A Principle Component Analysis of the Correlation Between HI Mass Fraction and other Galactic Parameters

Sean Dillon
California State University, Chico
Karen Masters
Department of Physics and Astronomy
Haverford College
David Stark
Department of Physics and Astronomy
Haverford College

Background

- Galaxy Age
- How to make a galaxy
- What is HI?

What We Did

- Plot correlations between HI Mass Fraction and other galactic properties using data from MaNGA
- Determine which galactic properties could affect our HI Mass Fraction the most
- What happens to HI

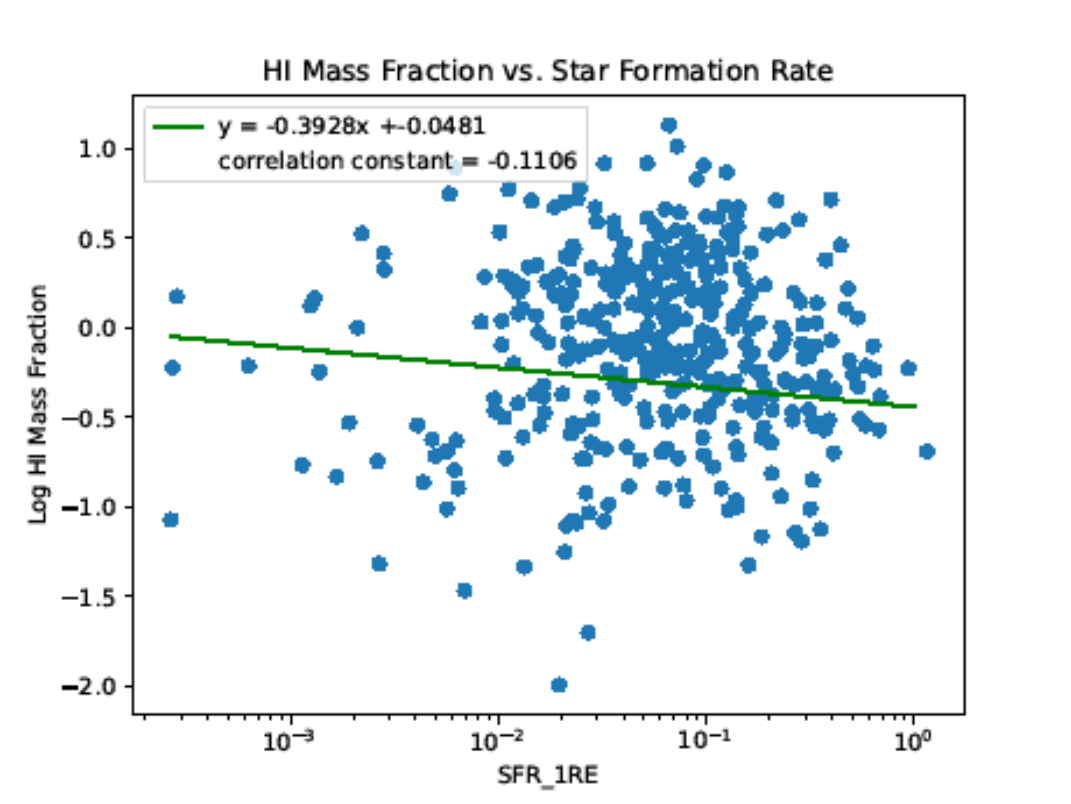
Where we get our data

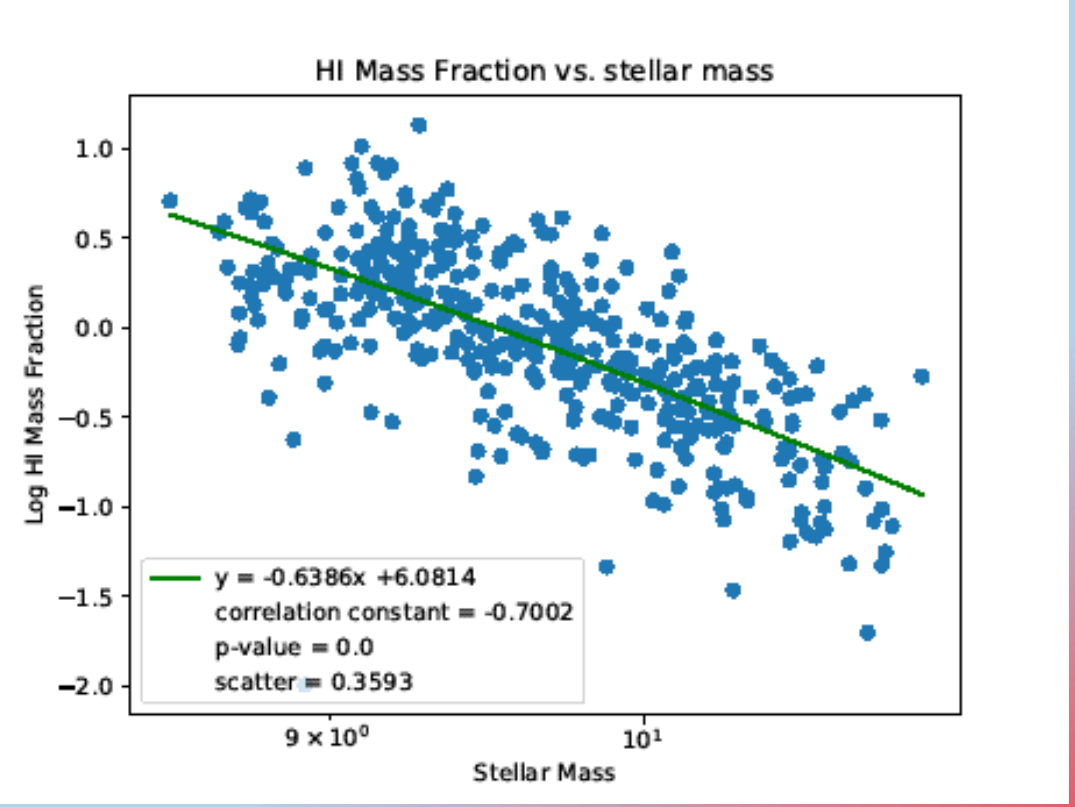
- What is MaNGA?
- first time we've been able to examine the correlations between HI content and quantities derived from spectroscopy over the whole galaxy (not just the centers).

Methods

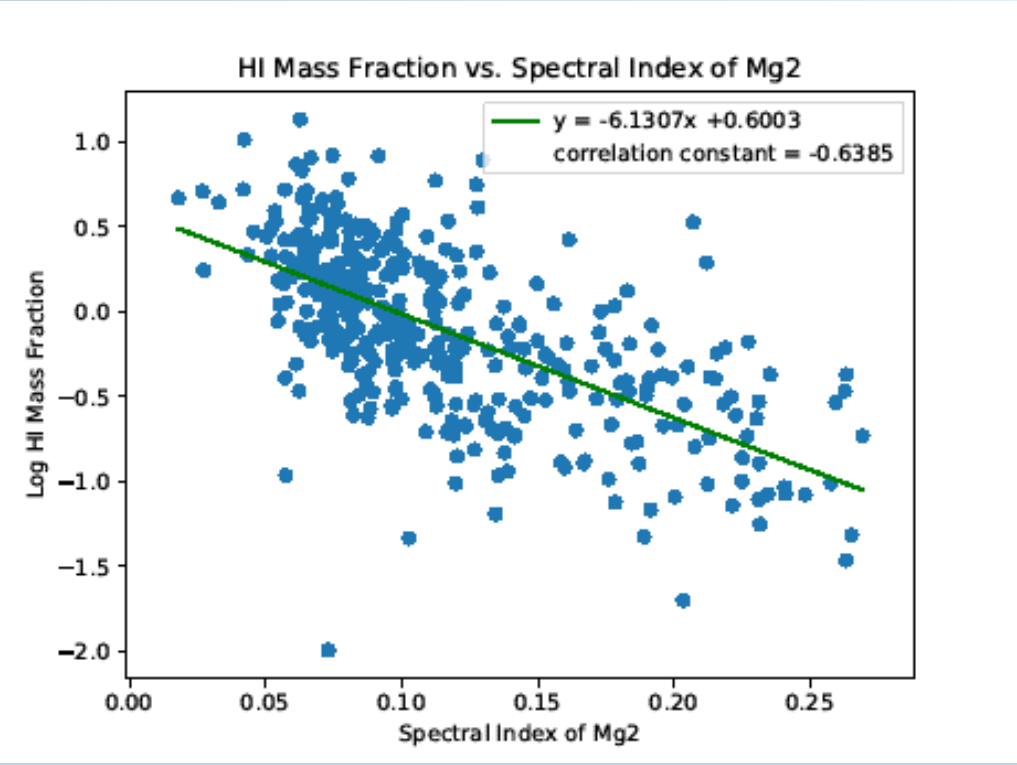
- Find Good Correlations
- Determine which ones are good and which ones are pure coincidences
- Determine which combination of variables provides the best correlation with HI-to-stellar mass ratio using Principle component analysis.

