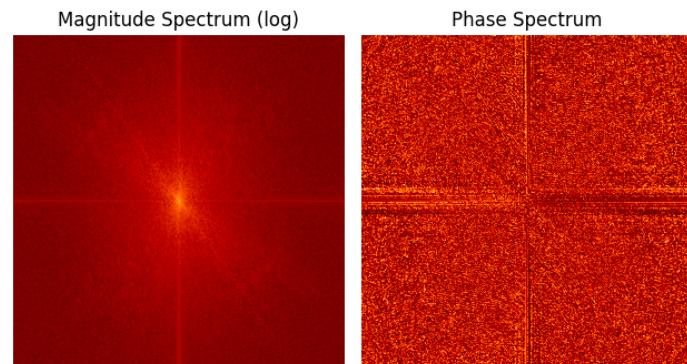
Ideal HPF:



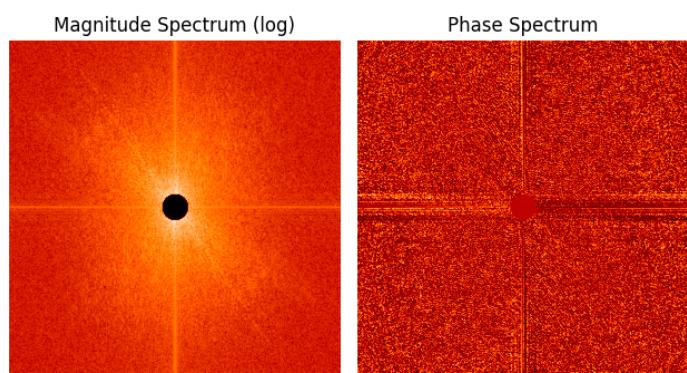
Filtered Image



Original FFT



Filtered FFT



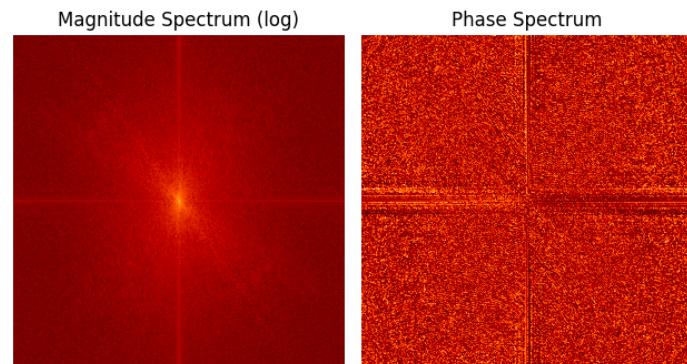
Gaussian LPF:



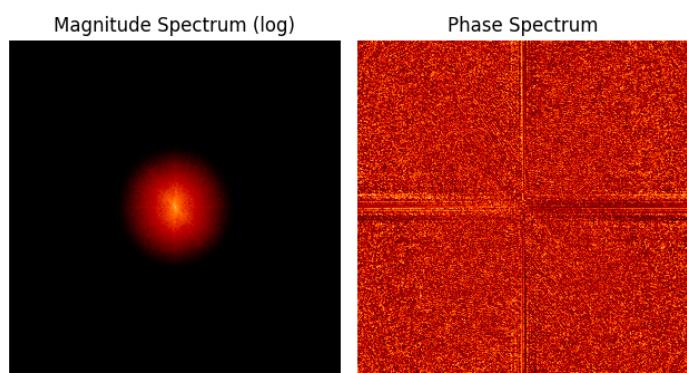
Filtered Image



Original FFT



Filtered FFT



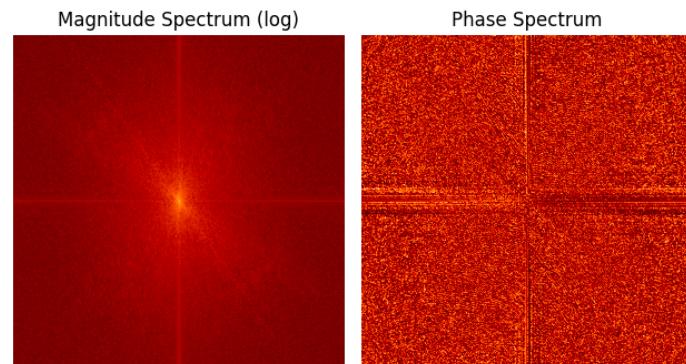
Gaussian HPF:



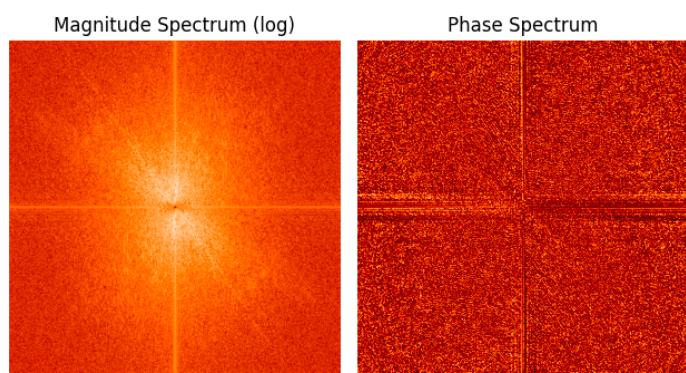
Filtered Image



Original FFT



Filtered FFT



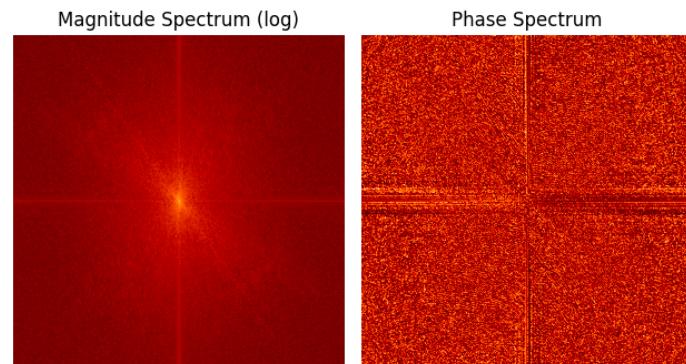
Butter LPF:



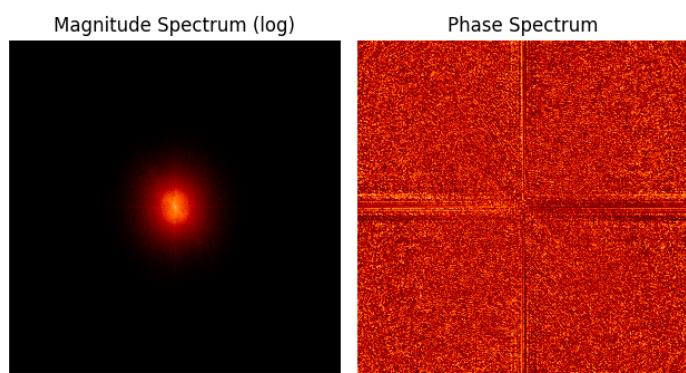
Filtered Image



Original FFT



Filtered FFT



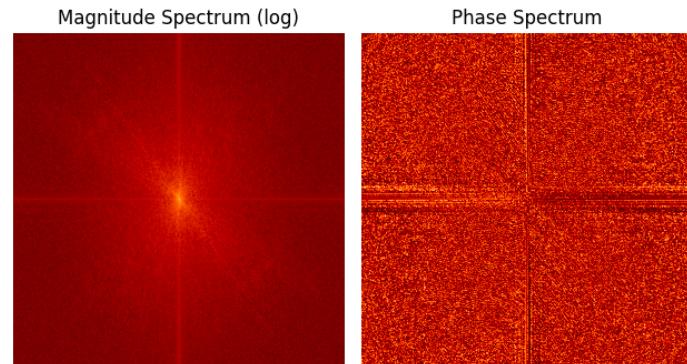
Butter HPF:



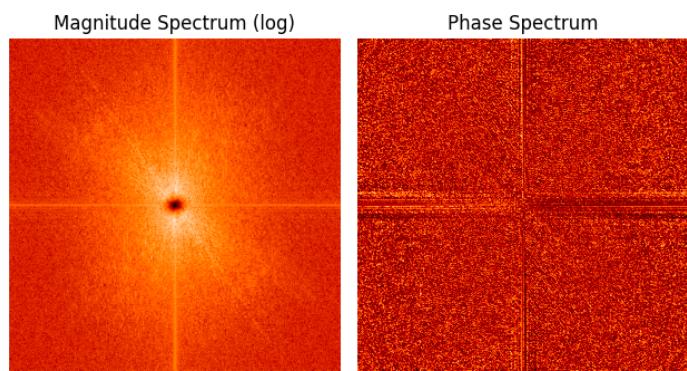
Filtered Image



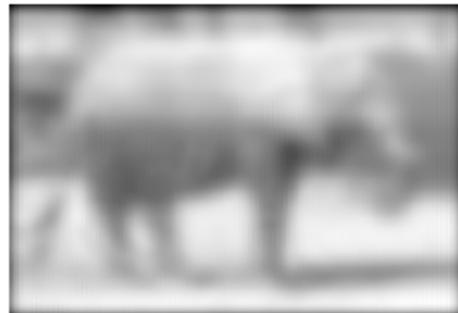
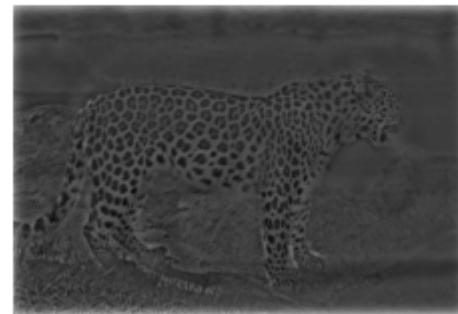
Original FFT



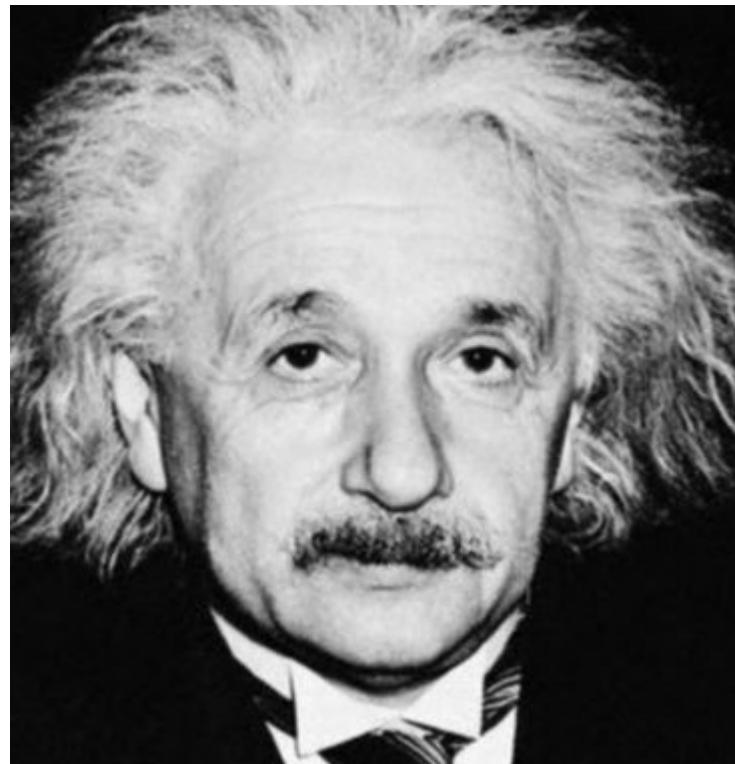
Filtered FFT

**Q2:**

The leopard_elephant image is an optical illusion which shows an elephant when viewed at low resolution and a leopard at higher resolution.

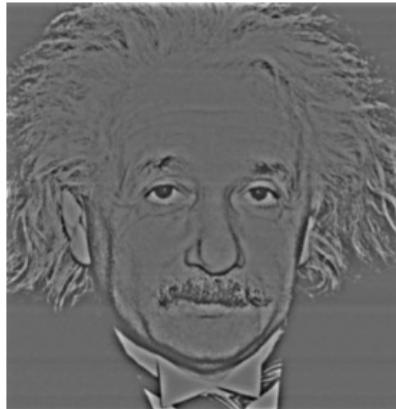
Original Image**Downscaled Image****Original Image****Upscaled Image**

We "hybridize" images of Albert Einstein and Marilyn Monroe.



Hybridizing!

