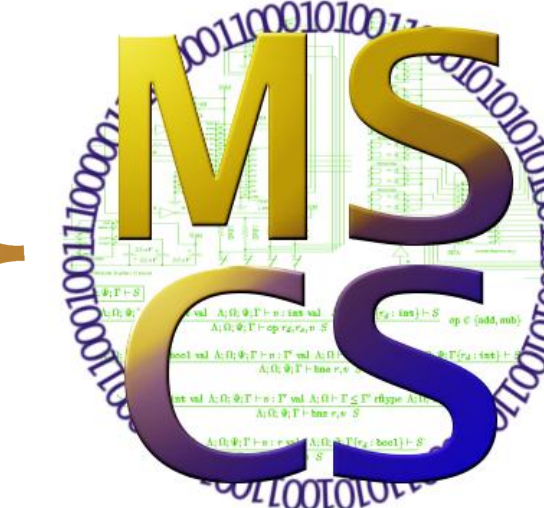


# Fourier Transform and MRIs

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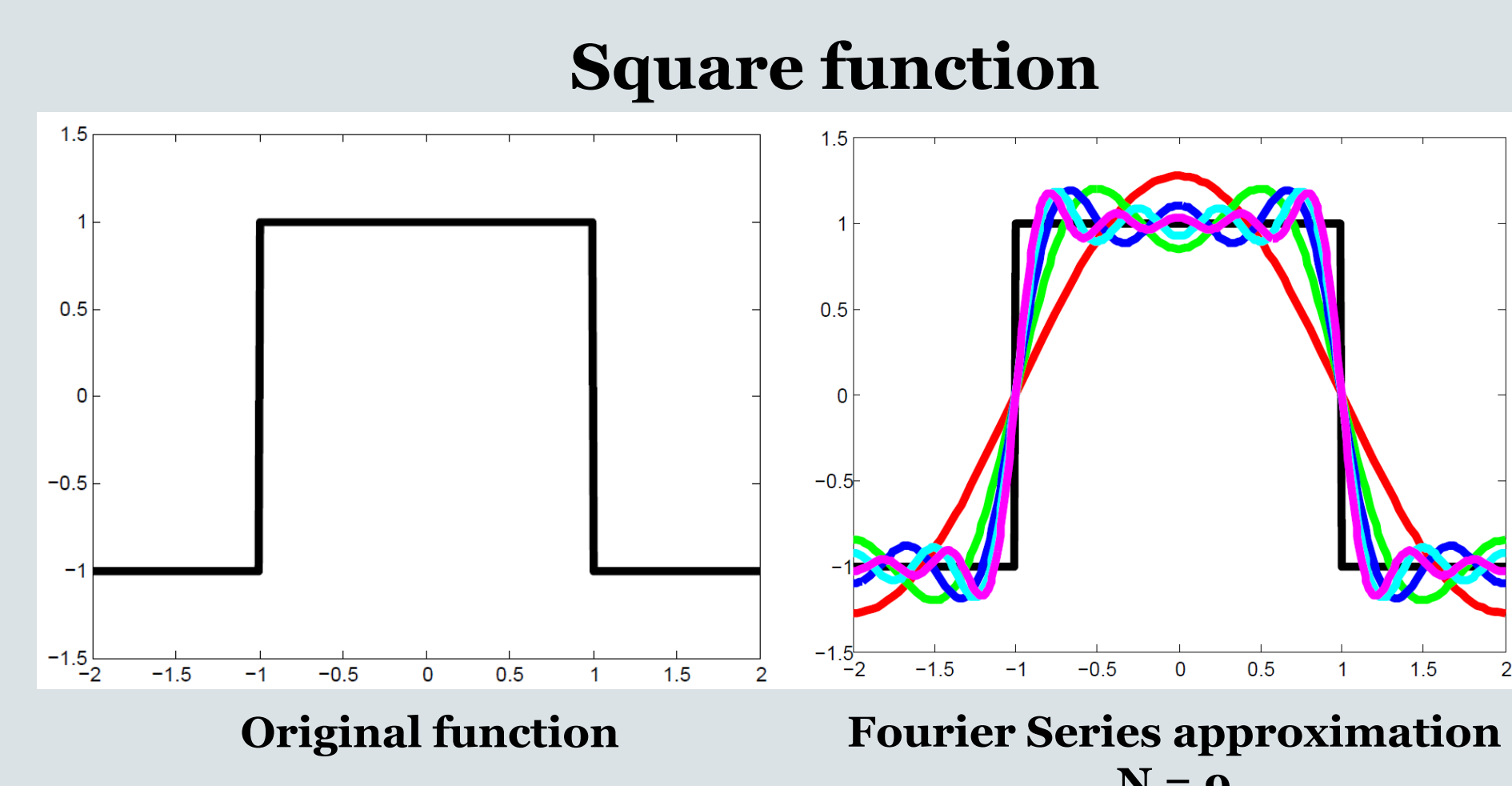
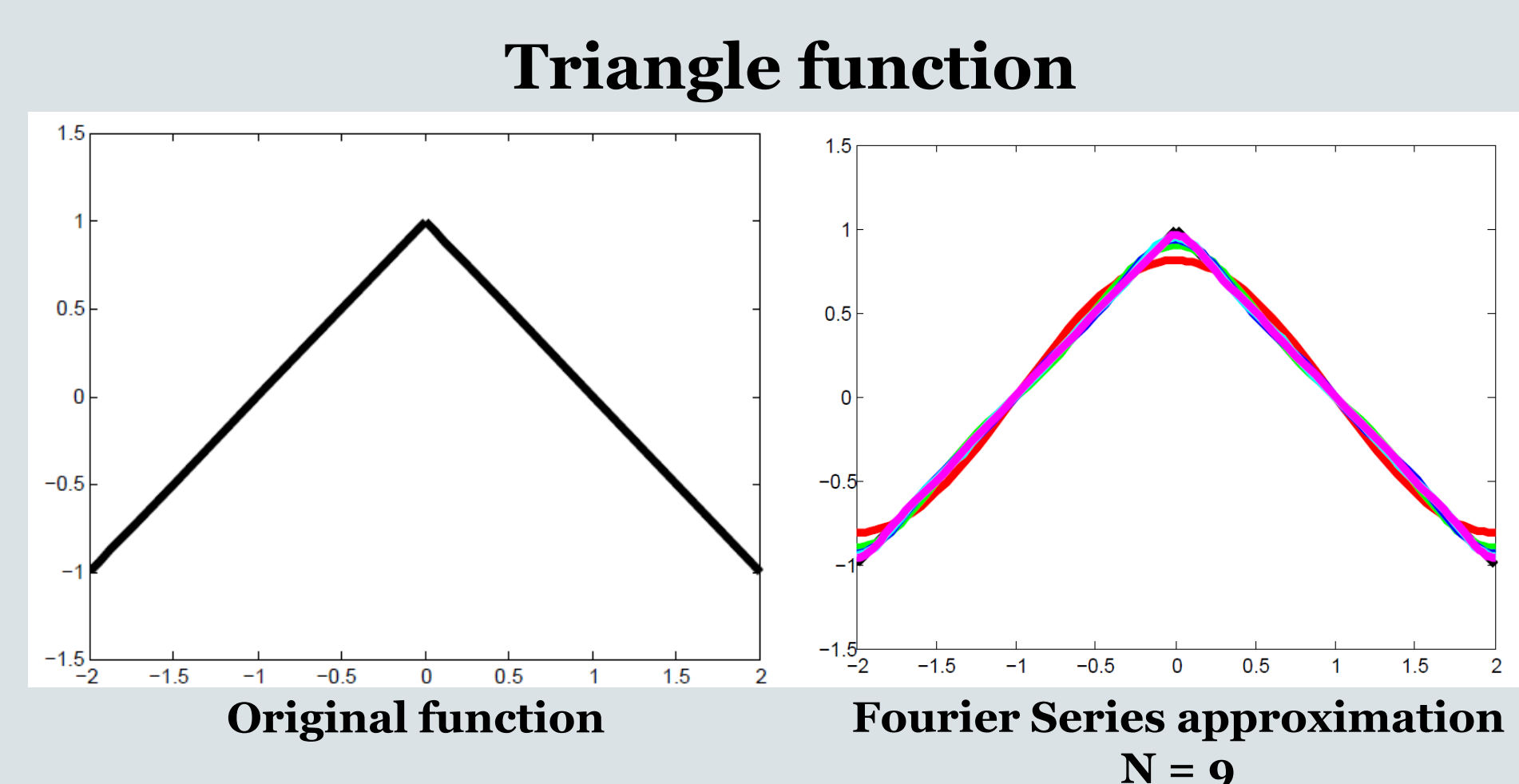


## Introduction

An incoming signal from an MRI machine does not immediately appear as an image. Before a person can look at it, the inverse Fourier Transform must be performed on it. My work this summer consisted of learning the mathematics of the Fourier Transform. I then used the information to simulate data for my partner to analyze.