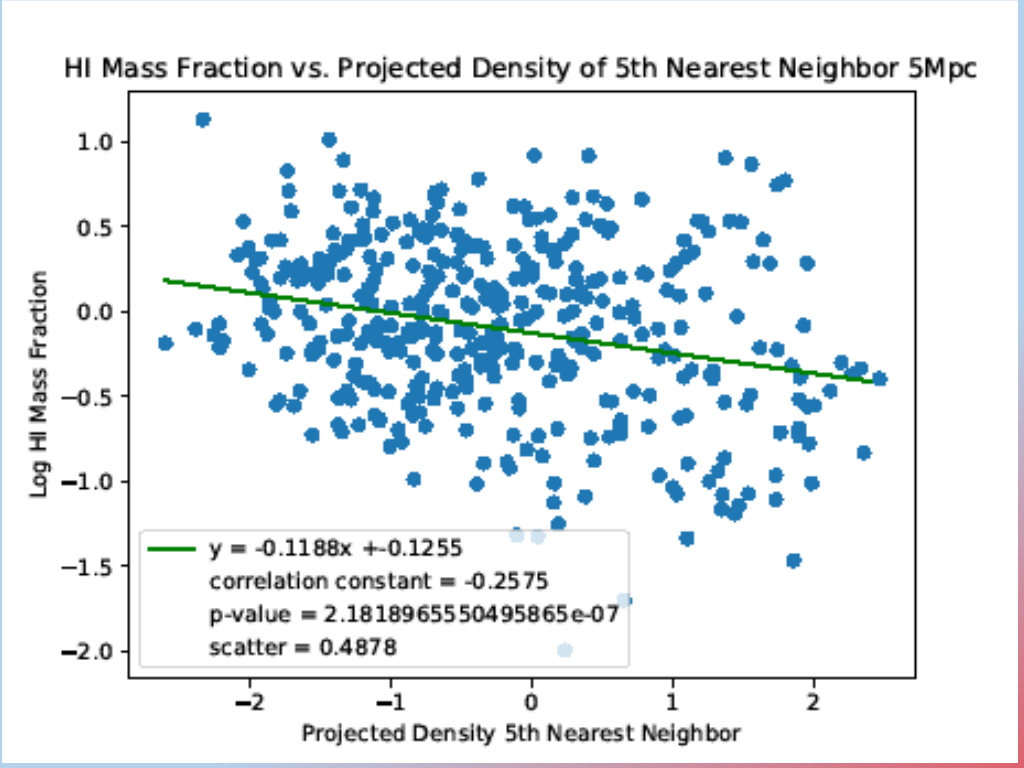
A Few Good Graphs





