

Spectral Analysis of SDSS Data

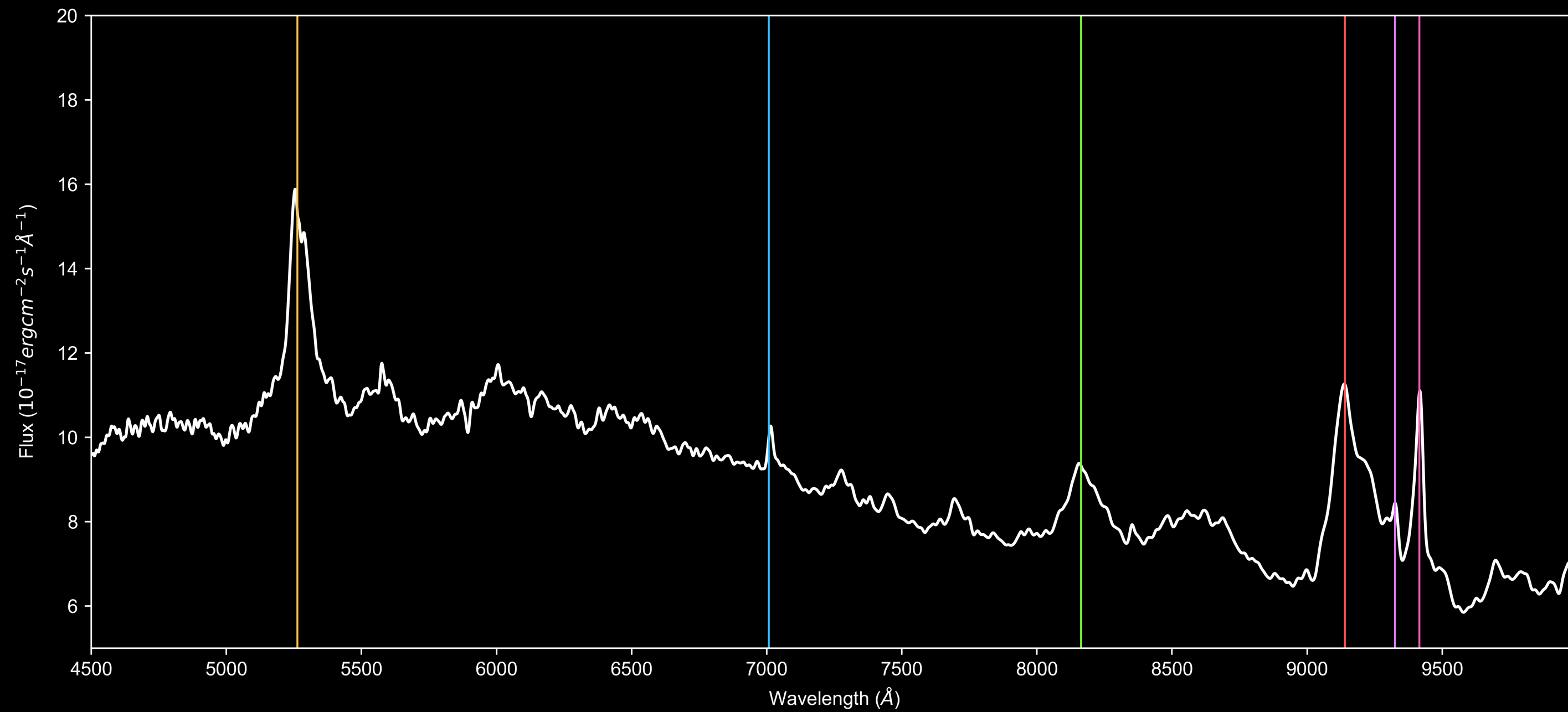
Zoe Ansari, Andras Chepregy, Nikki Arendse & Cecilie Hede

“All group members have contributed evenly to the project”



Motivation

Spectrum



Objects

Quasar

Brightest type of AGN
BH with accretion disk and torus

- **MgII**
- **H γ**
- **H β**
- **OIII**
- **H α**
- **OII**

Galaxy

Collection of stars
Ellipticals, Spirals

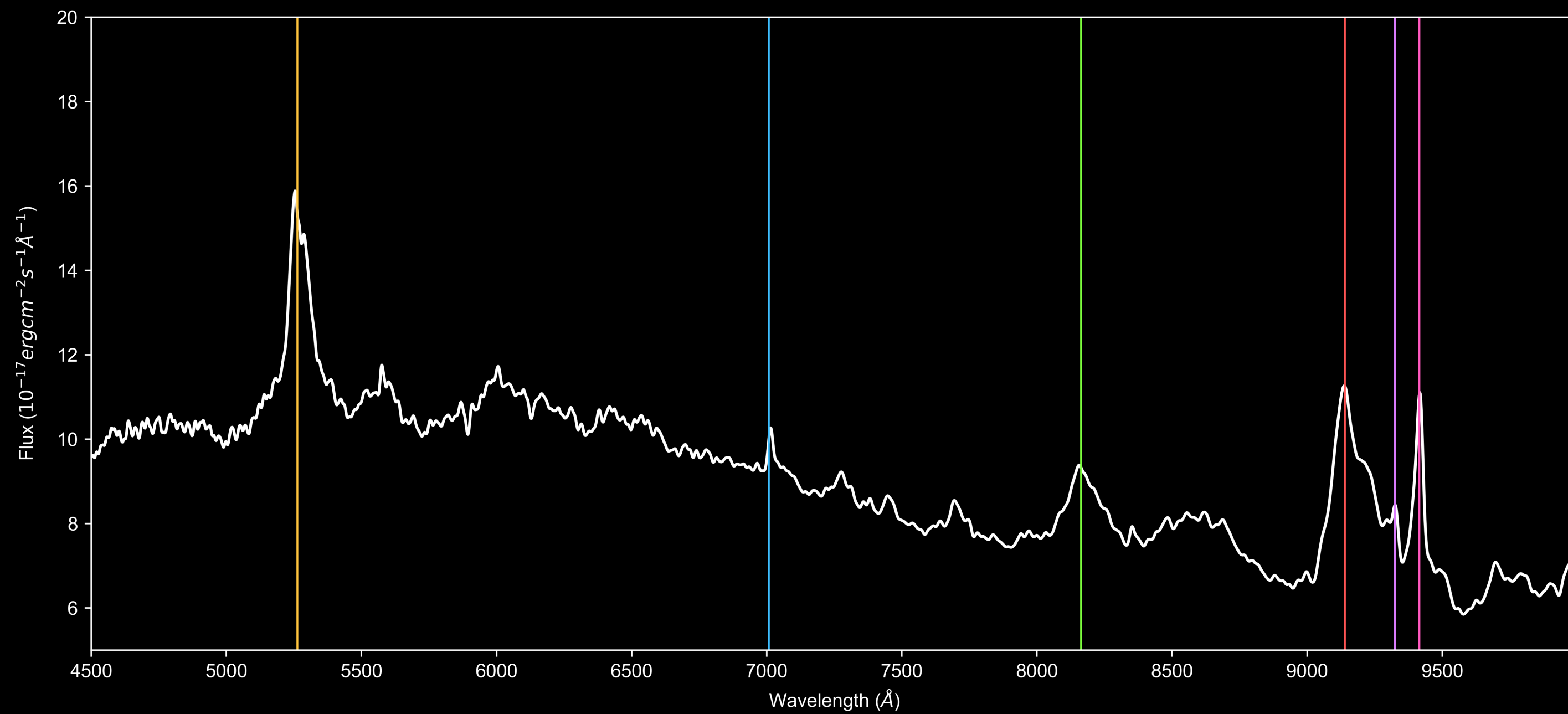
- **NaI**
- **MgII**
- **H α**
- **SII**
- **H β**
- **G band**
- **CaII HK**
- **OII**