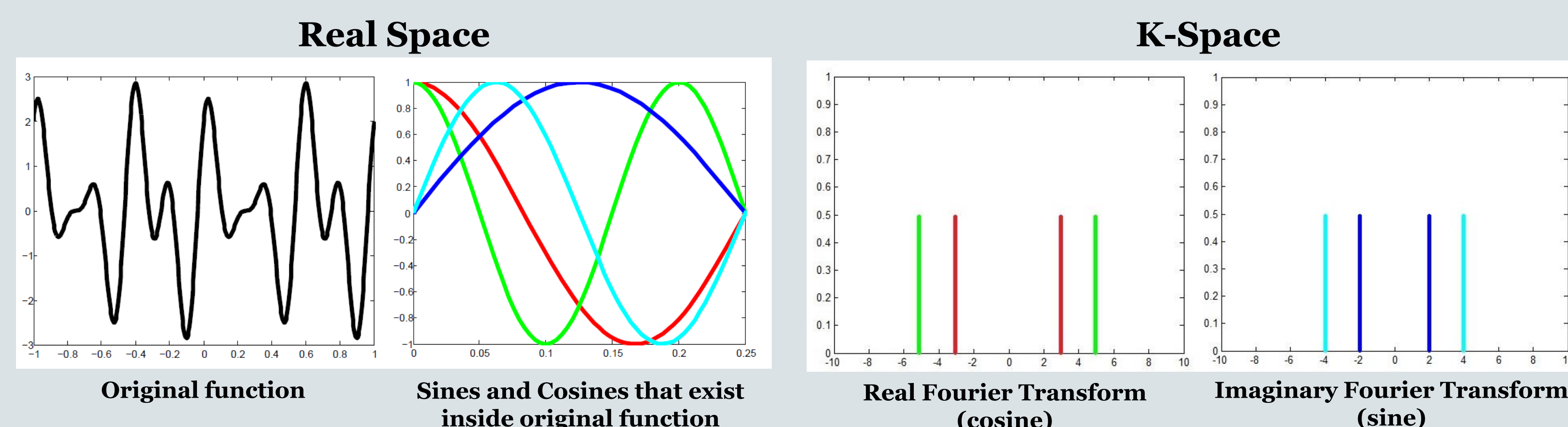
## Fourier Series

- Similar to Taylor Series
- Rewrites a function in a series of sine and cosine



## Fourier Transform

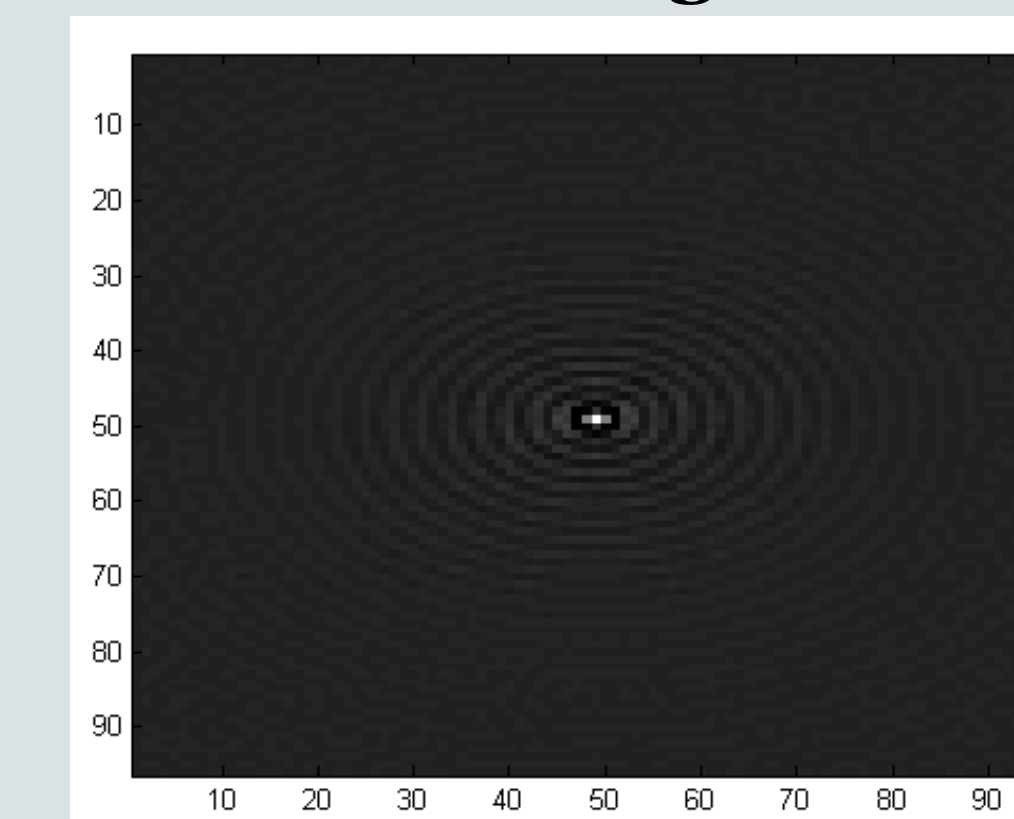
- Creates a frequency spectrum of sine and cosine that exist inside the function
