Problem Set 5 Latex Report

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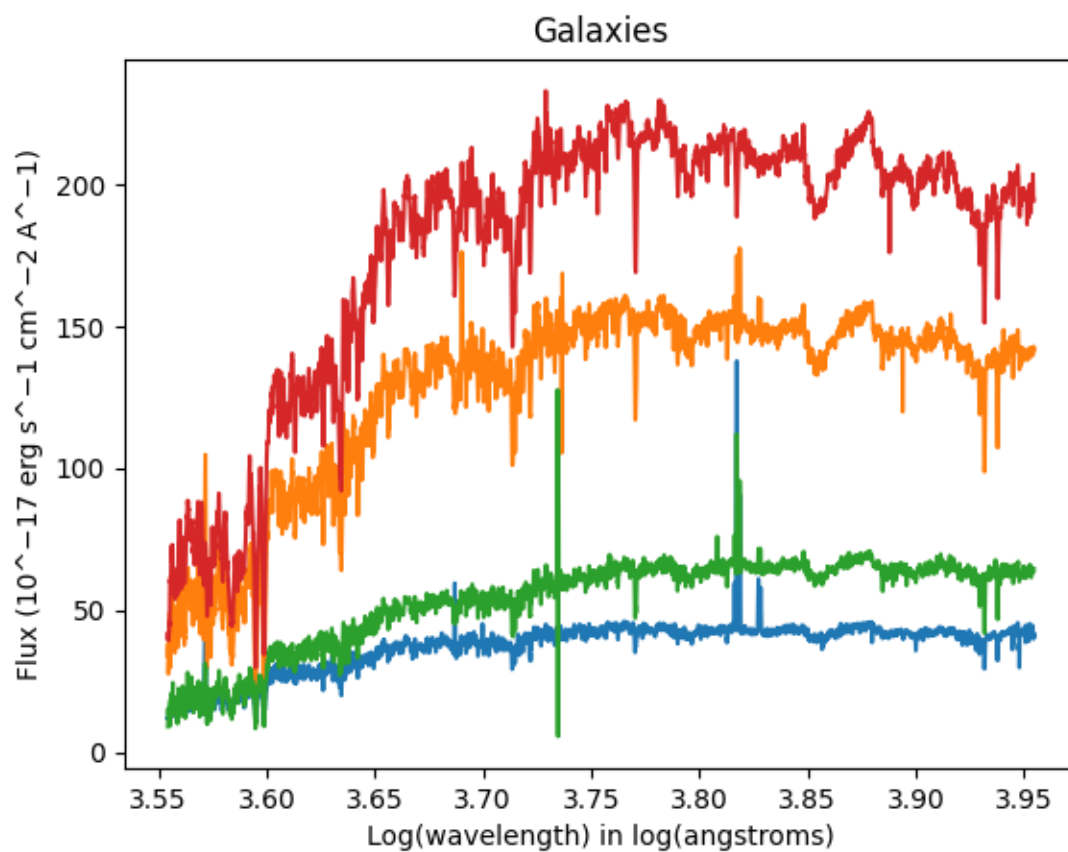# 1   Problem 1