Star

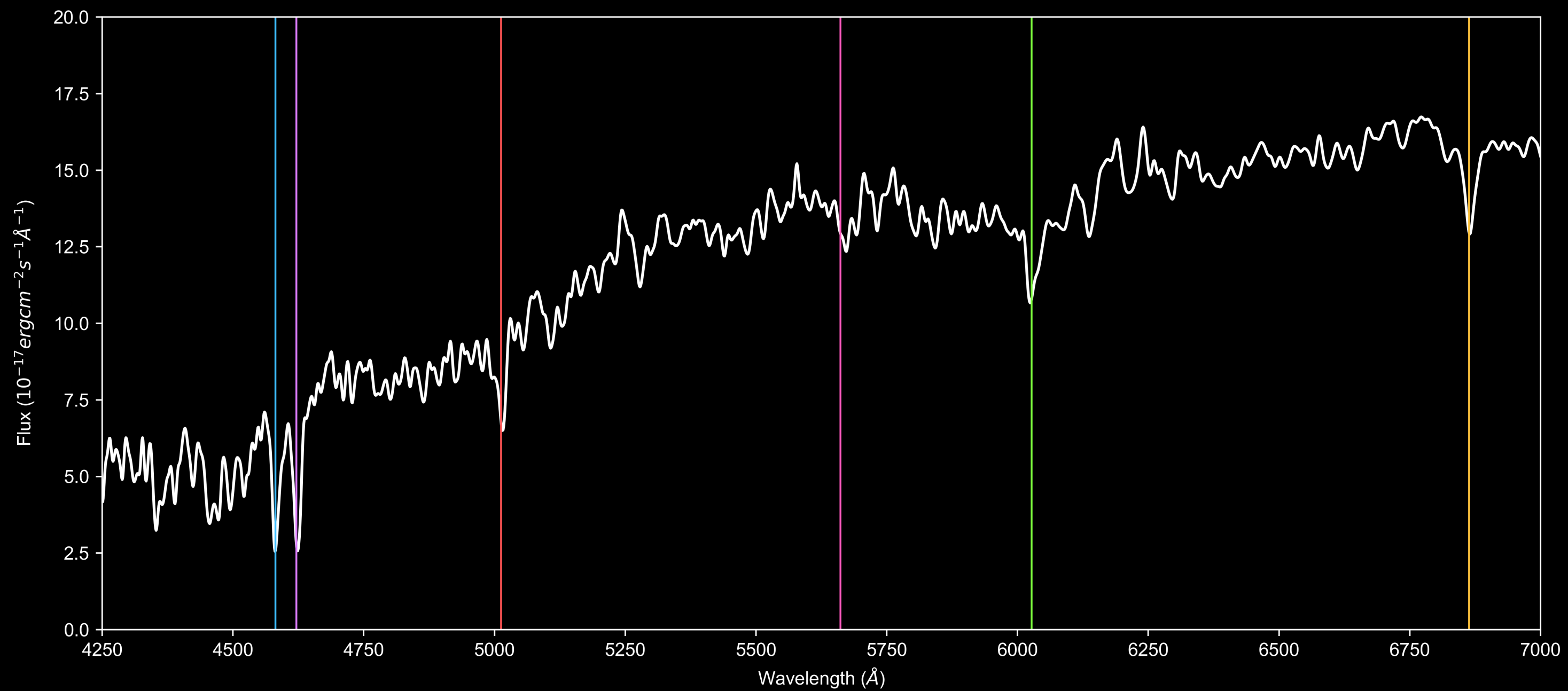
Spheroid of plasma
O B A F G K M

- **H α**
- **H β**
- **H γ**
- **H δ**
- **NaI**

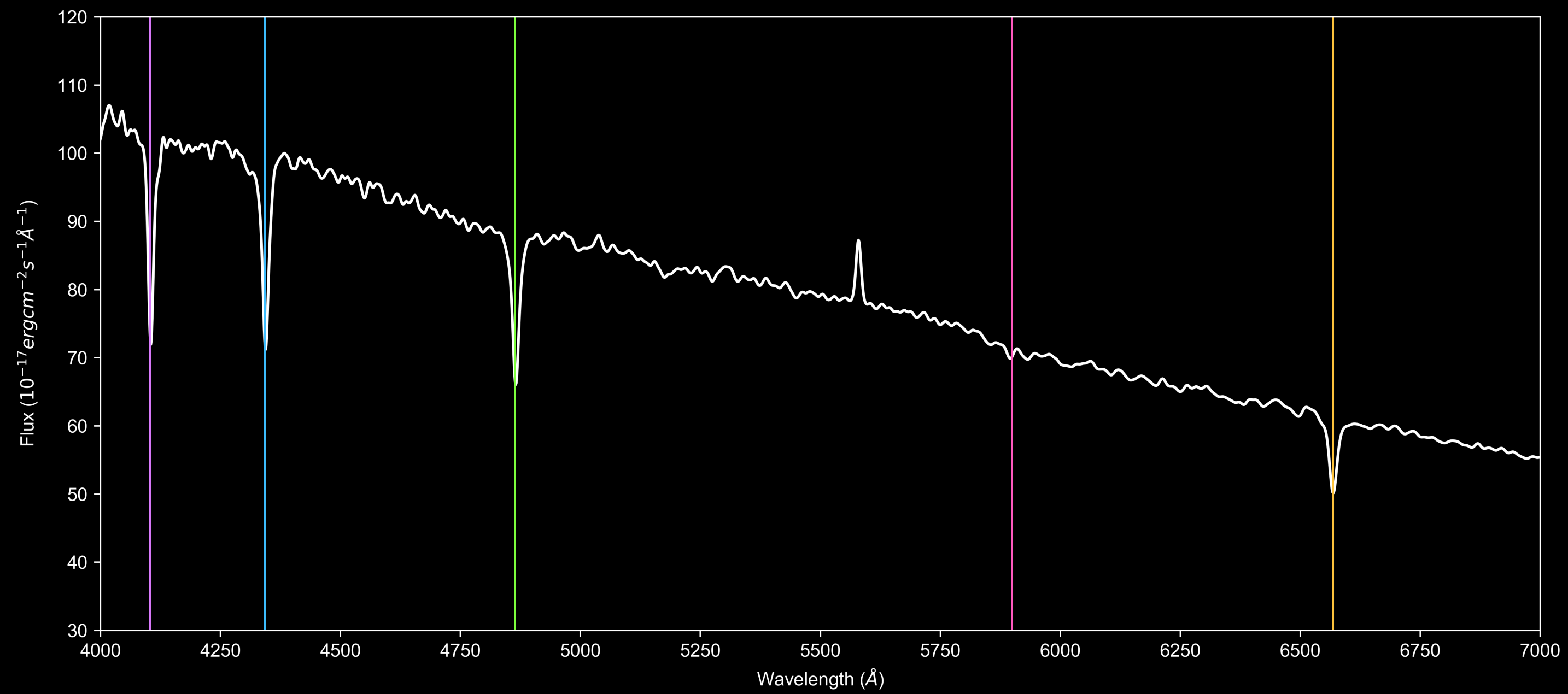
Quasar



Galaxy

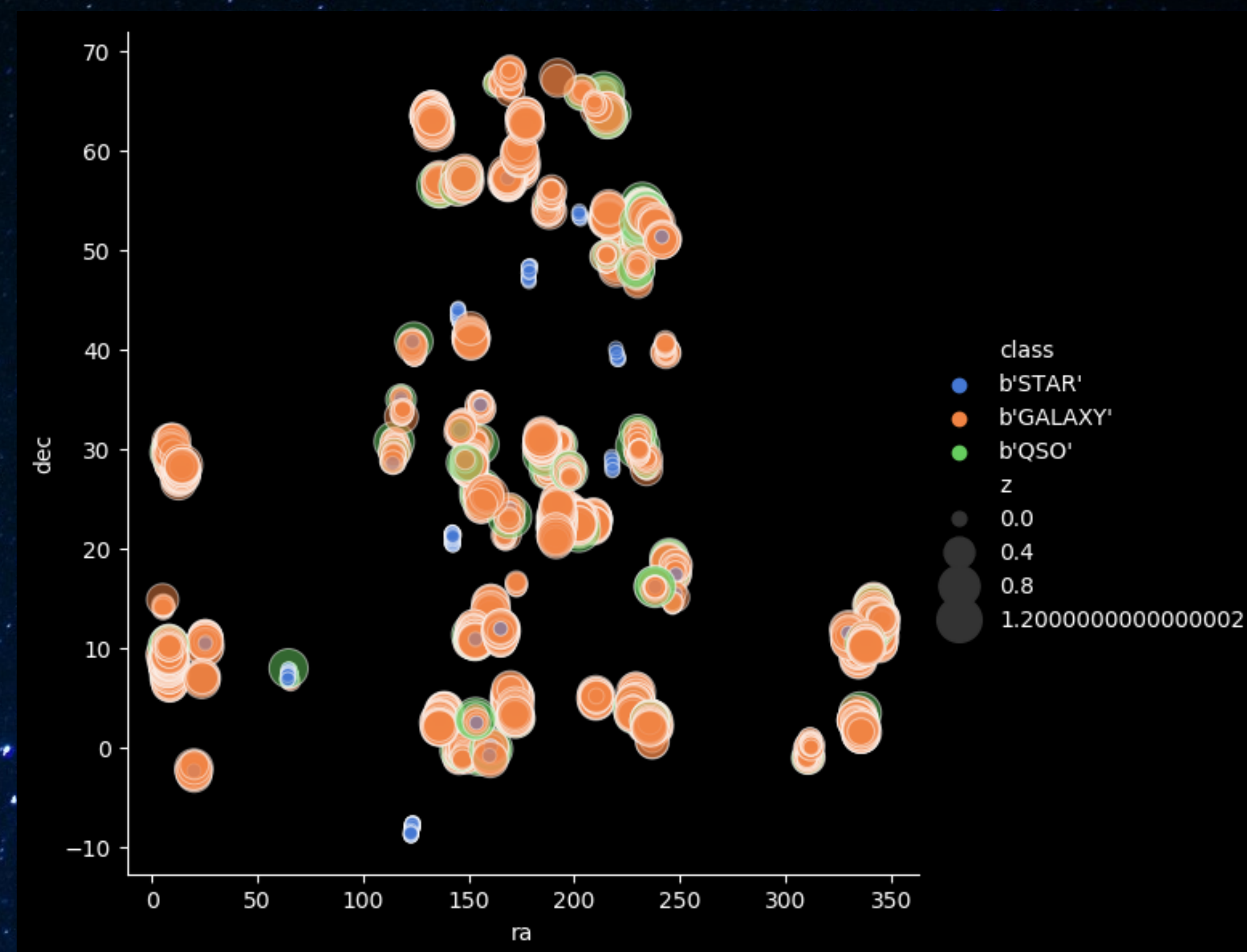


Star



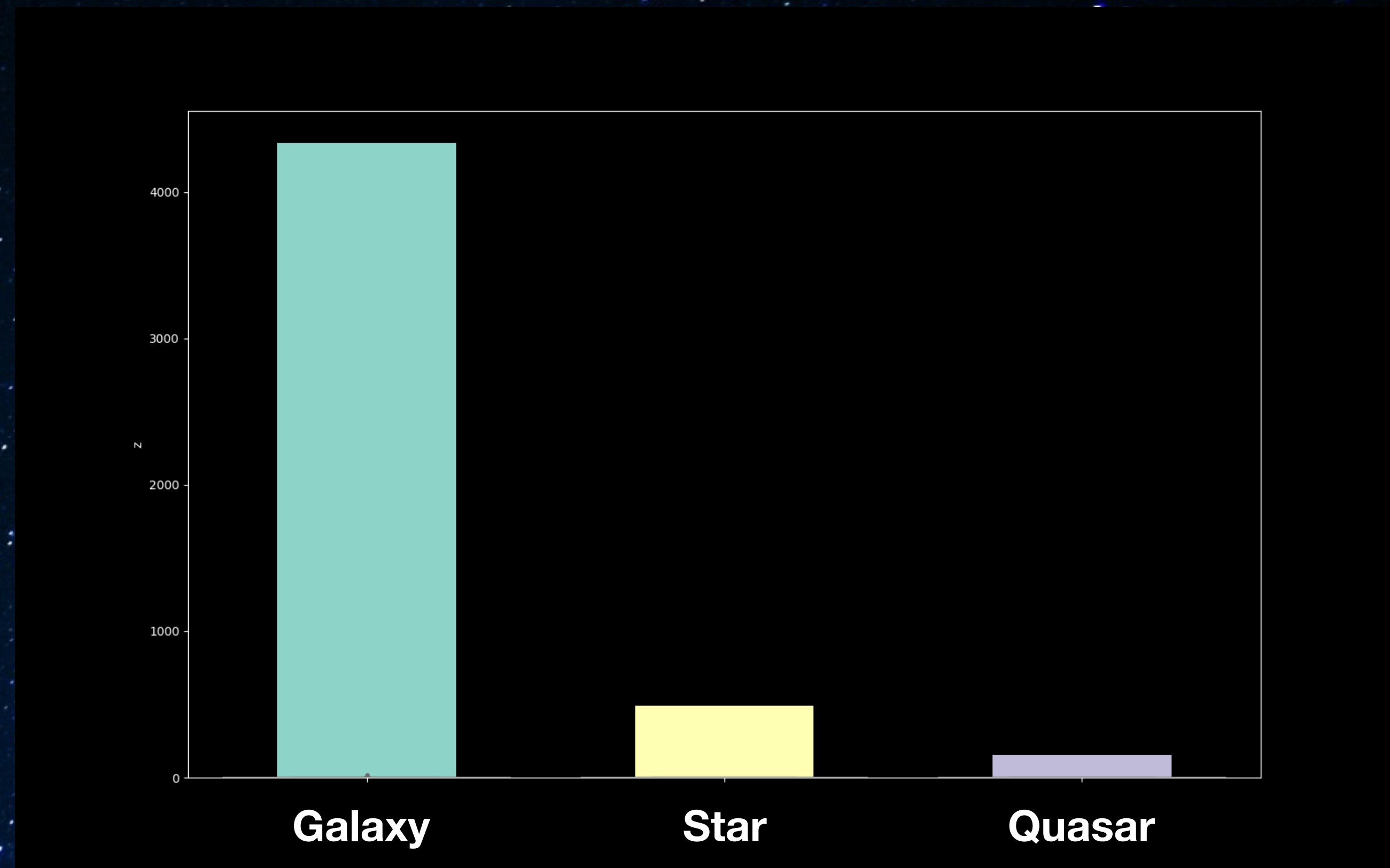
Data Import

- SDSS database
- SQL & astroquery
 - Redshift, redshift error, class, spectrum