- Exist in individual pairs (real space and k-space)



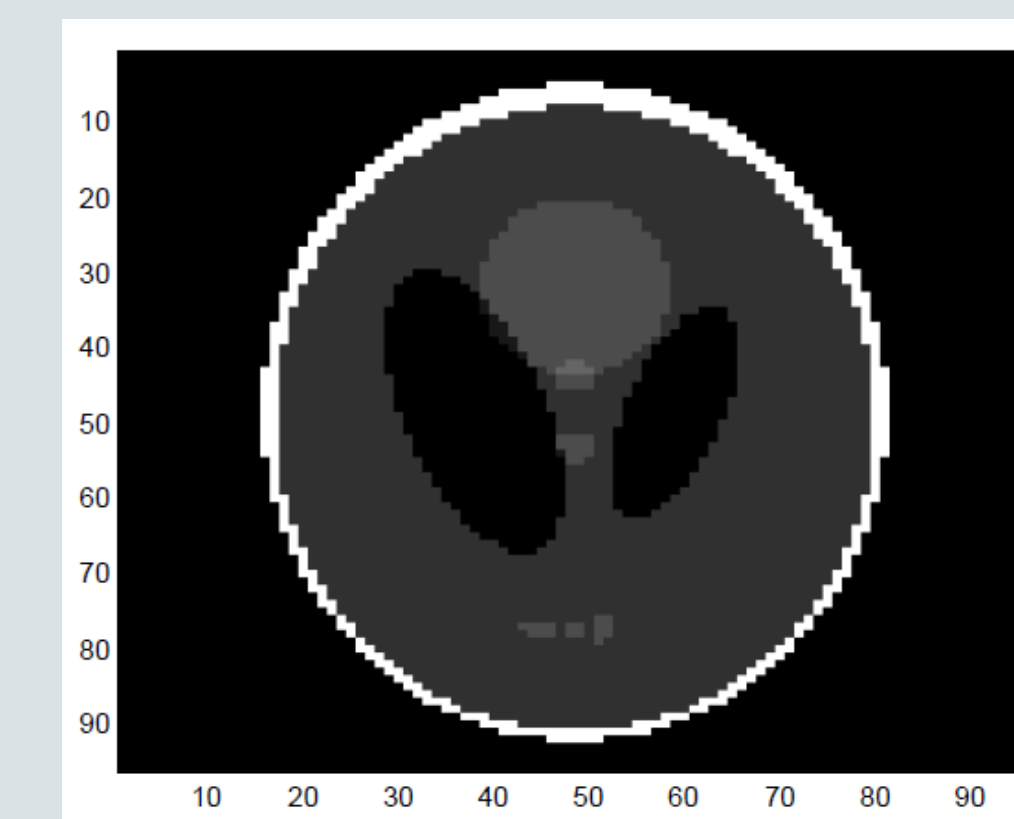
## MRIs and the Fourier Transform

- Continually running
- Reads information in slices
- Common slice size: 96x96
- Common slice amount: 128

