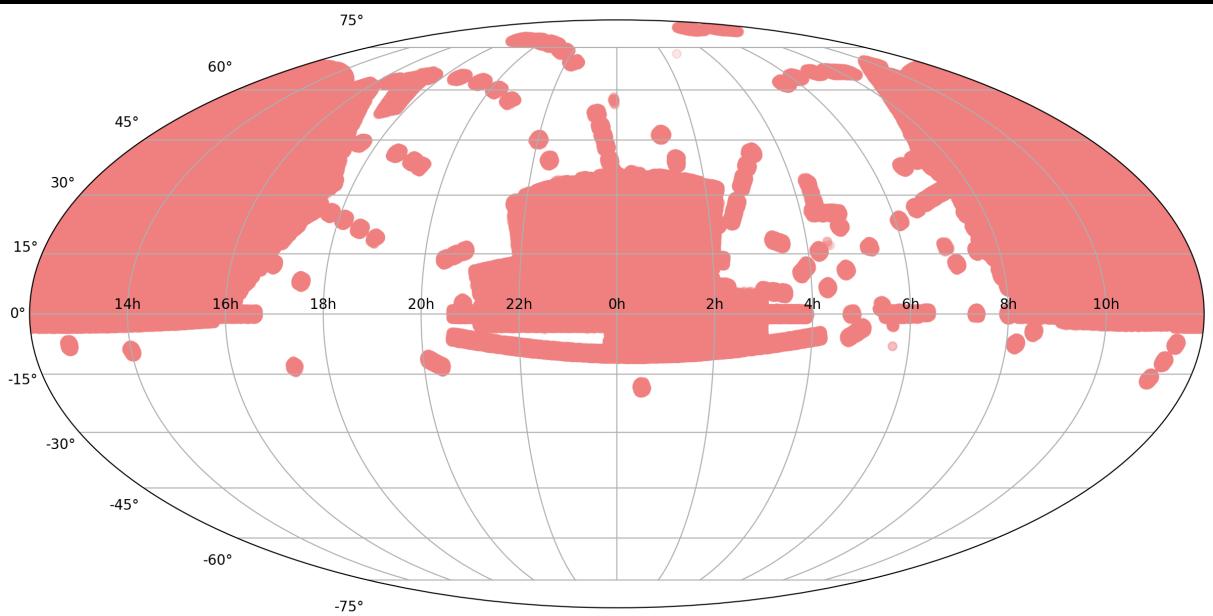




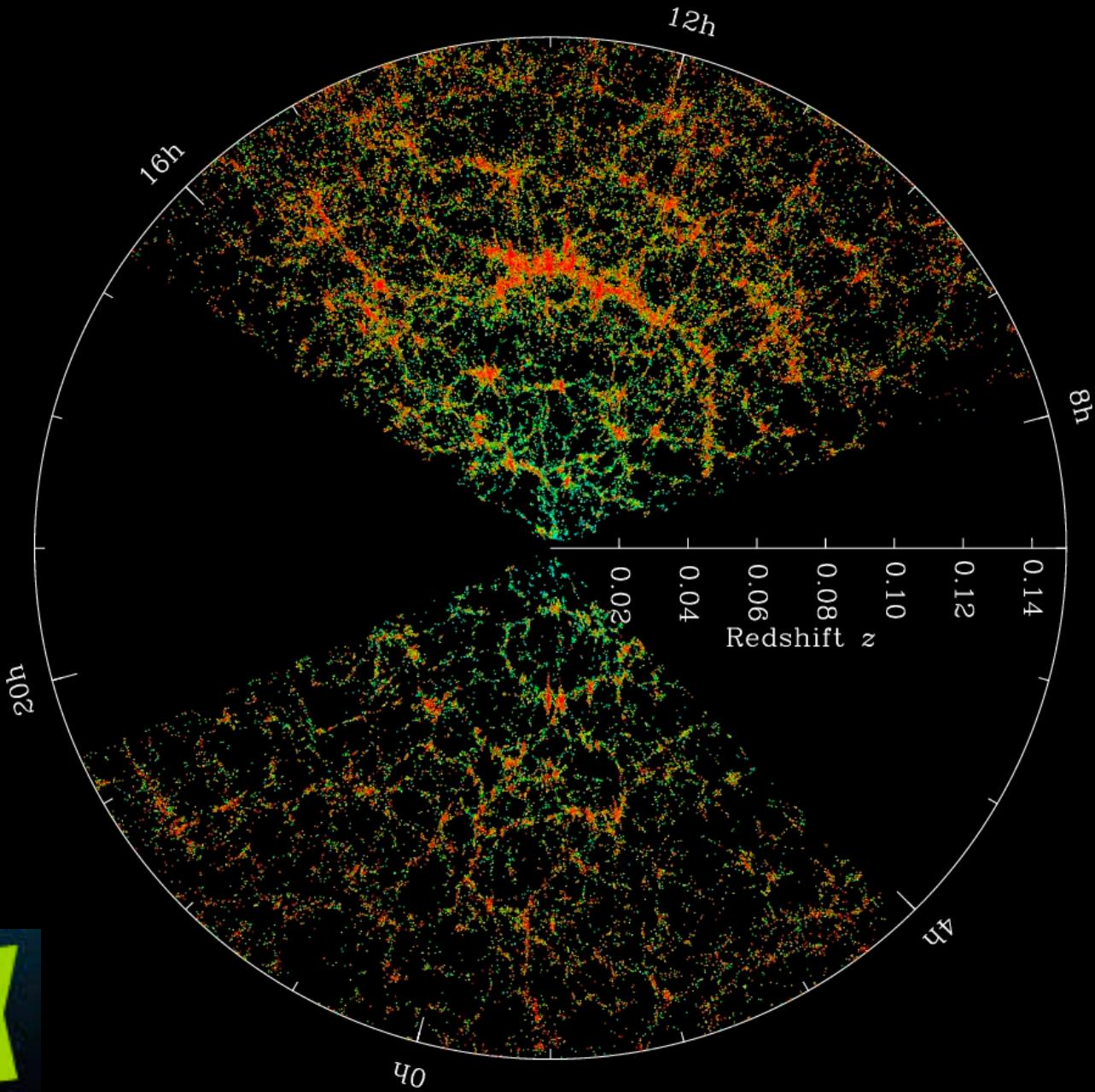
# Classifying the Known Universe

Peter Ilhardt  