- 50000 spectra



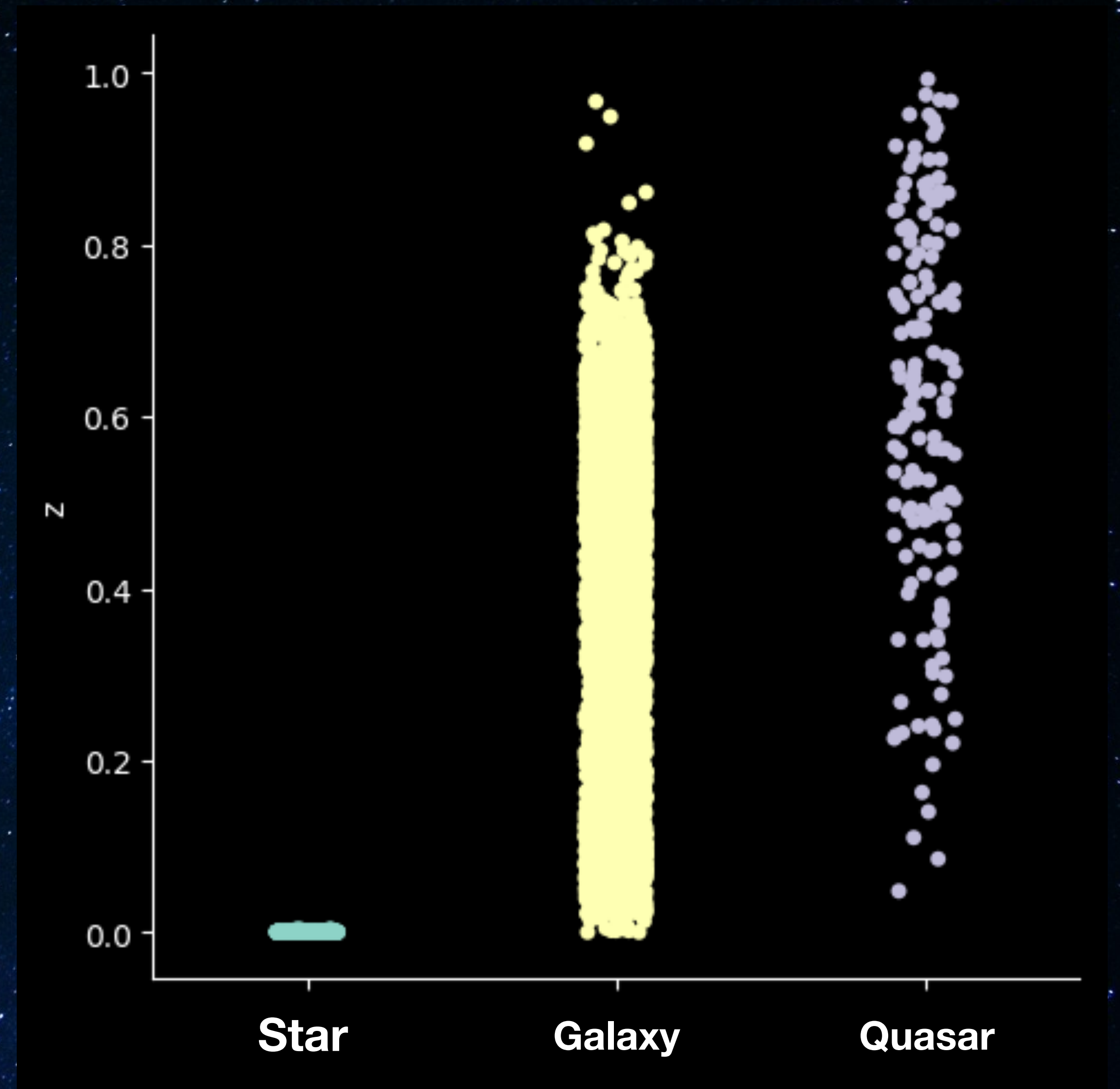
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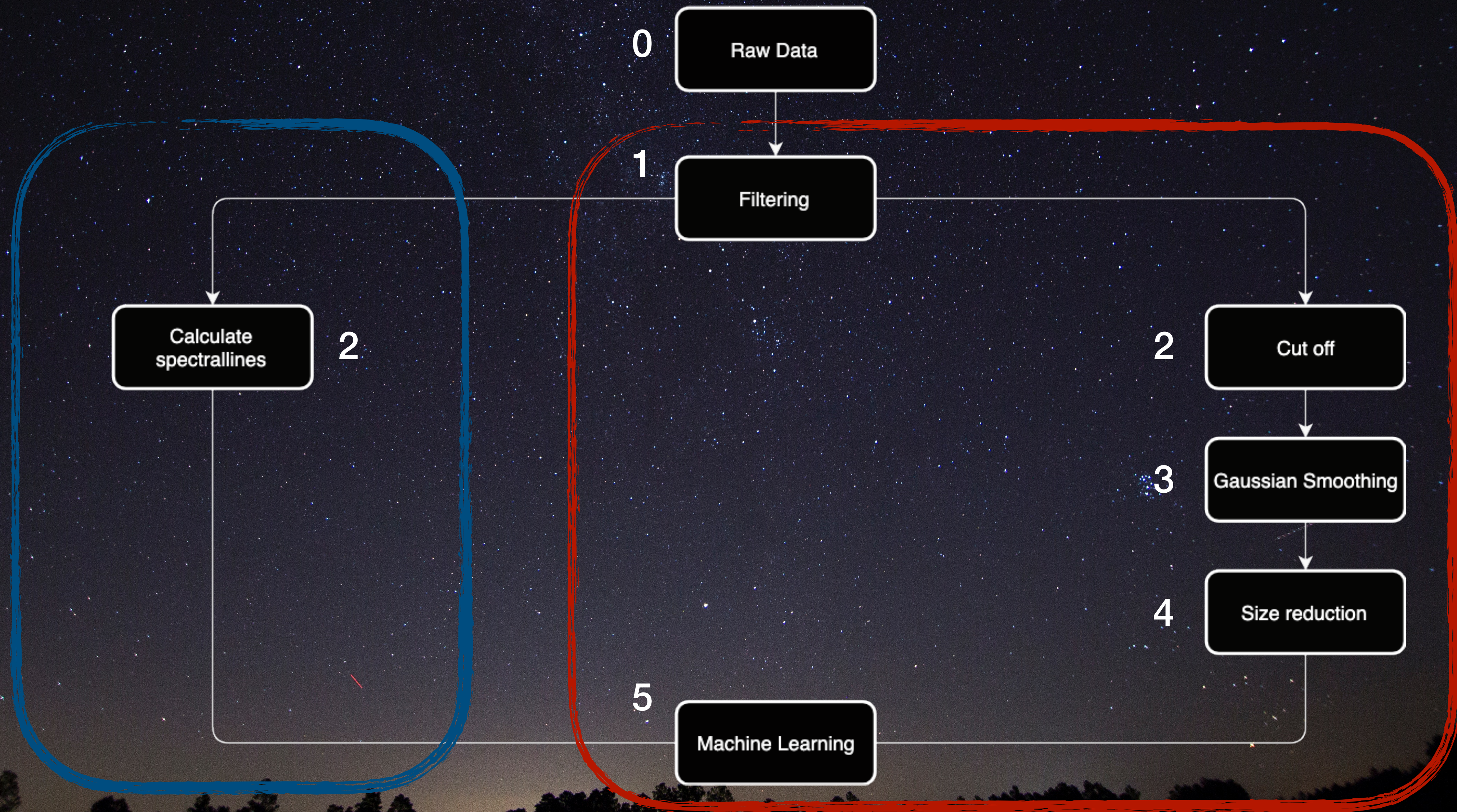


Data Import

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 - Redshift, redshift error, class, spectrum
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Data Preprocessing