1.1   Part a

Figure 1: Flux for various Galaxies

Looking at Figure 1, we can see that the flux is higher after 5600 Angstroms, which approximately corresponds to the hydrogen emission spectrum wavelengths.
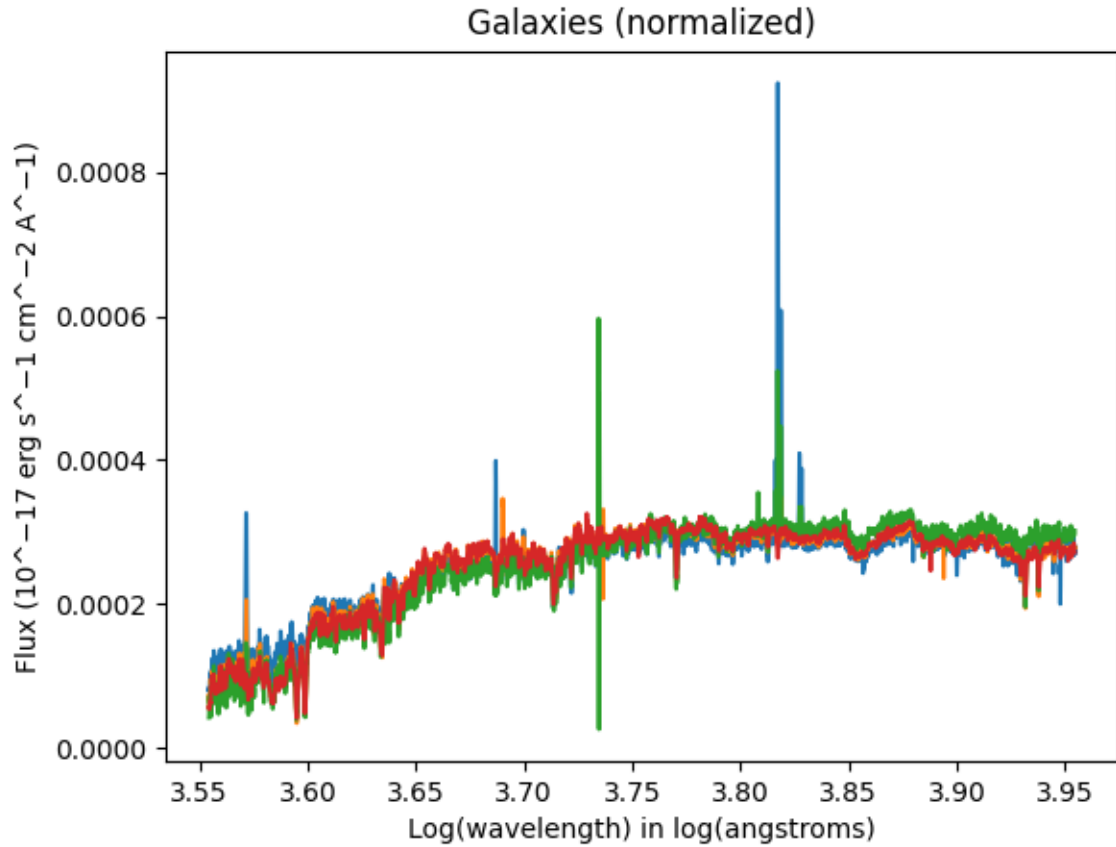
1.2   Part b

Galaxies (normalized)

Figure 2: Normalized Galaxies

Looking at Figure 2, we can see that normalizing the dataset lowered the dynamic ranges of the flux.