August 7, 2019

# “The Largest Map in Human History”



SDSS



Sloan Digital Sky Survey

# Can Objects be Classified Based on their Light?

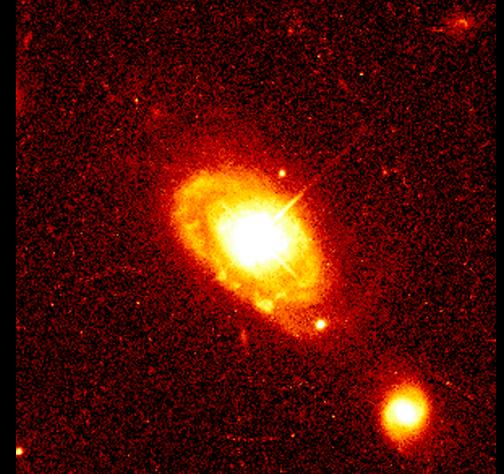
Stars



Galaxies



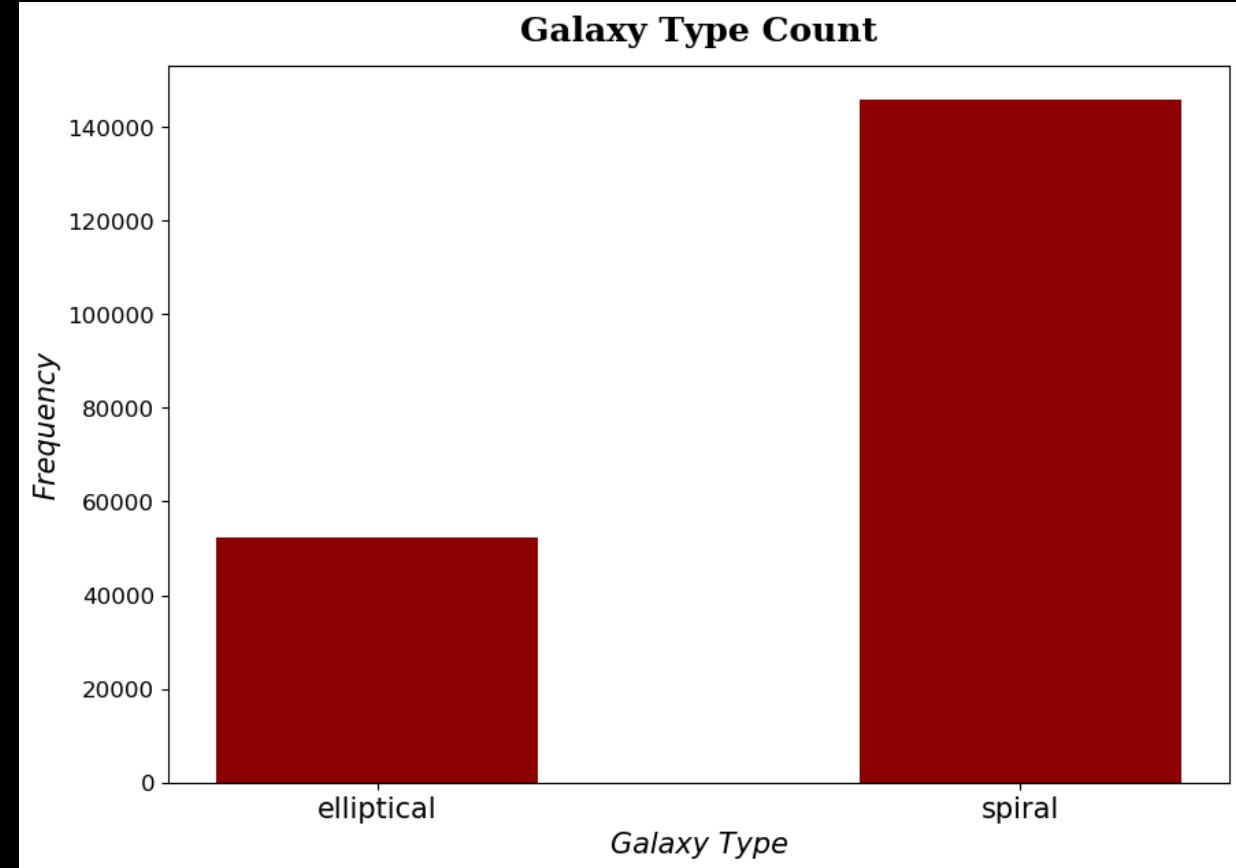
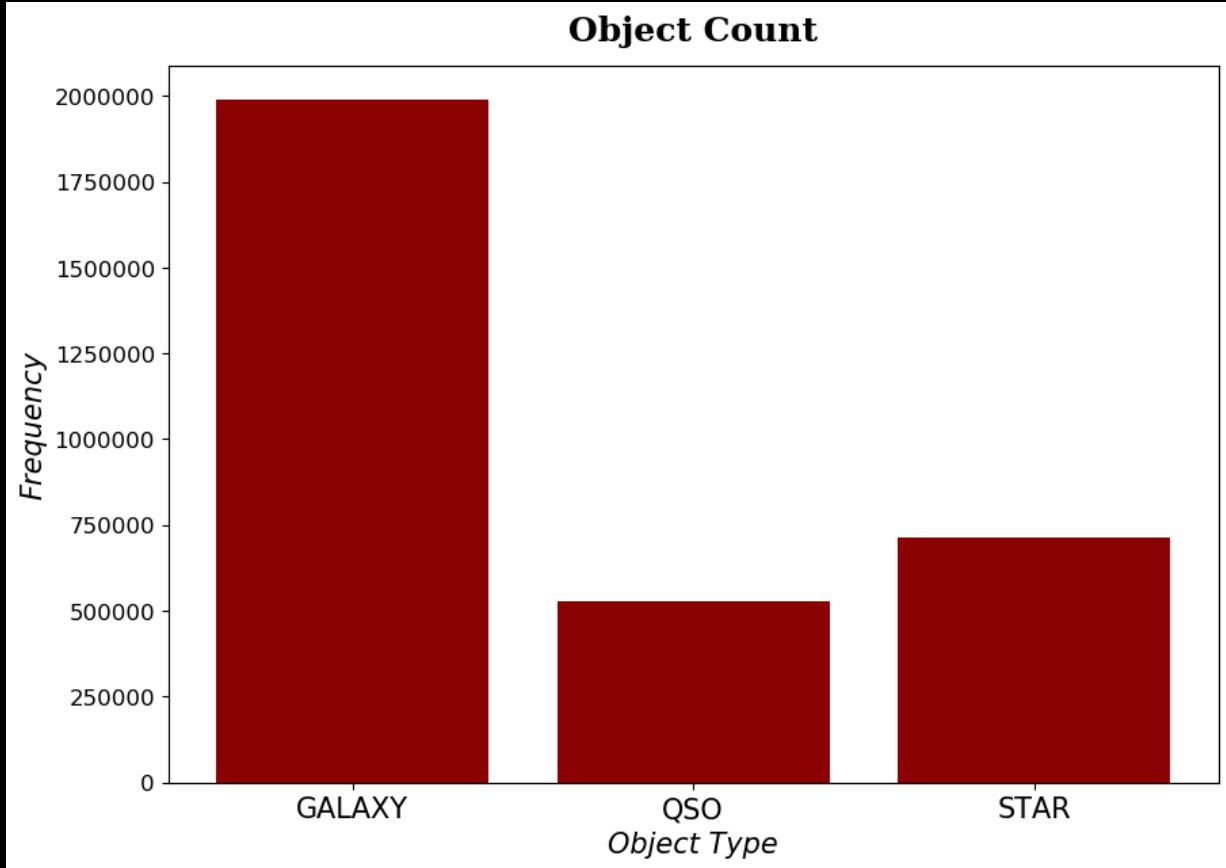
Quasars



