

# Problem Set #6

Sarah Odeh - odesmodes

## 1 Question 1

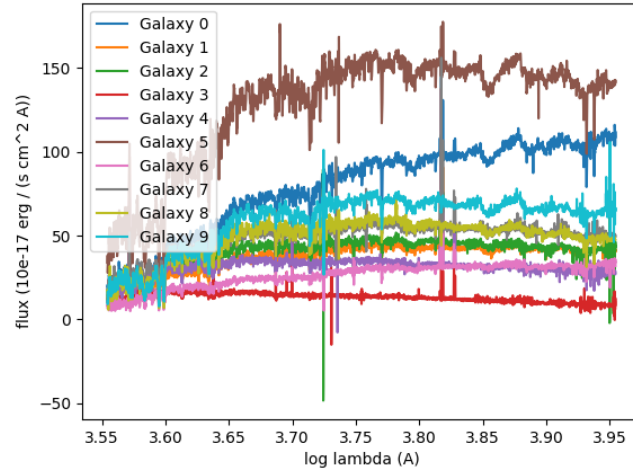


Figure 1: Part a: Plot of ten galaxies. The peaks in the flux in each galaxy correspond to the wavelength for different hydrogen transitions.

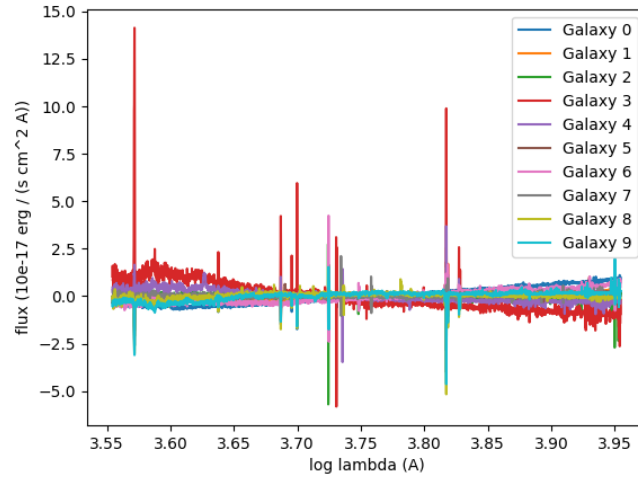


Figure 2: Parts b and c: Plot of the same galaxies with normalized spectrum and the mean subtracted.

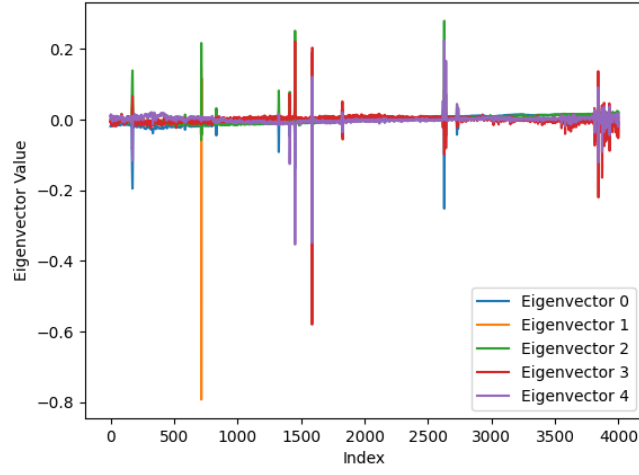


Figure 3: Part d: Plot of first five eigenvectors

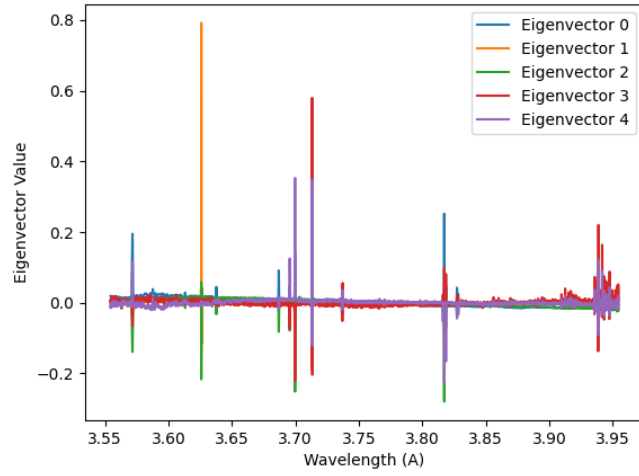


Figure 4: Parts e and f: Plot of first five eigenvectors using the SVD technique. The computational cost of the SVD technique is less. SVD is better because it has higher accuracy and its faster. The condition number of the covariance matrix is generally higher.