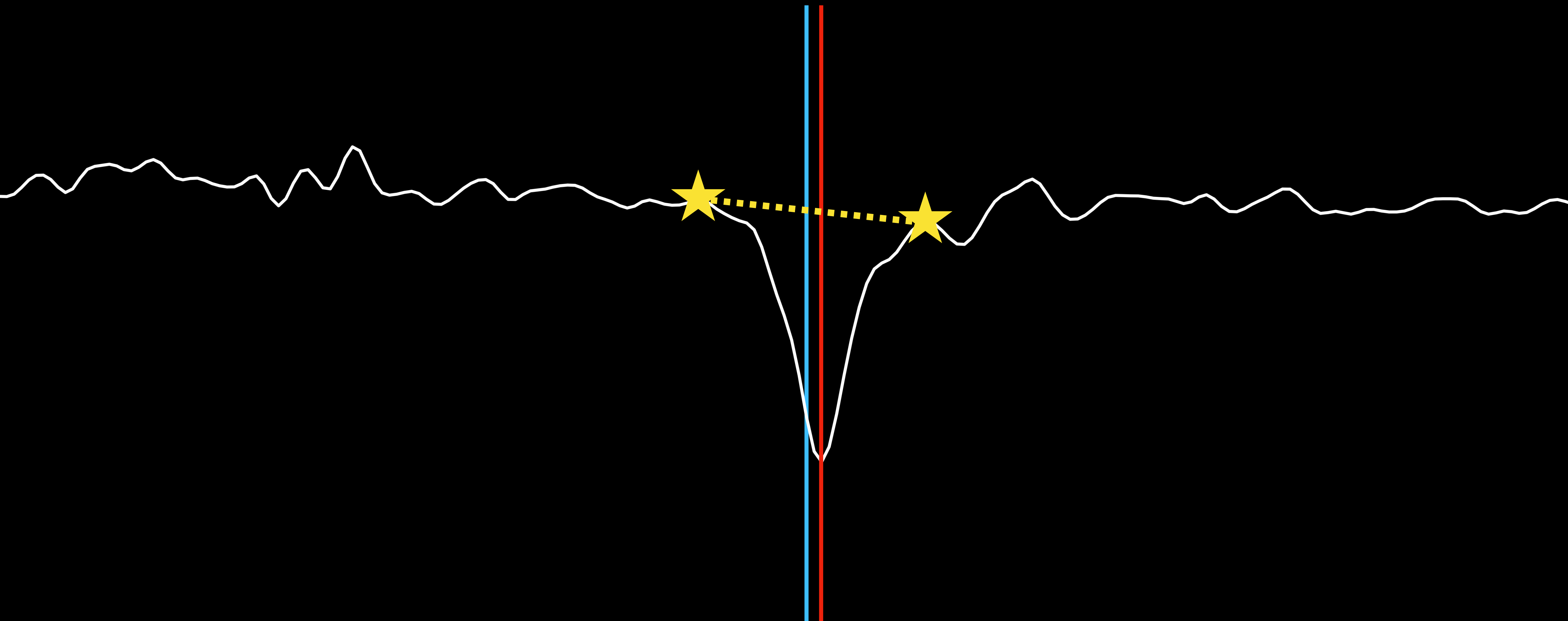
WaveFilteringCutoff



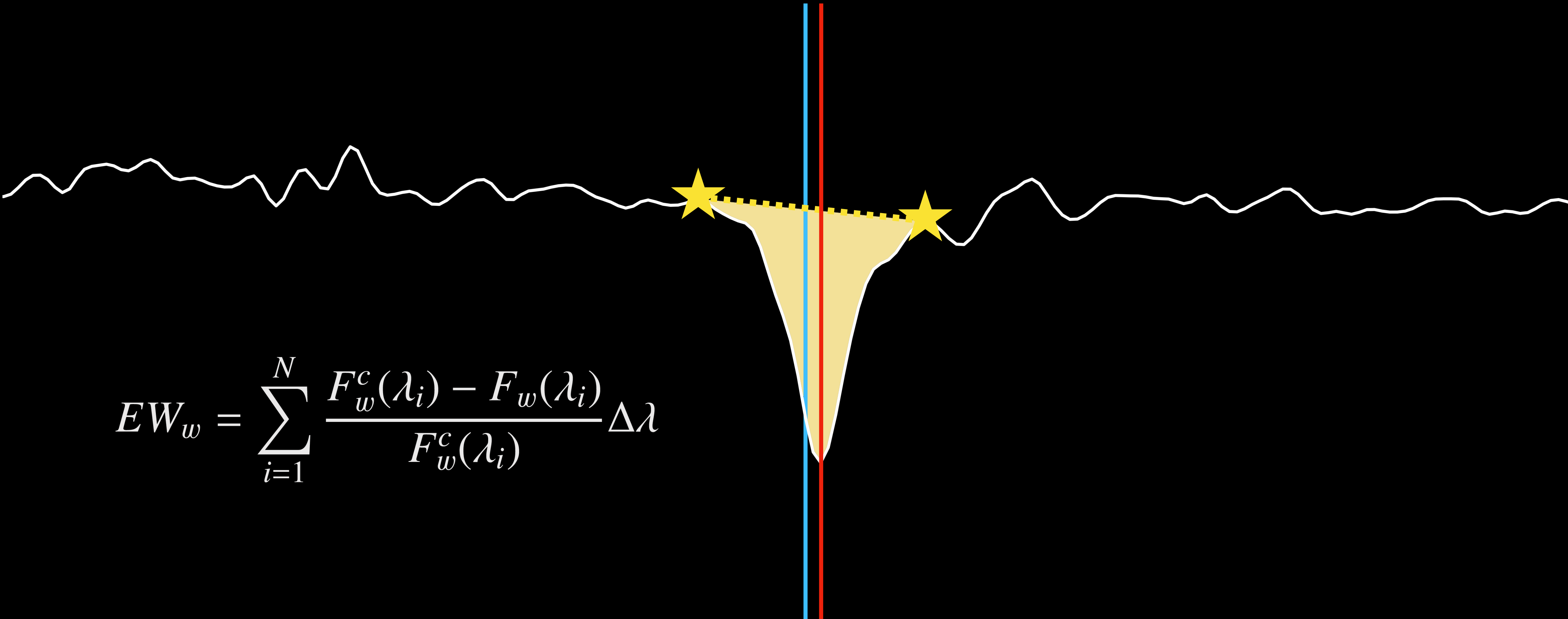
Gaussian Smoothing



Equivalent Width



Equivalent Width



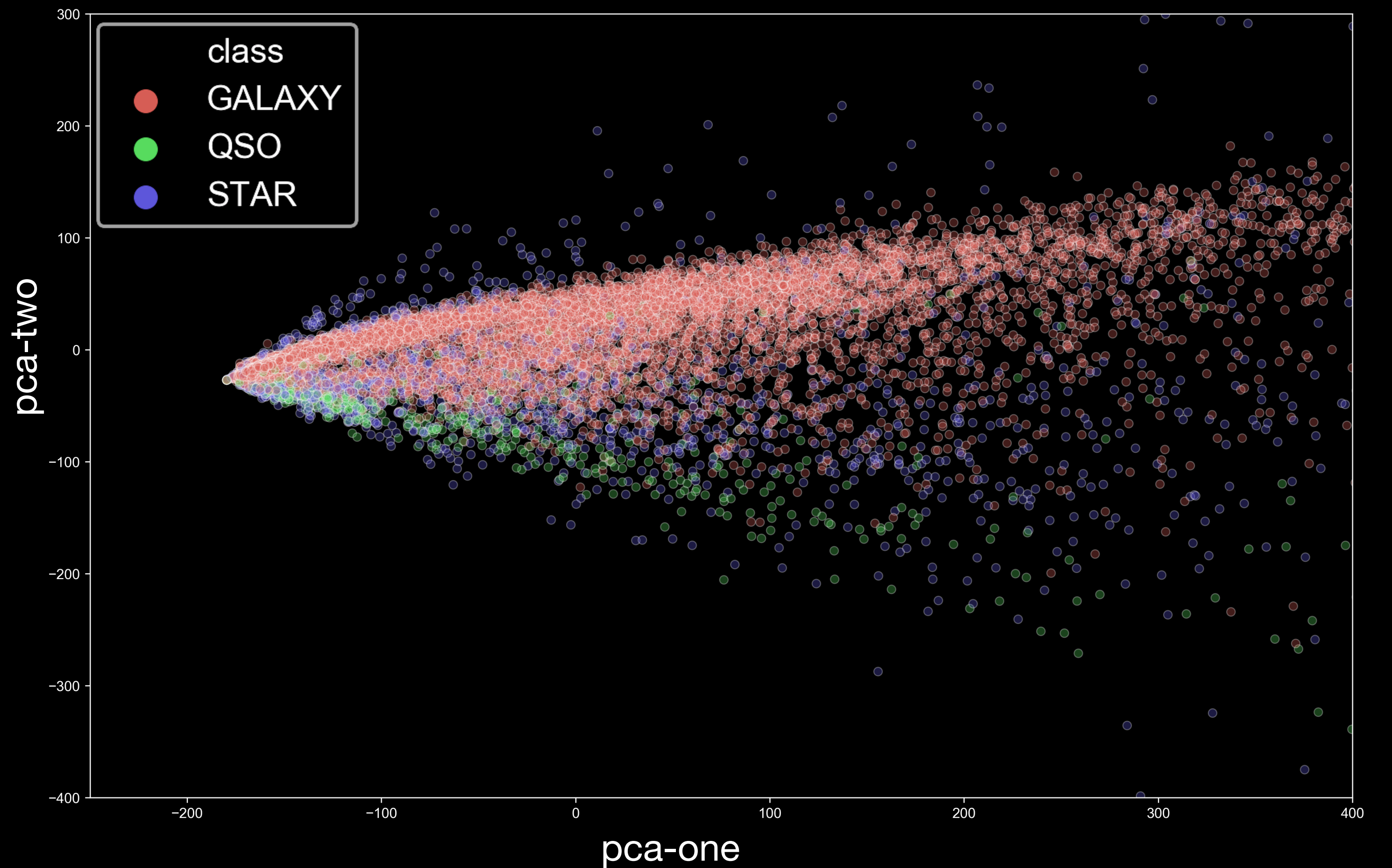
Dimensionality Reduction

14 spectral lines & 467 continuum flux points