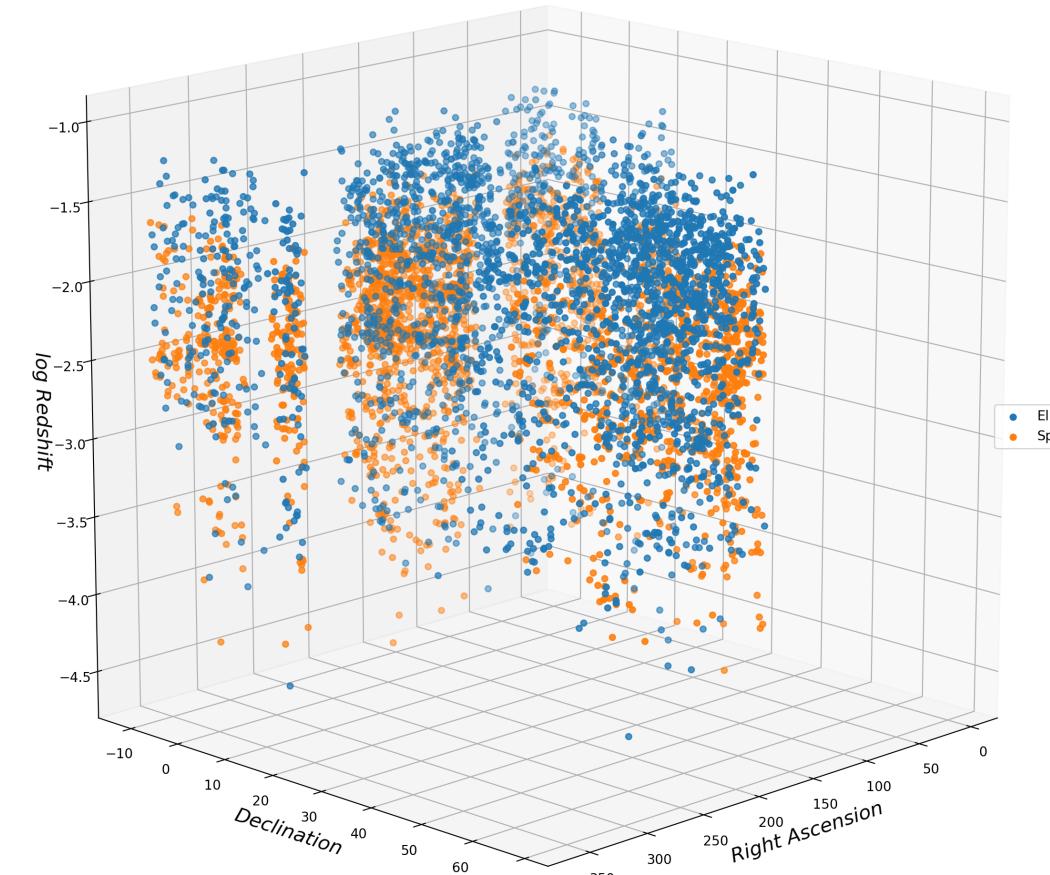
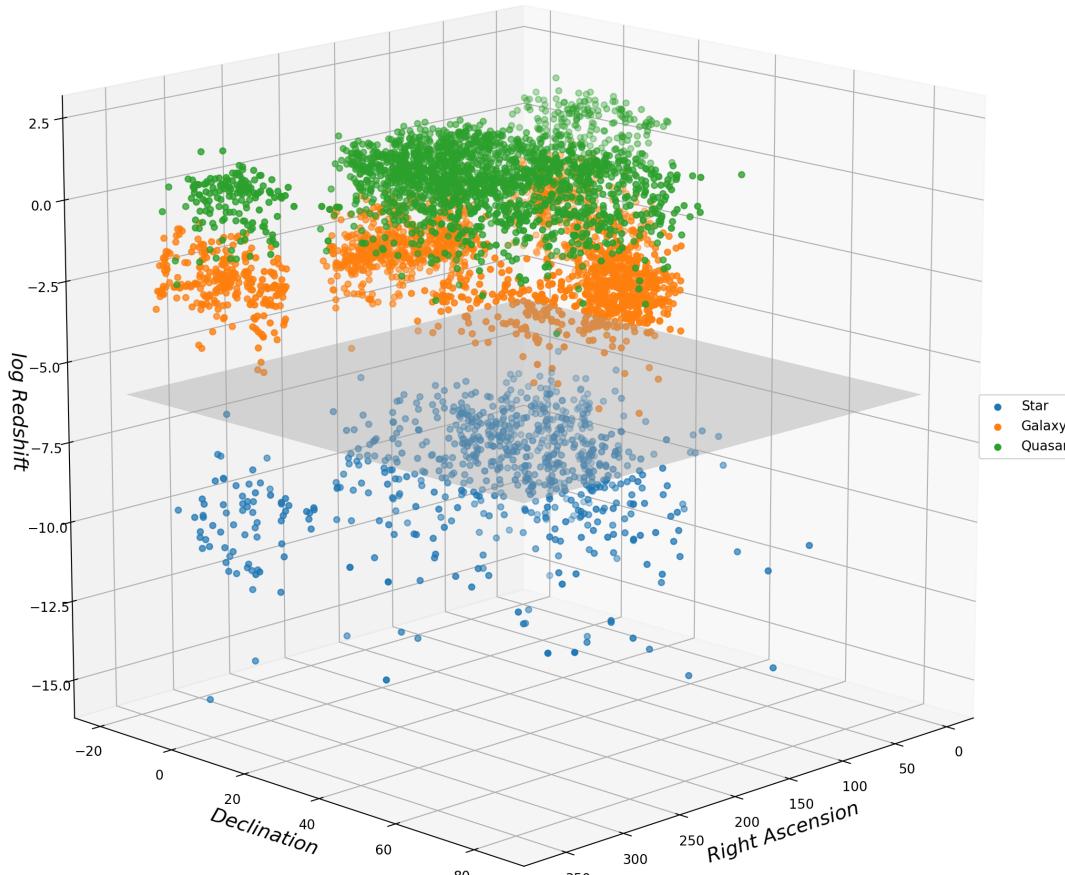
Spiral