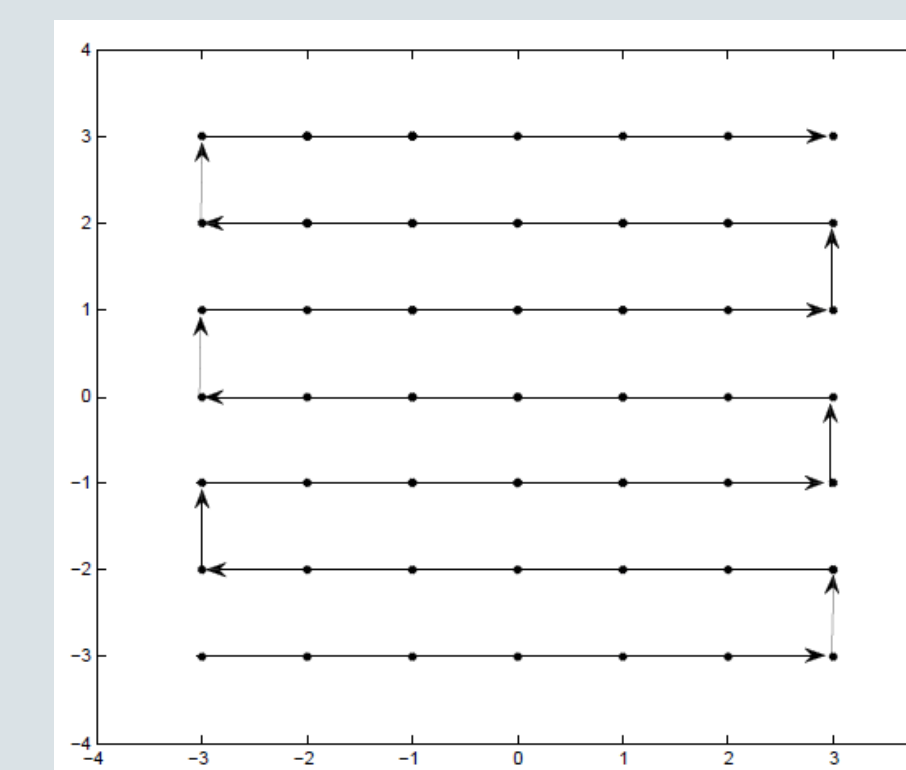
Incoming data



Inverse Fourier of data



How an MRI reads data

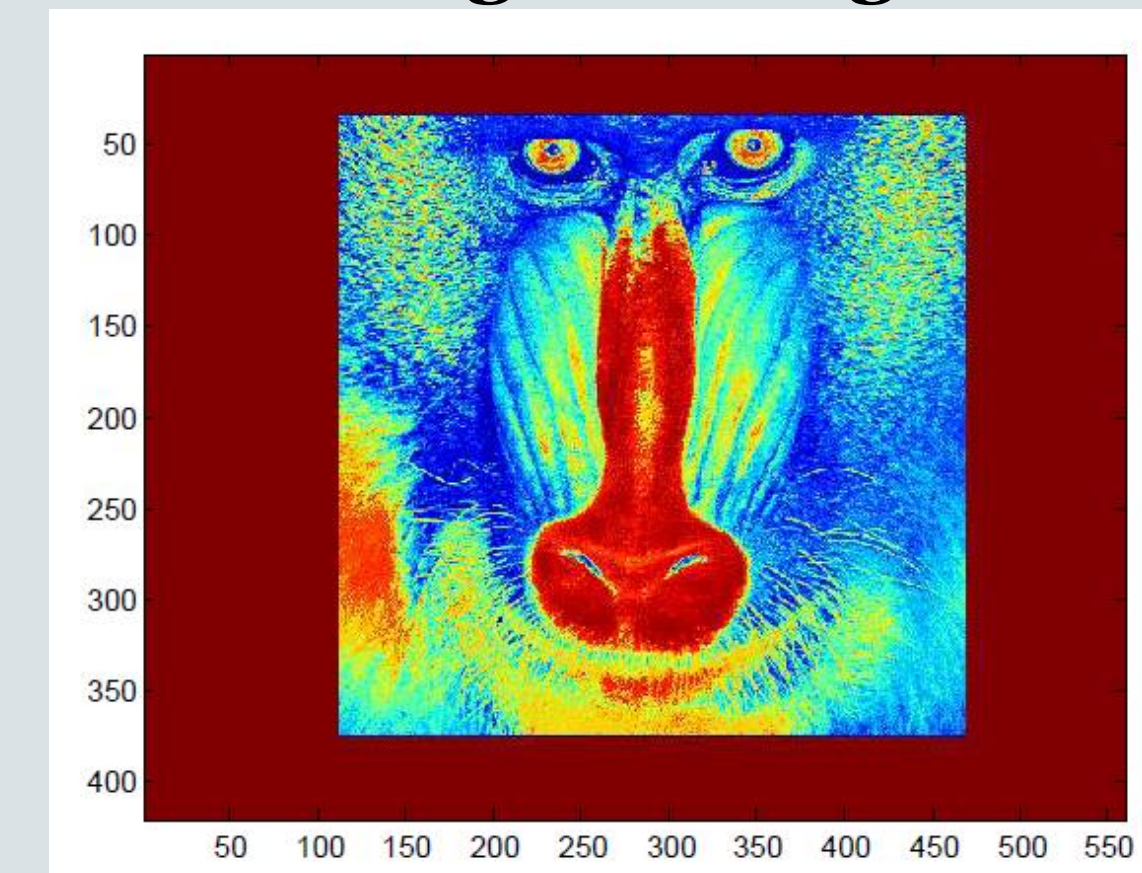


- Incoming data appears in Fourier Transform
- Inverse Fourier Transform must be performed to see image