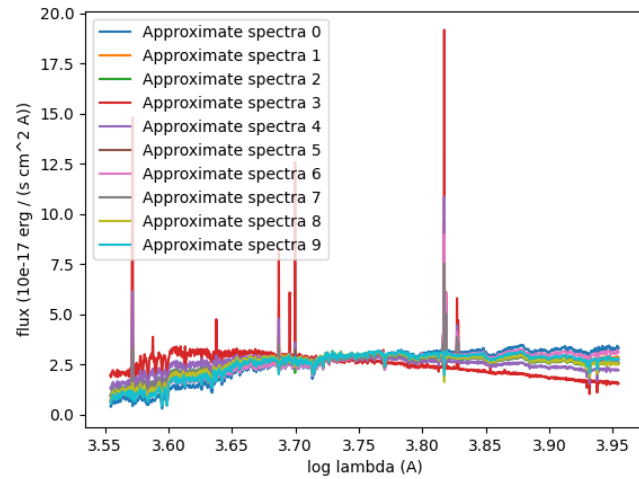


Figure 5: Part g: Plot of approximate spectra

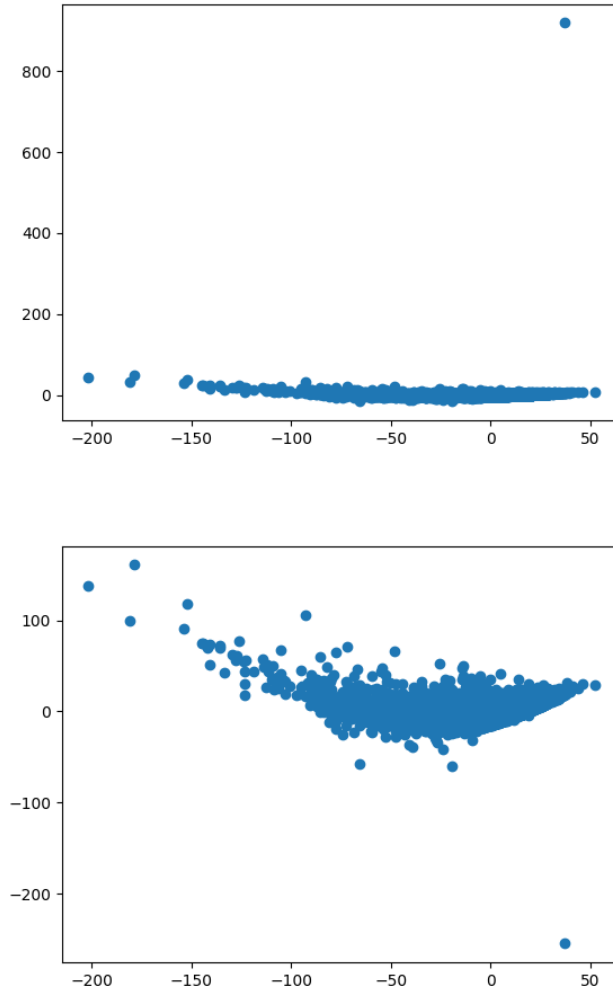


Figure 6: Part h: Plot of  $c_0$  vs  $c_1$  and  $c_0$  vs  $c_2$

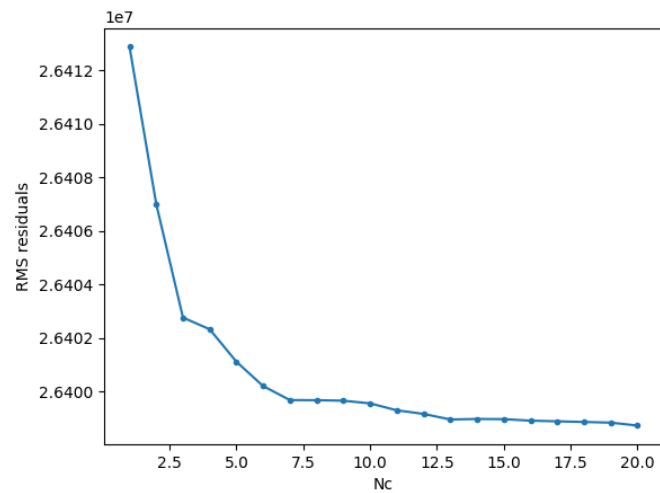


Figure 7: Part i: Root mean squared residuals plotted vs  $N_c$ , which varies from 1-20.  $N_c = 20$  has a RMSR of 2.6398