Dimensionality Reduction

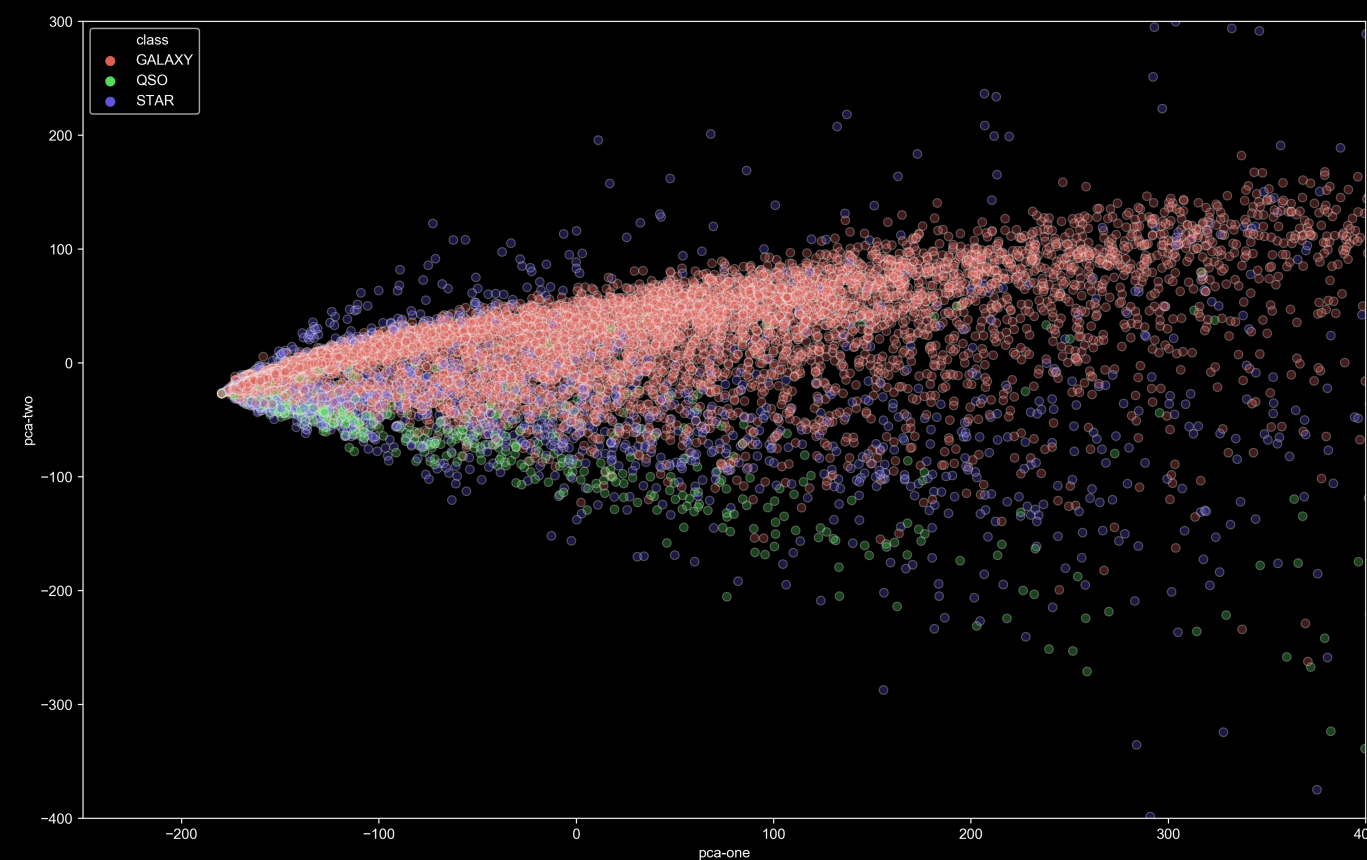
PCA

Using only the continuum

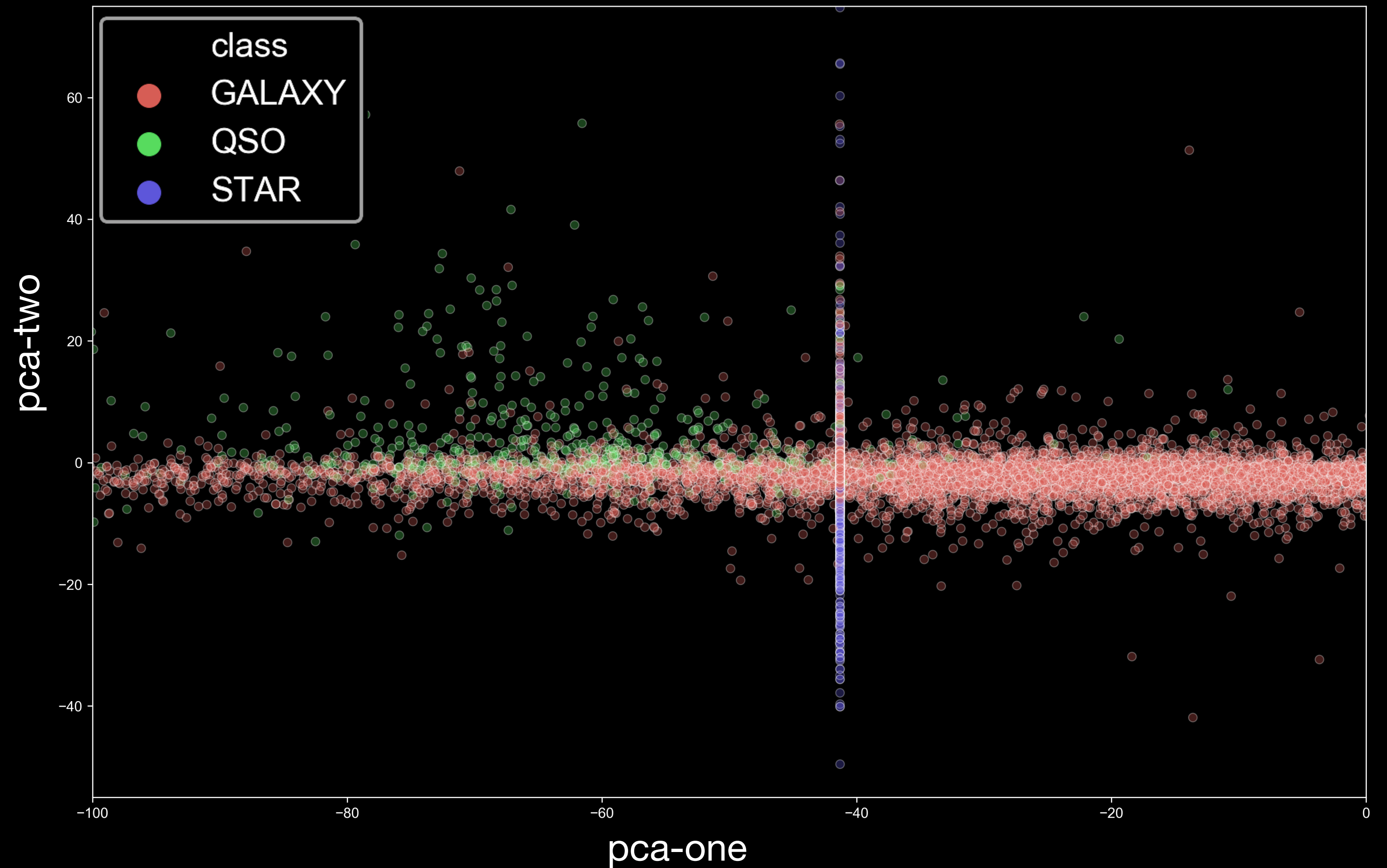


Dimensionality Reduction

PCA

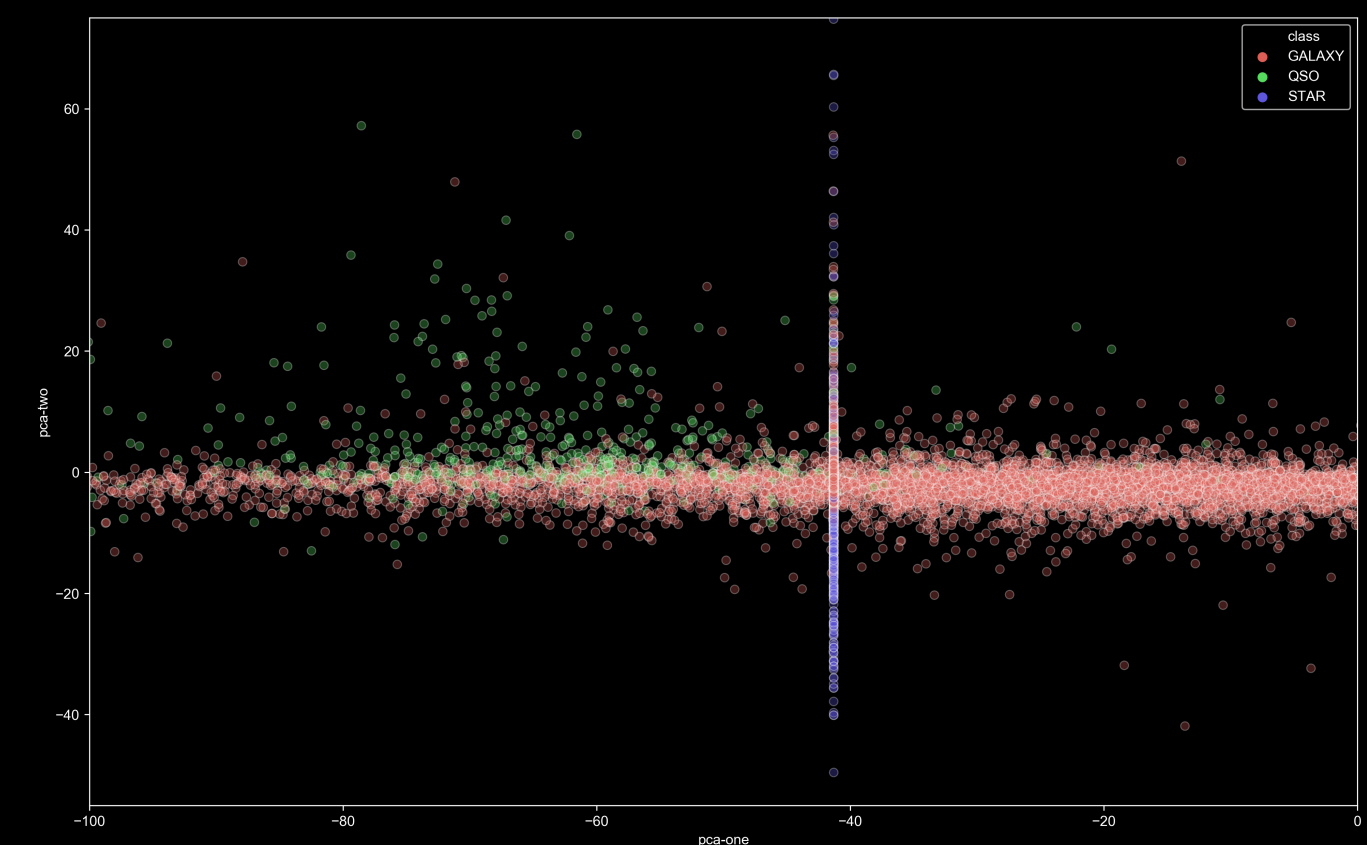
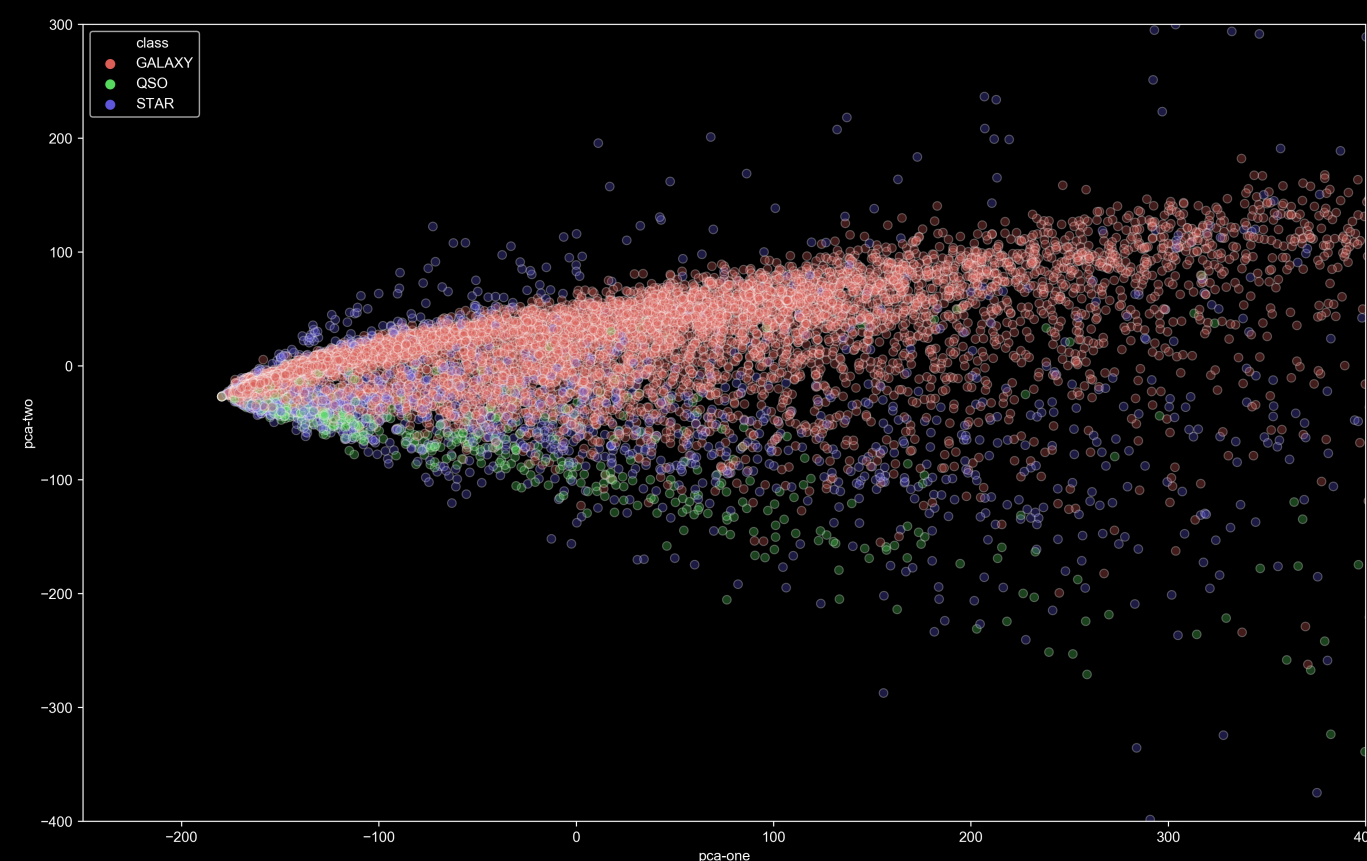