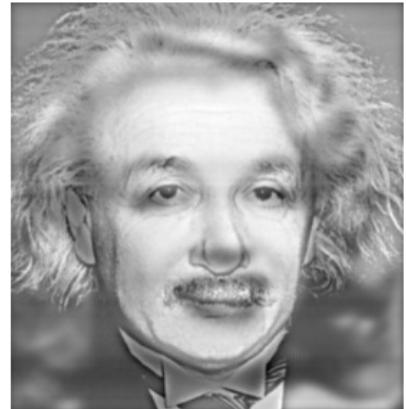
High Frequency Image



Low Frequency Image



Hybrid Image



Then viewing at different resolutions:

Original Image



Downscaled Image



Original Image



Upscaled Image



Q3:

We have two noisy images:

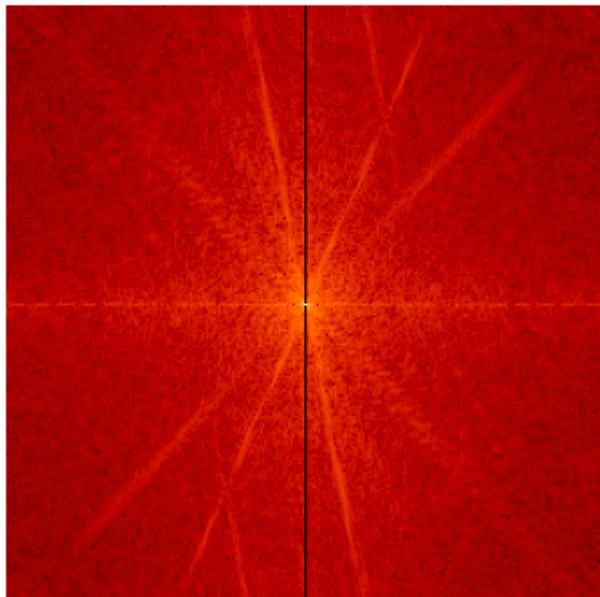


Both of them have some kind of sinusoidal grating as noise, we see similar noise when we take an image of a screen. (some kind of aliasing)

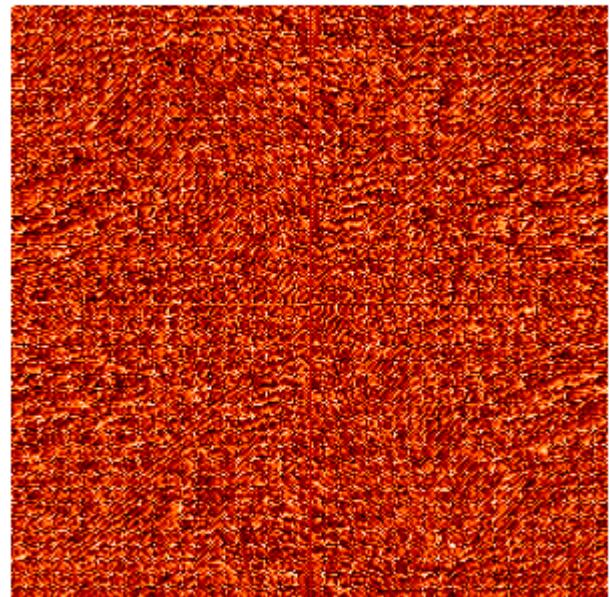
The approach I have followed is to first pass the image through LPF and retain its content and then subtract the sinusoidal grating then add back the LPFed Image.

Modified FFT

Magnitude Spectrum (log)