1.3   Part e
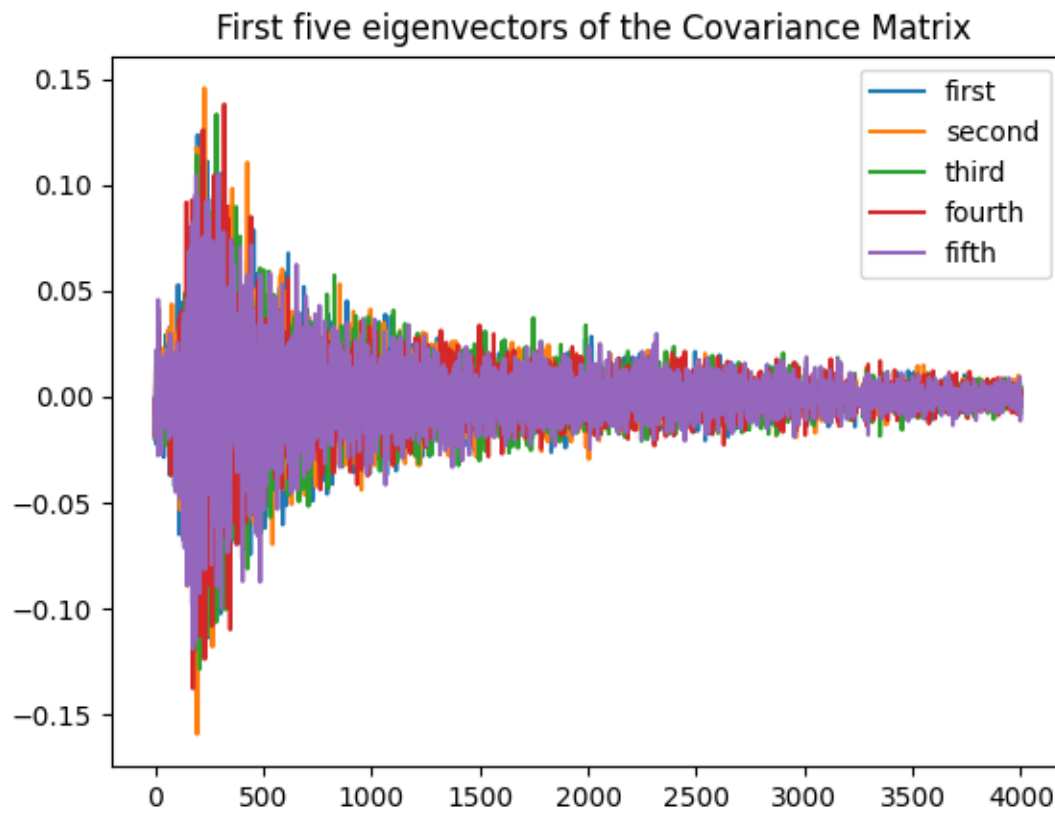

First five eigenvectors of the Covariance Matrix
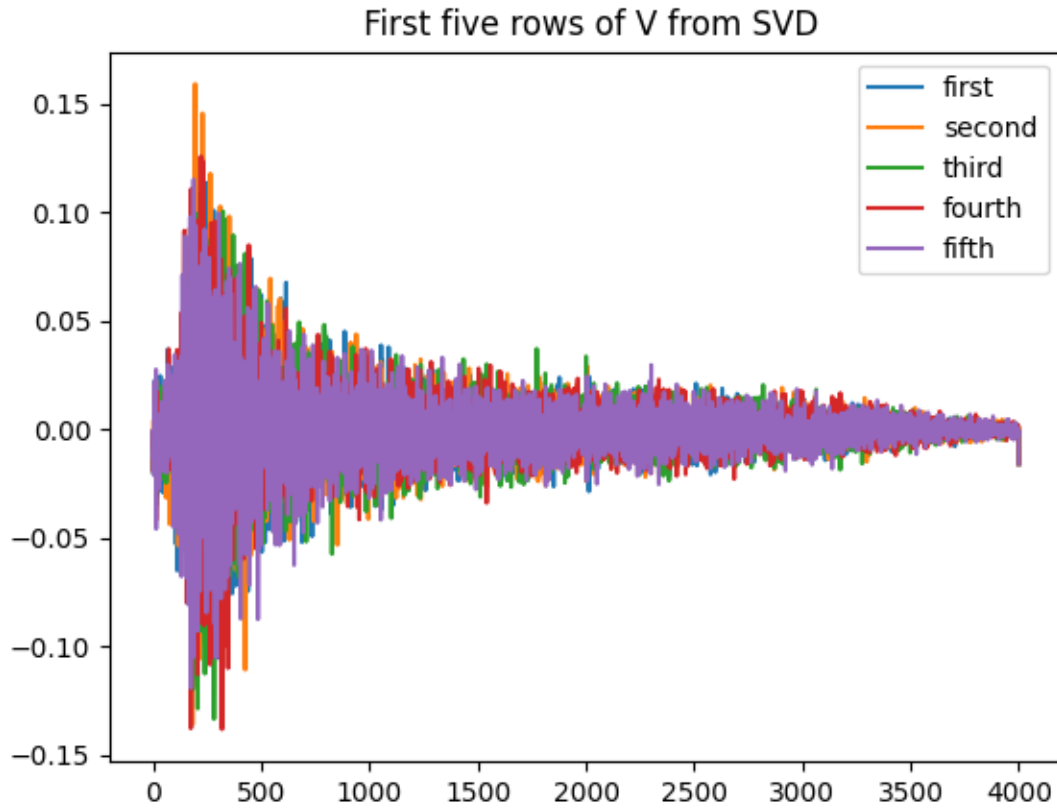
Figure 3: First five Eigenvectors

Figure 4: First five Eigenvectors from SVD

It is entirely possible to construct the eigenvectors from SVD decomposition. Here, we can see that Figure 3 and Figure 4 are nearly identical.

1.4 Part f

SVD was much faster when getting the eigenvectors. Also, the condition number of SVD was much higher.
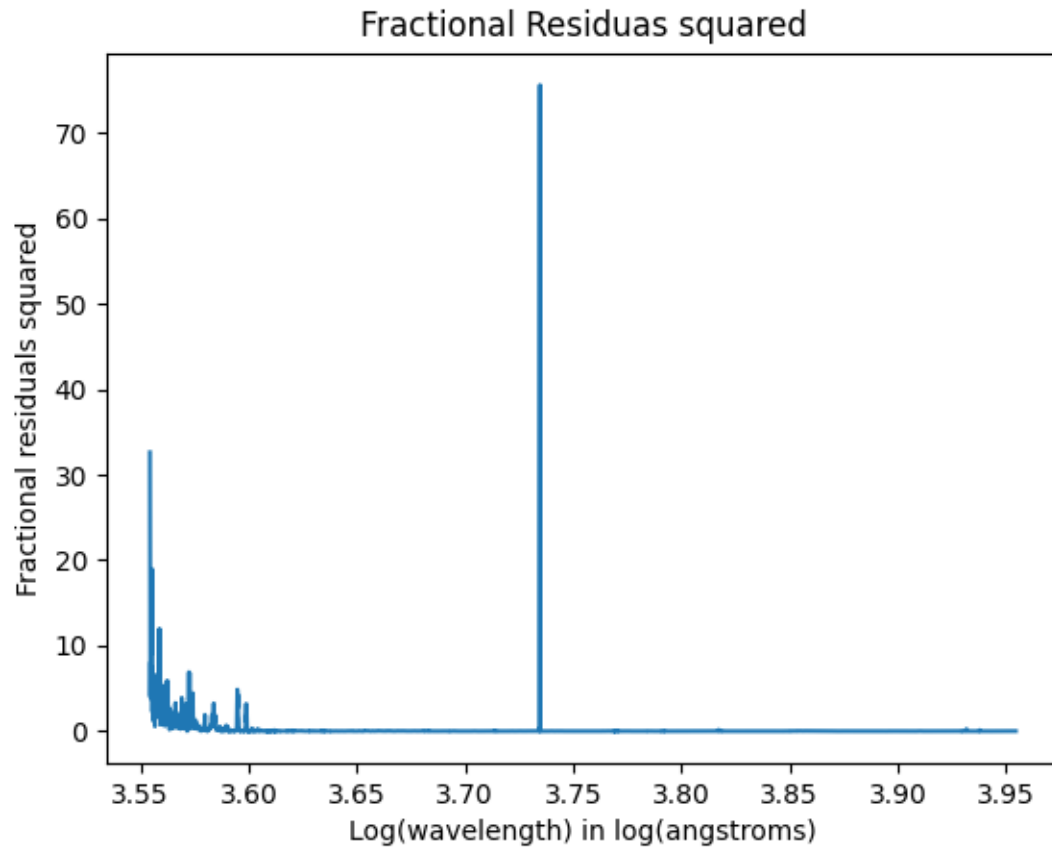
1.5 Part i