Using only the spectral lines

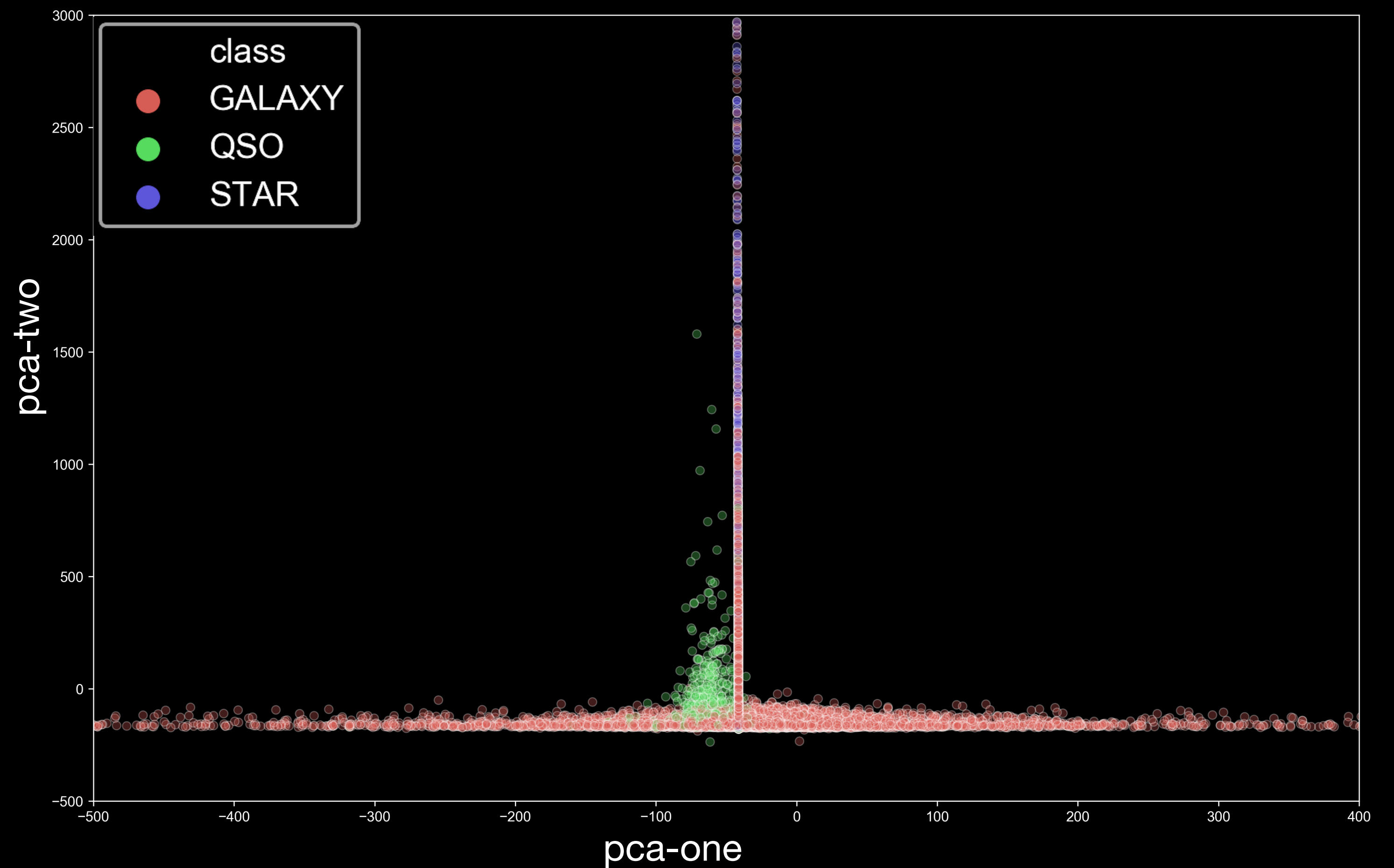


Dimensionality Reduction

PCA



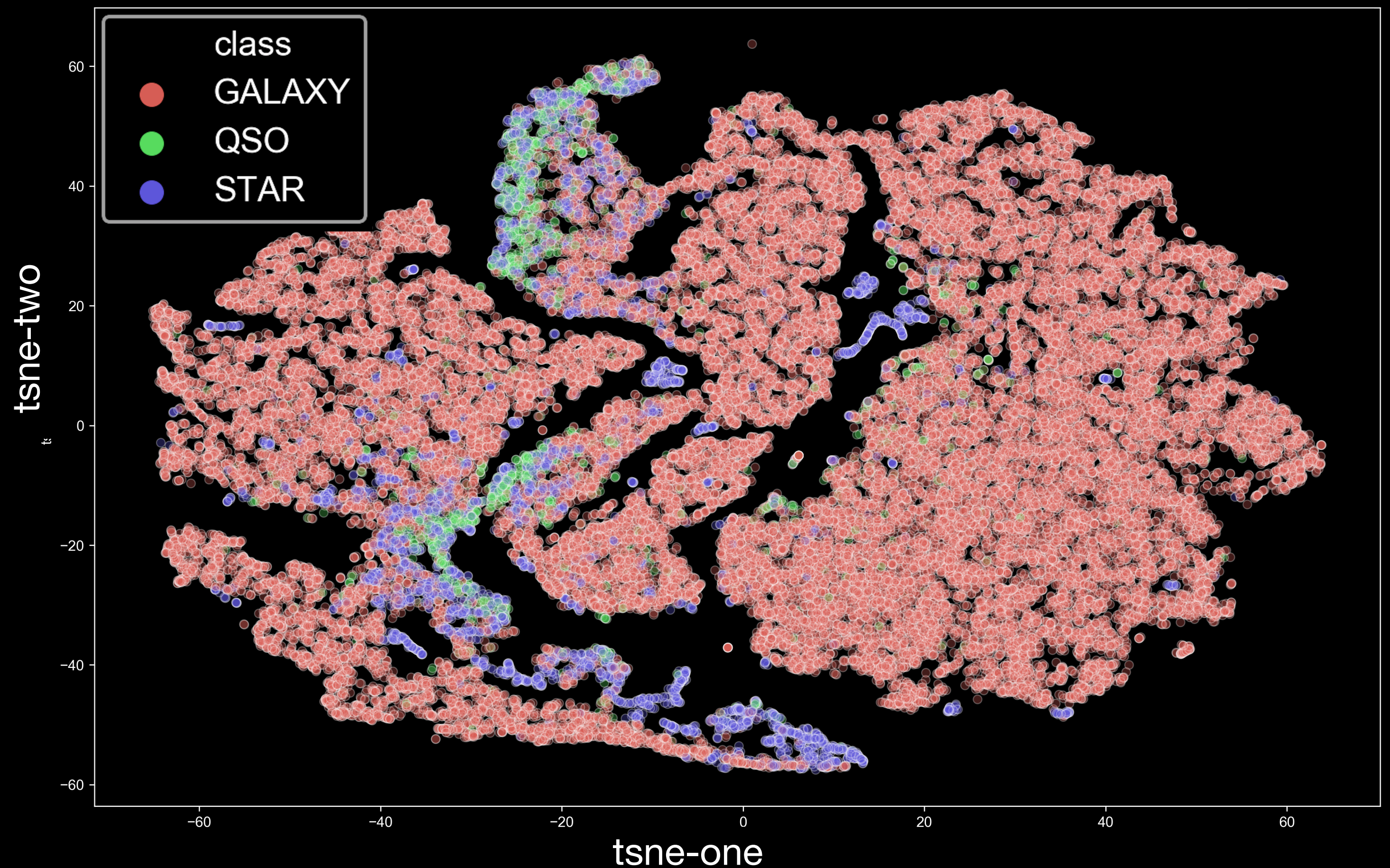
Using the spectral lines & continuum



Dimensionality Reduction

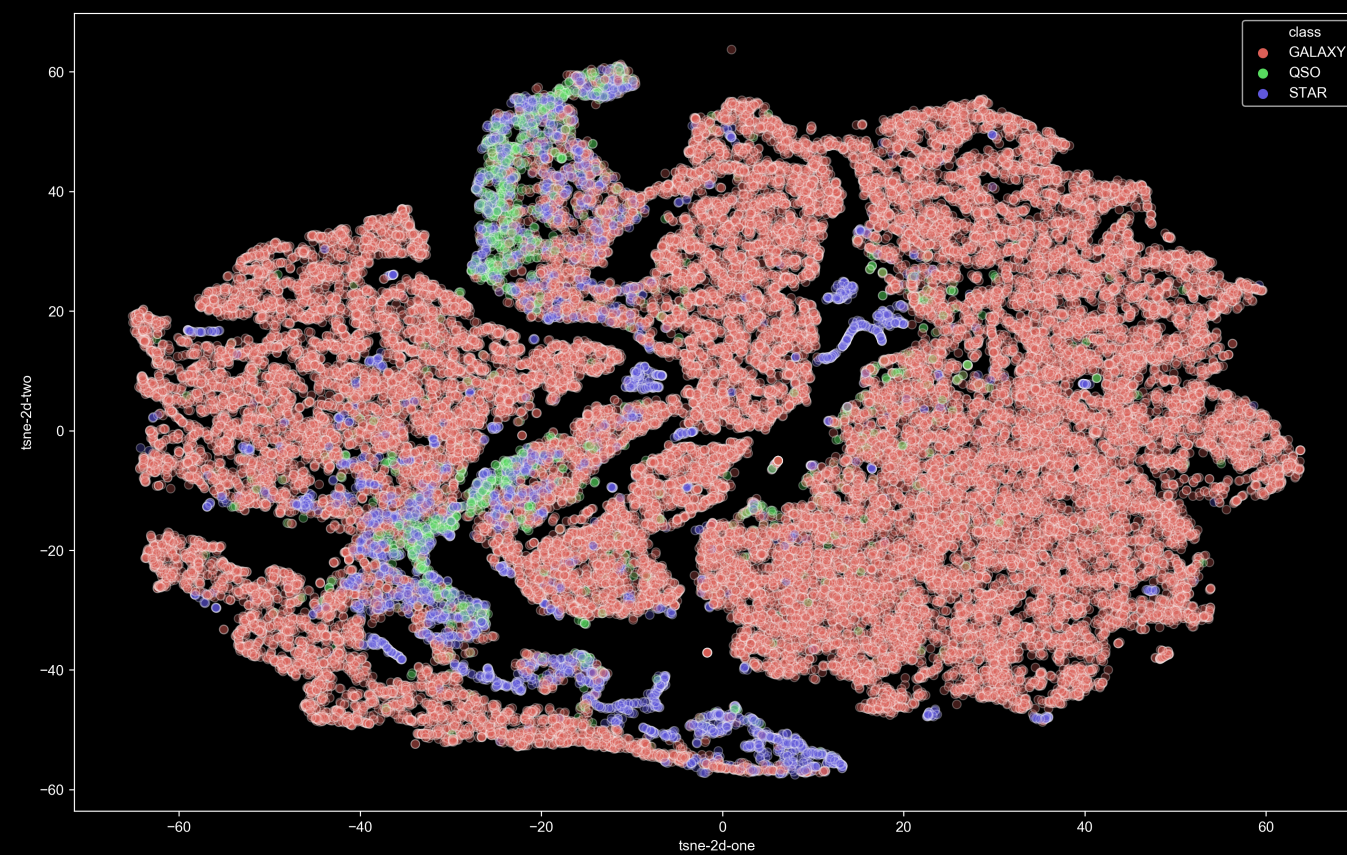
t-SNE