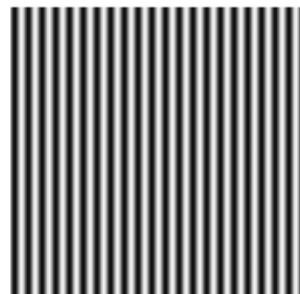
Phase Spectrum



Original Image



Grating

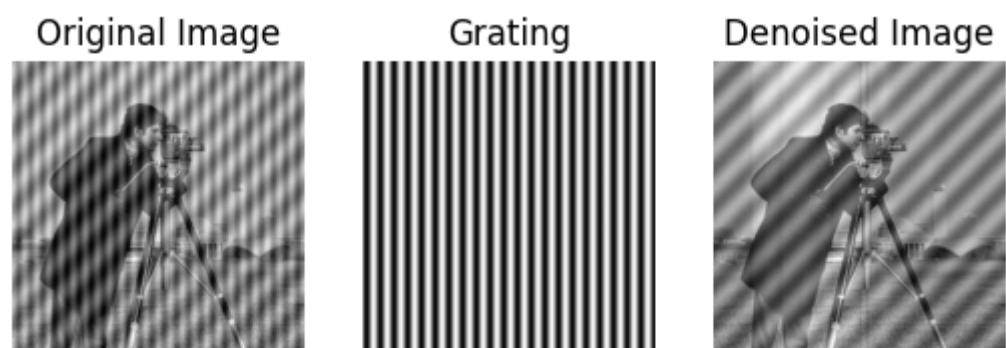
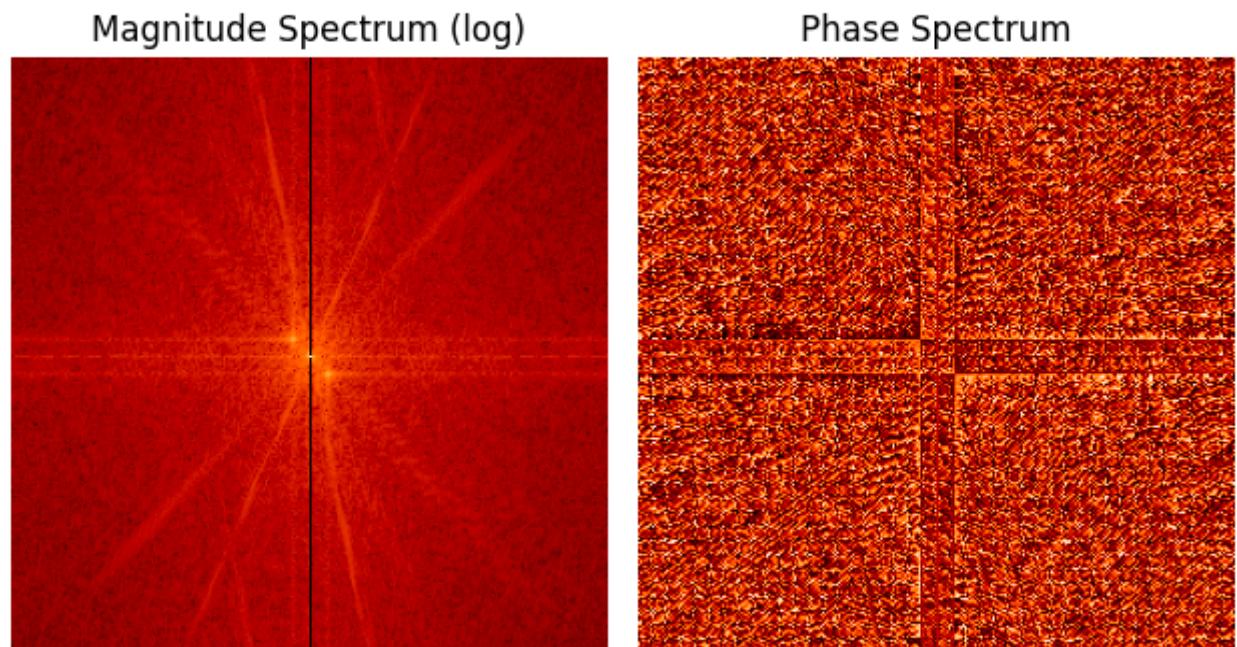