Figure 5: Fractional Square Errors

Looking at the residuals, we can see that the residuals up to 3.60 are high, and there is a residual around 3.74, which is high.
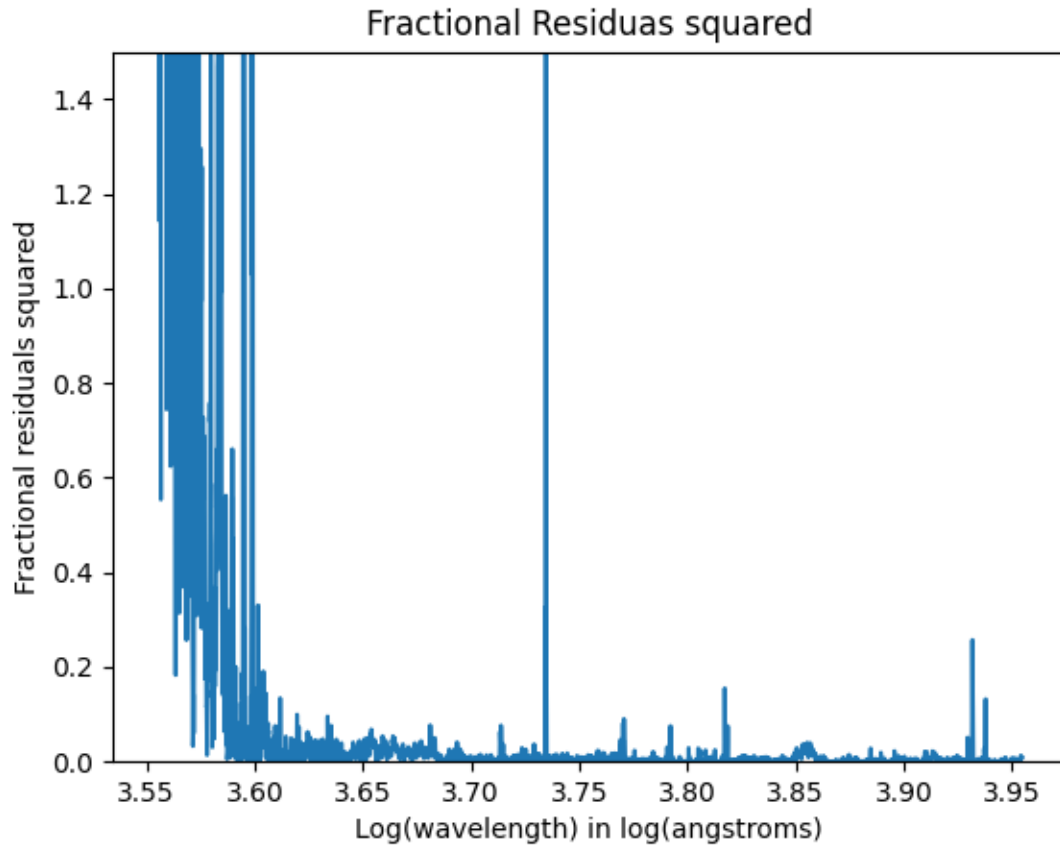
Figure 6: Fractional Square Errors (Zoomed)

Zooming in, we get Figure 6. In Figure 6 we can see that most residuals are below 0.1.