Elliptical

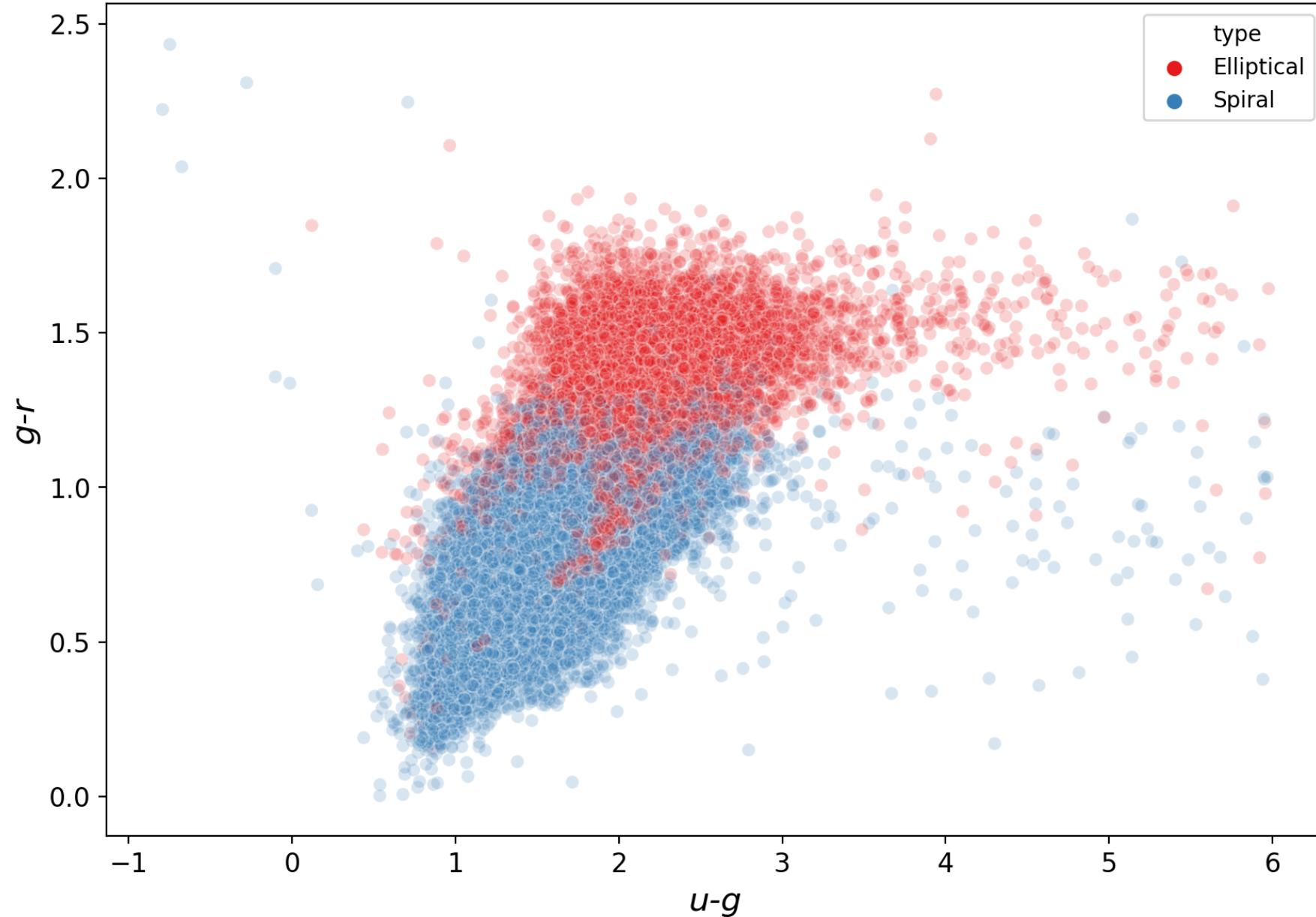
# Managing Astronomical Proportions



# Redshift, Blueshift

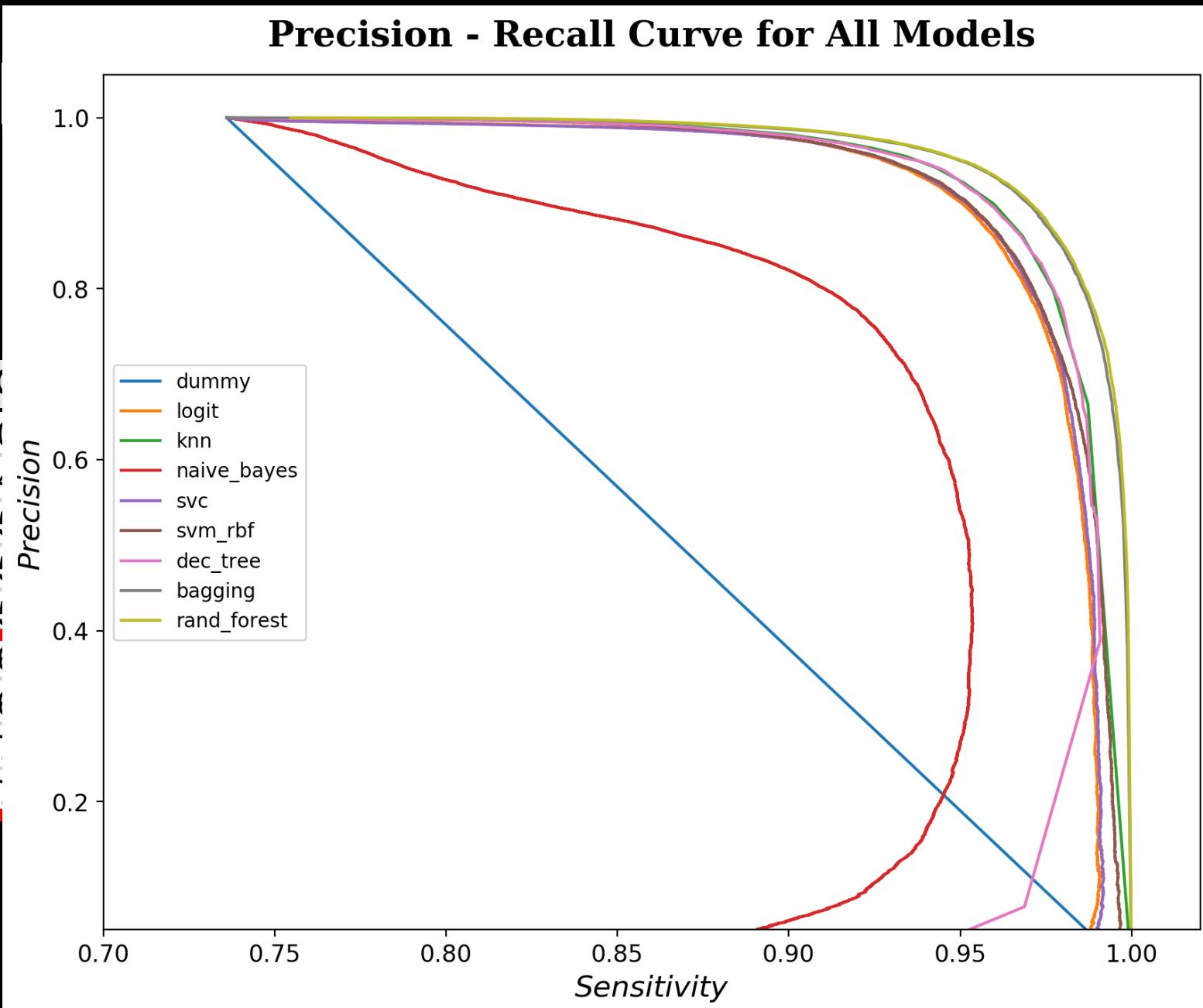


# Color-Color Diagram for Galaxy Types

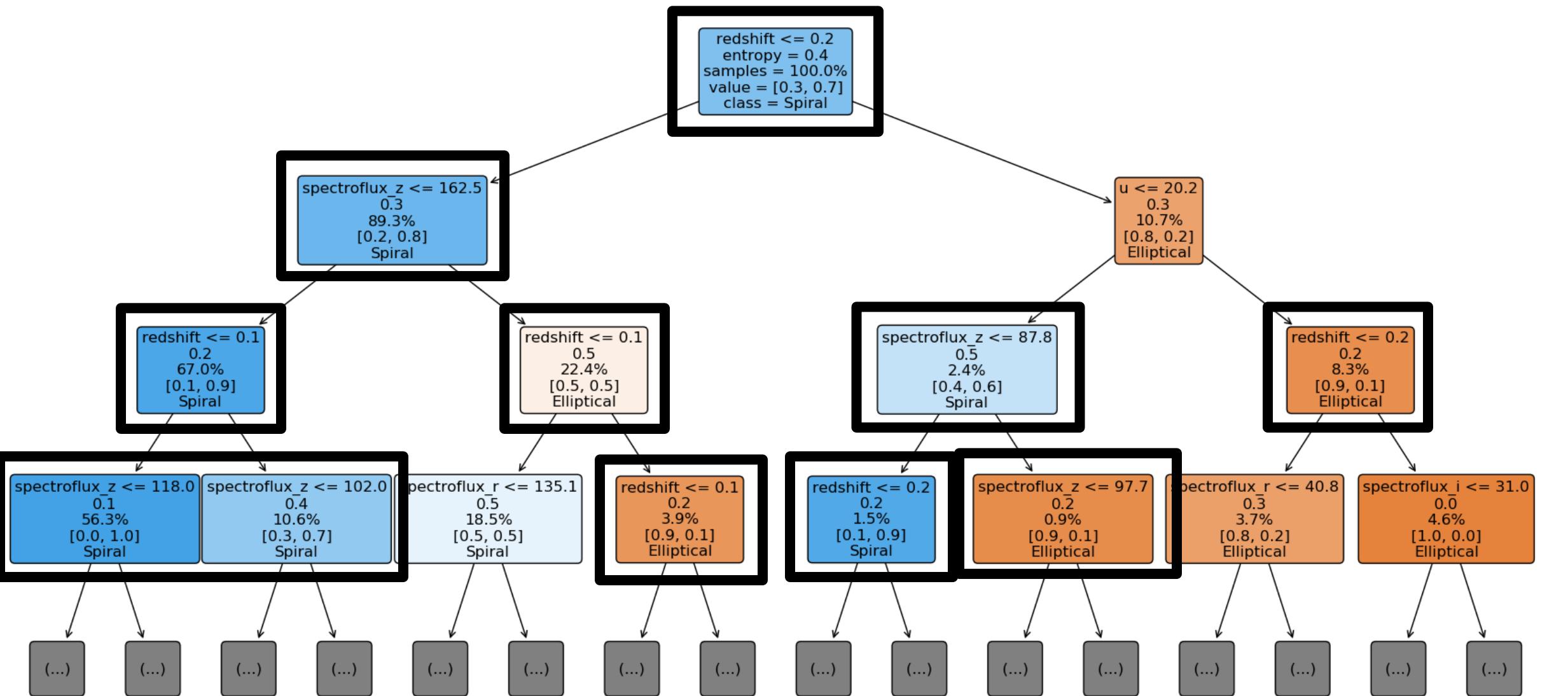


# Nonlinear Mode

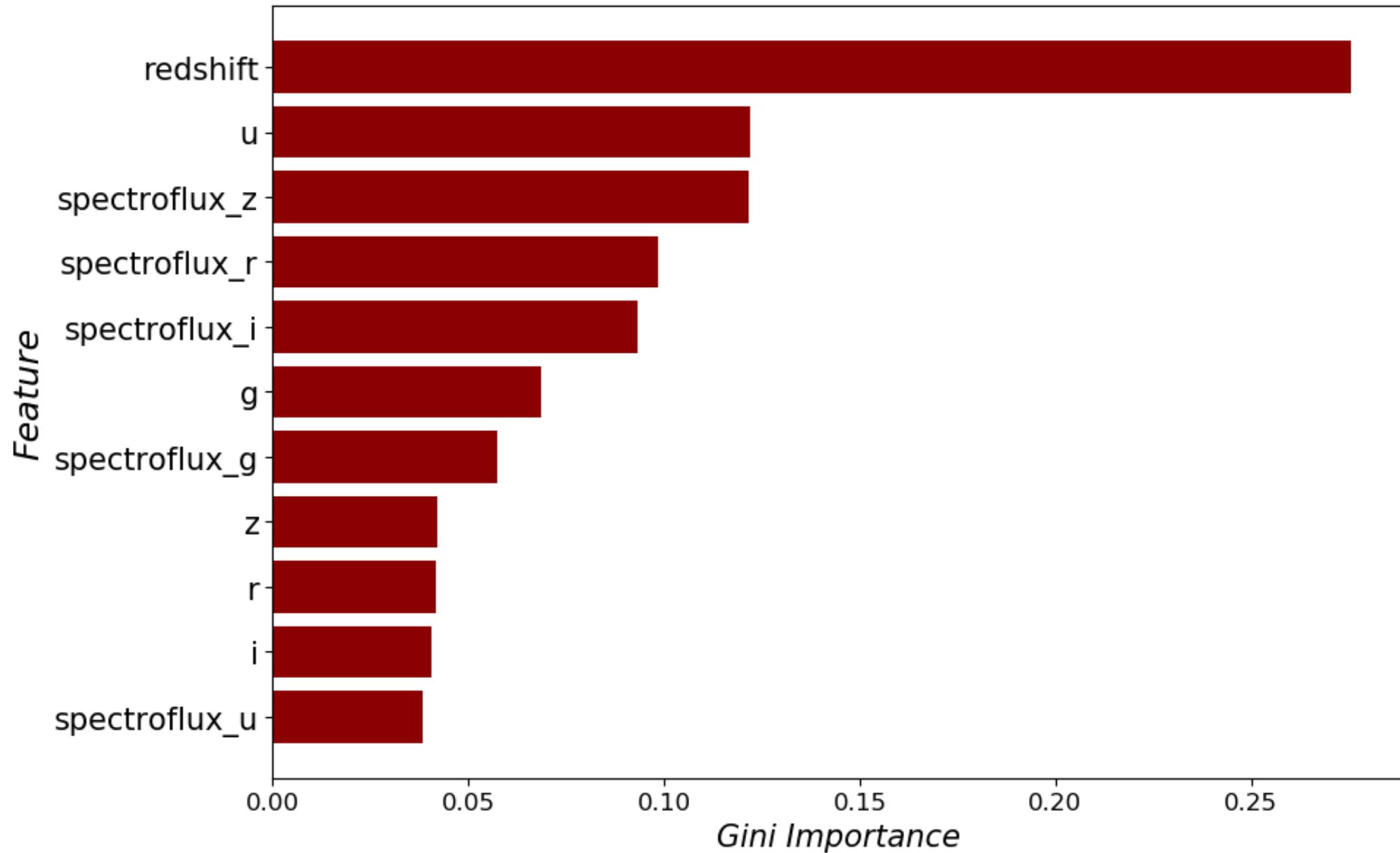
	Accuracy	AUC
Dummy	0.74	0.50
Naïve Bayes	0.63	0.84
Logistic	0.91	0.95
SVC	0.91	0.95
SVM (RBF)	0.91	0.95
kNN	0.92	0.96
Decision Tree	0.92	0.96
Bagging	0.93	0.97
Random Forest	0.93	0.97



# Early Splits Dominated by Redshift, Infrared



## Random Forest Feature Importance



# Predicting Unknown Objects

## What Astronomical Object Is It?

Enter the redshift and color of the object and a class prediction is returned.

'u', 'g', and 'r' refer to the ultraviolet, green, and red filter magnitudes used by the Sloan Digital Sky Survey.

Redshift:

u-g color:

g-r color:

Identify

# Appendix

# Why Classify Space?

- Understand the origins, history and fate of the universe
- Provide insight into objects we cannot reach
- Test fundamental scientific laws
- Exploration, curiosity

## Edwin Hubble's Classification Scheme