Denoised Image



Similar approach can be followed for `cameraman_noisy2.jpg`

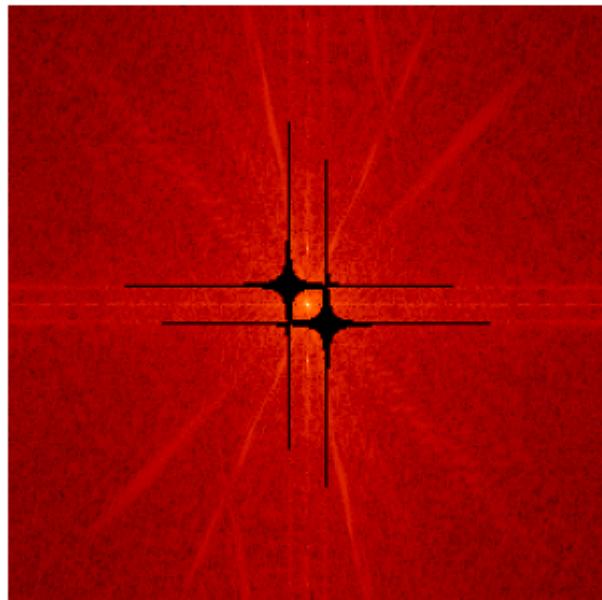
Modified FFT



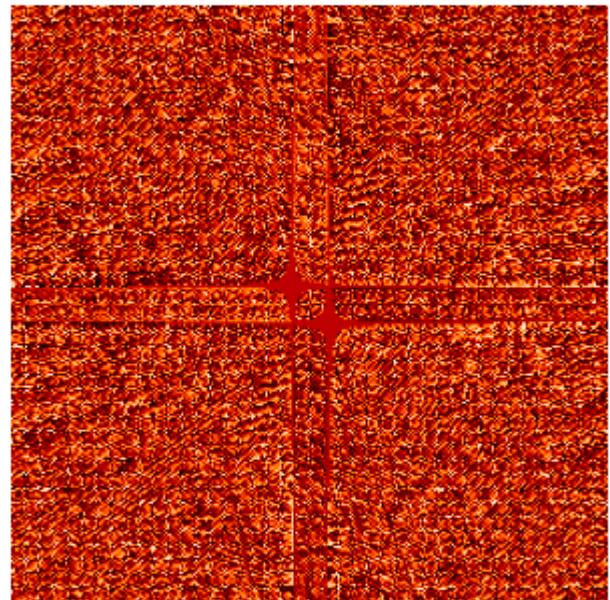
We can also have something like:

Modified FFT

Magnitude Spectrum (log)



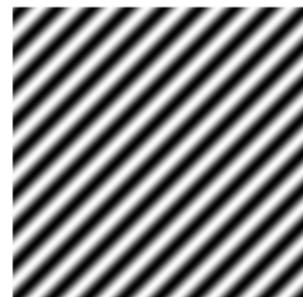
Phase Spectrum



Original Image



Grating

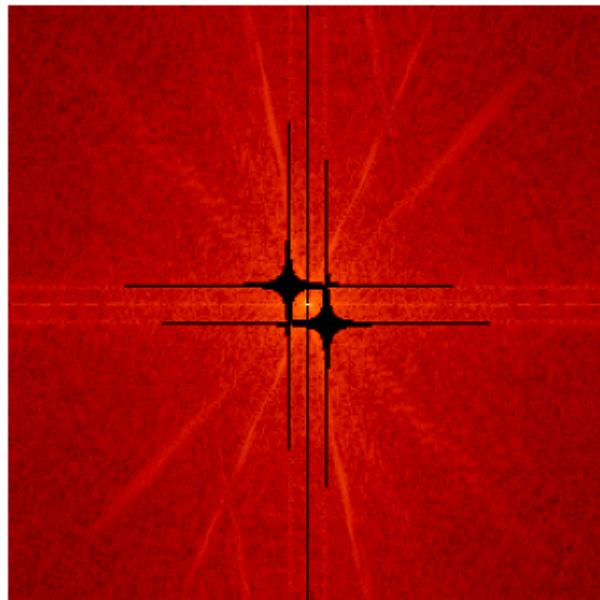


Denoised Image

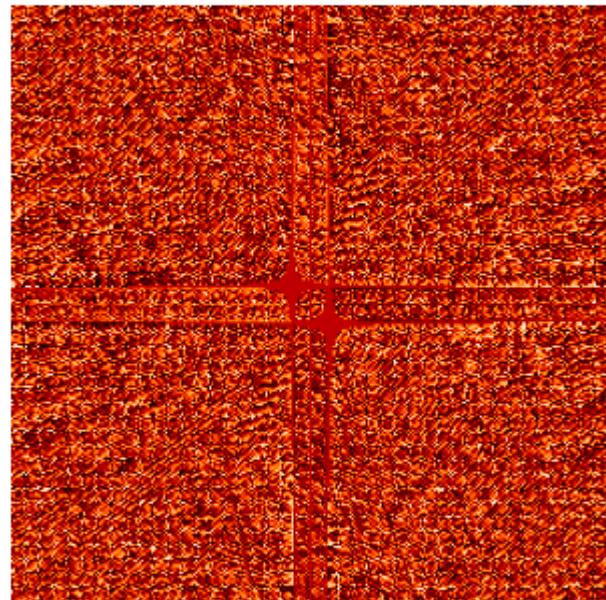


Modified FFT

Magnitude Spectrum (log)



Phase Spectrum



Original Image



Grating



Denoised Image