Using only the continuum

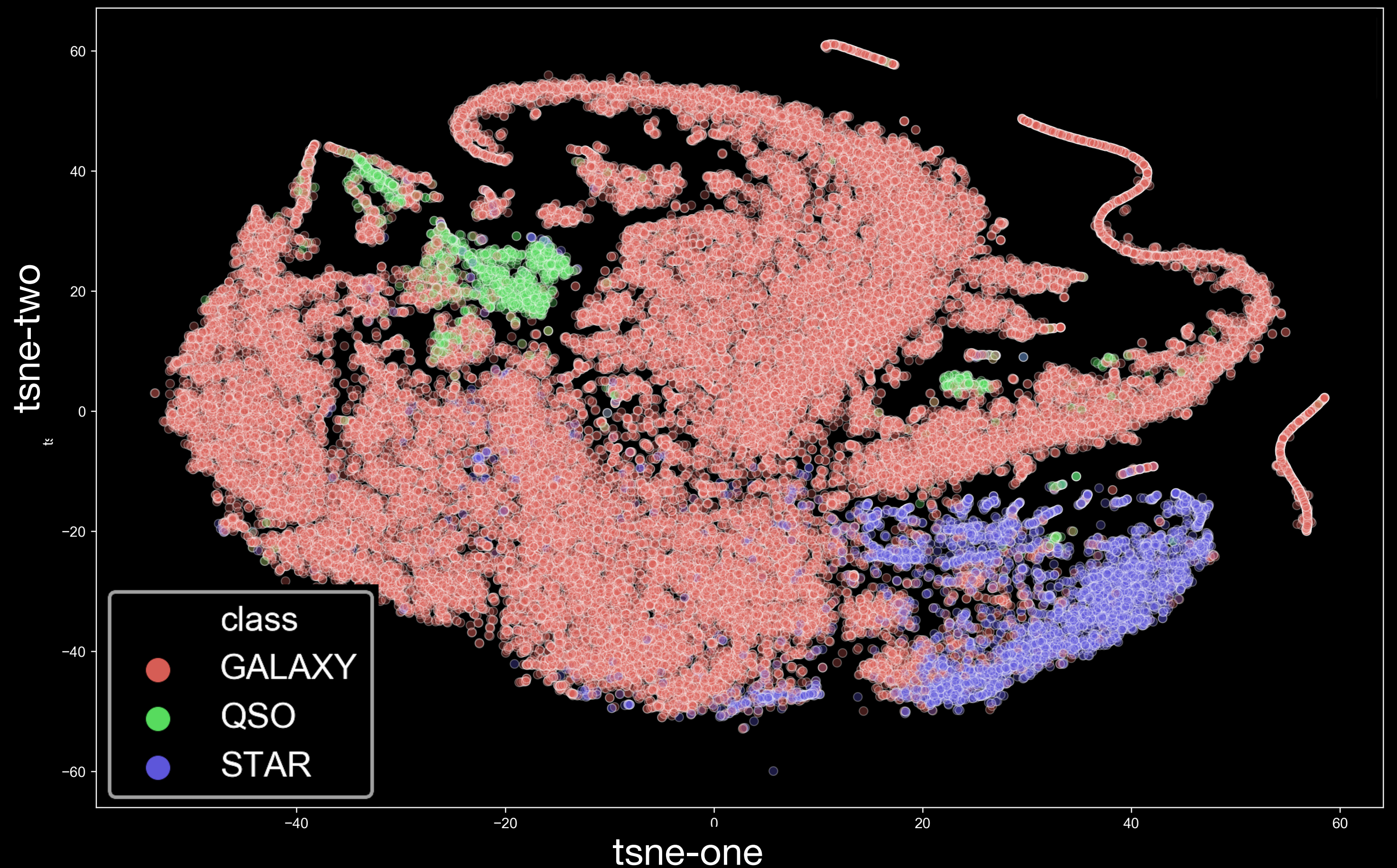


Dimensionality Reduction

t-SNE

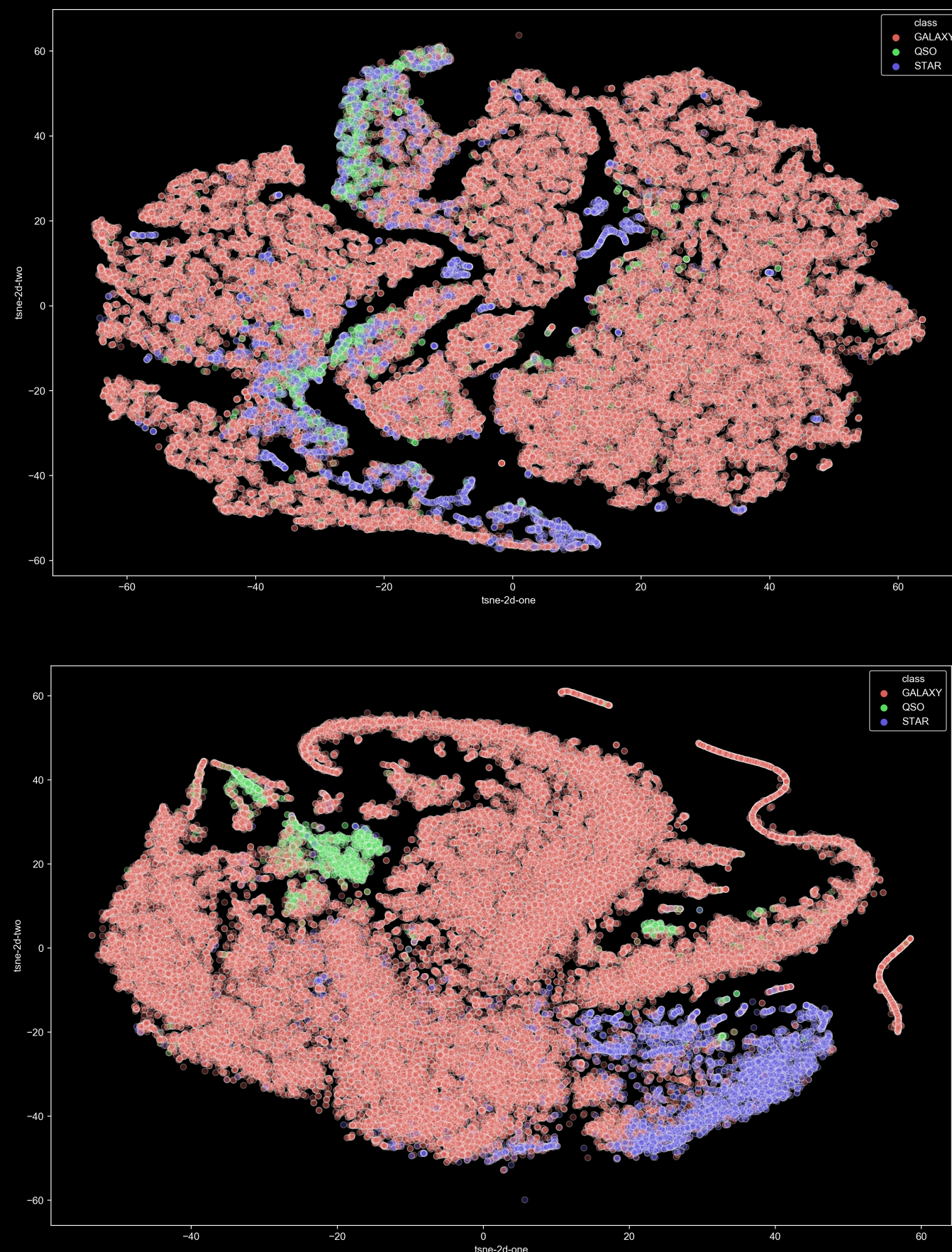


Using only the spectral lines

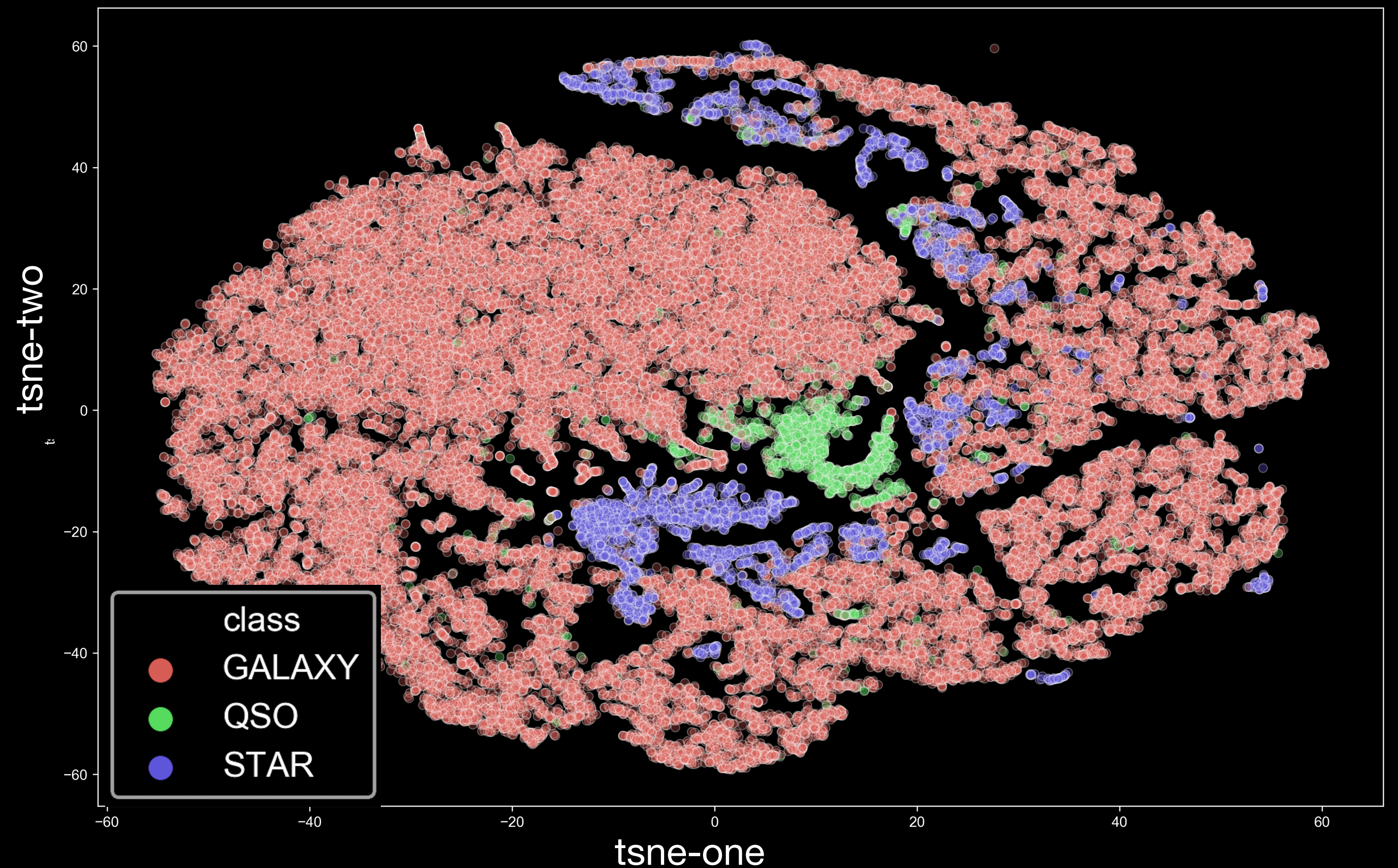


Dimensionality Reduction

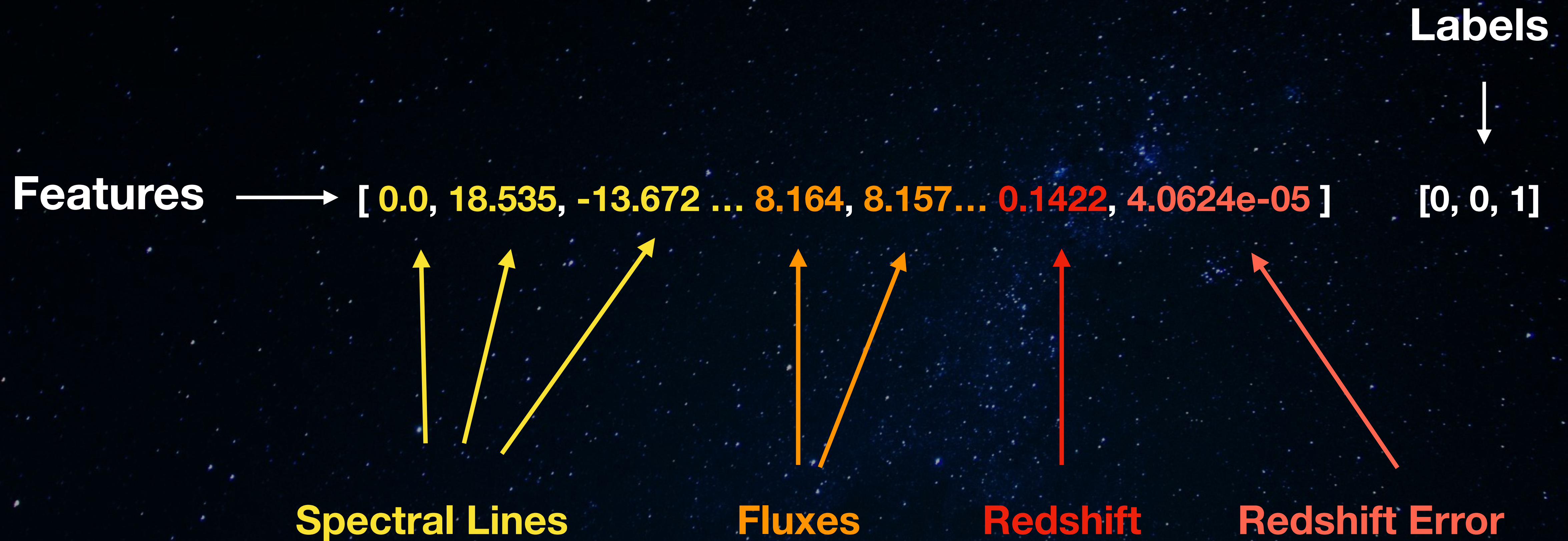
t-SNE



Using the spectral lines & continuum



Classification



Classification

ML Algorithm	Accuracy
Neural Network	99%
Random Forest	97.99%
Gaussian Classifier	95.45%
XGBoost	

Conclusions

Future Work



Thank you for your attention!



Special thanks to Adriano Agnello