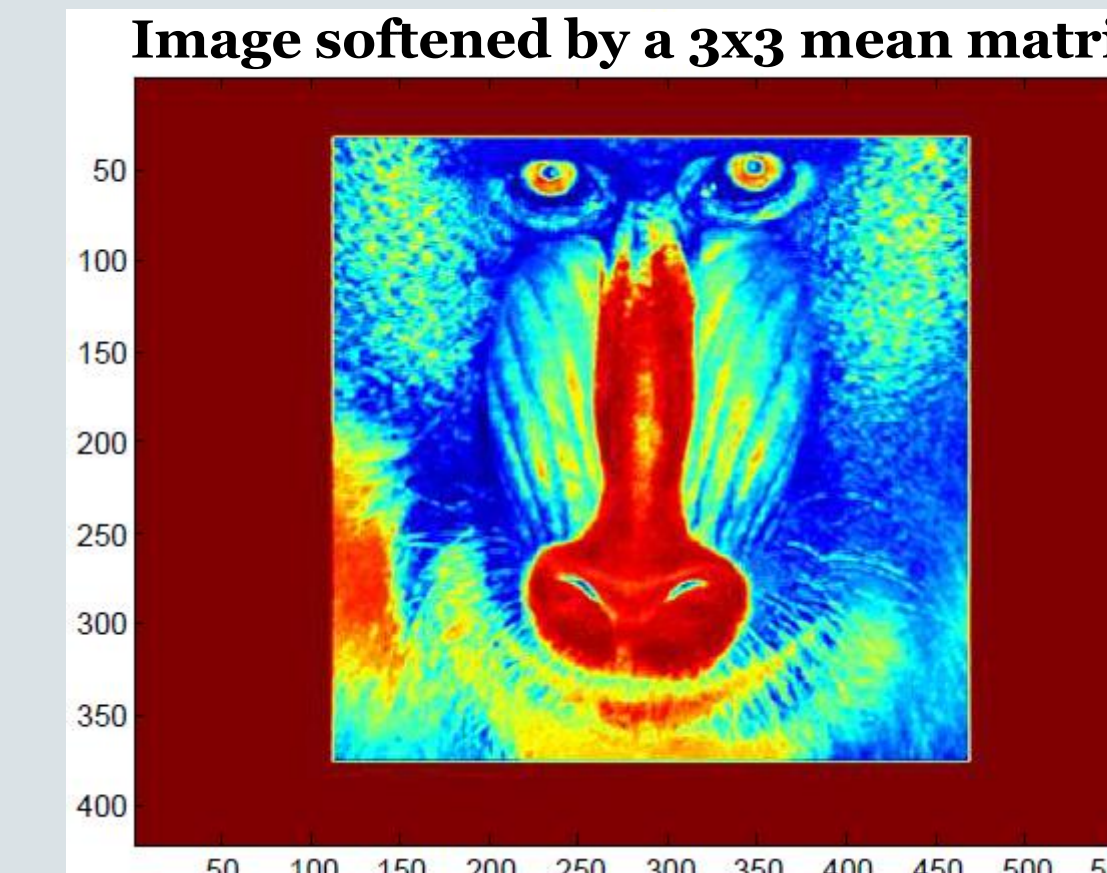
## Image Processing

Using matrixes and different properties of the Fourier Transform (particularly the convolution property) images may be filtered.

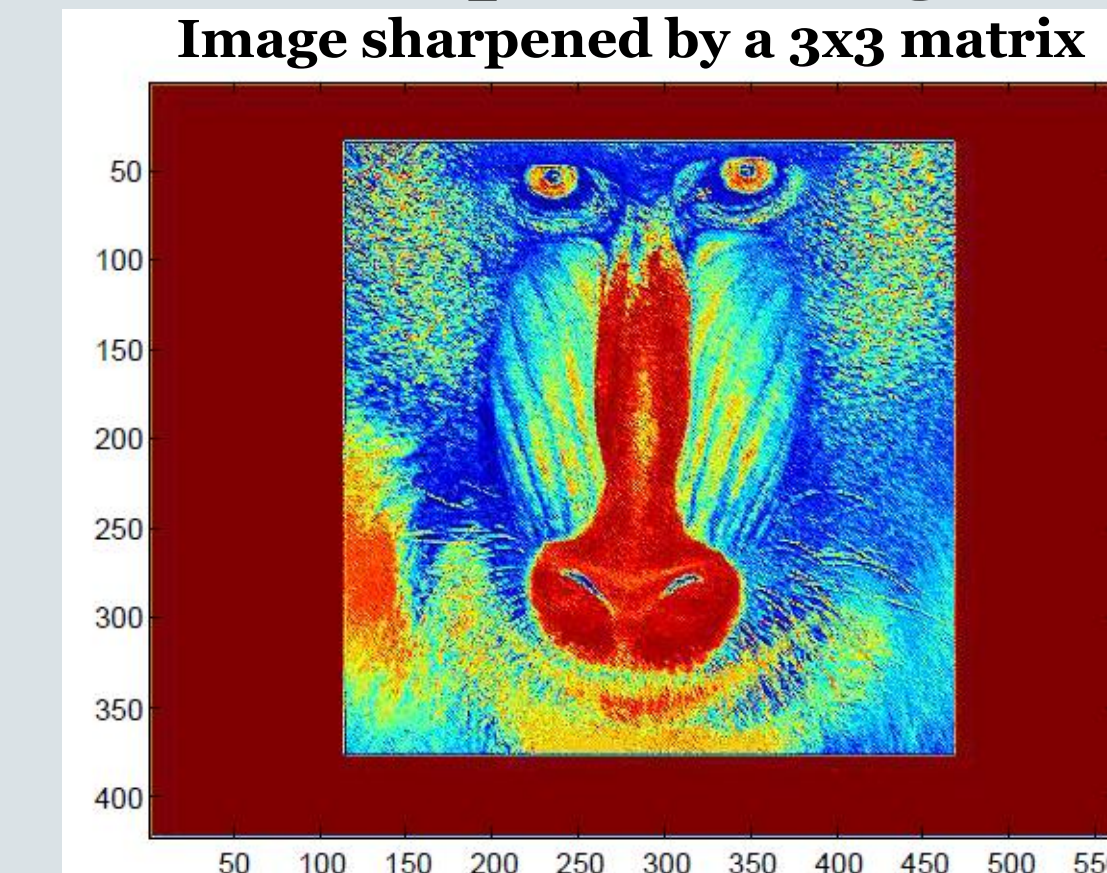
Original image



Smoothed image



Sharpened image



## Future Work

The Fourier Transform is just an approximation. In the future, more accurate approximations may be developed. The same may be true for the image processing. I worked with just a few filters this summer, but more efficient filters may be developed.