A Few (more) Good Graphs

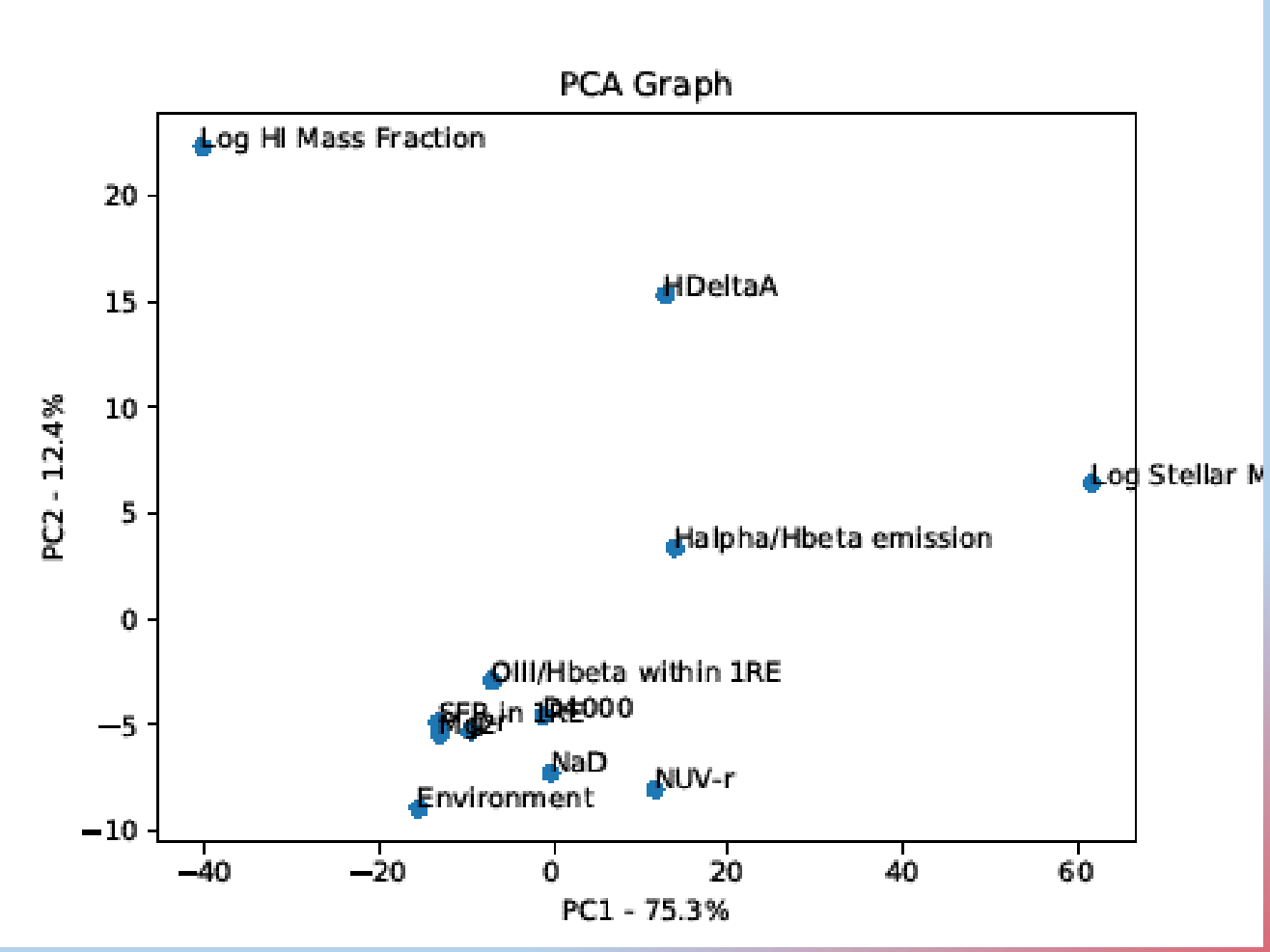




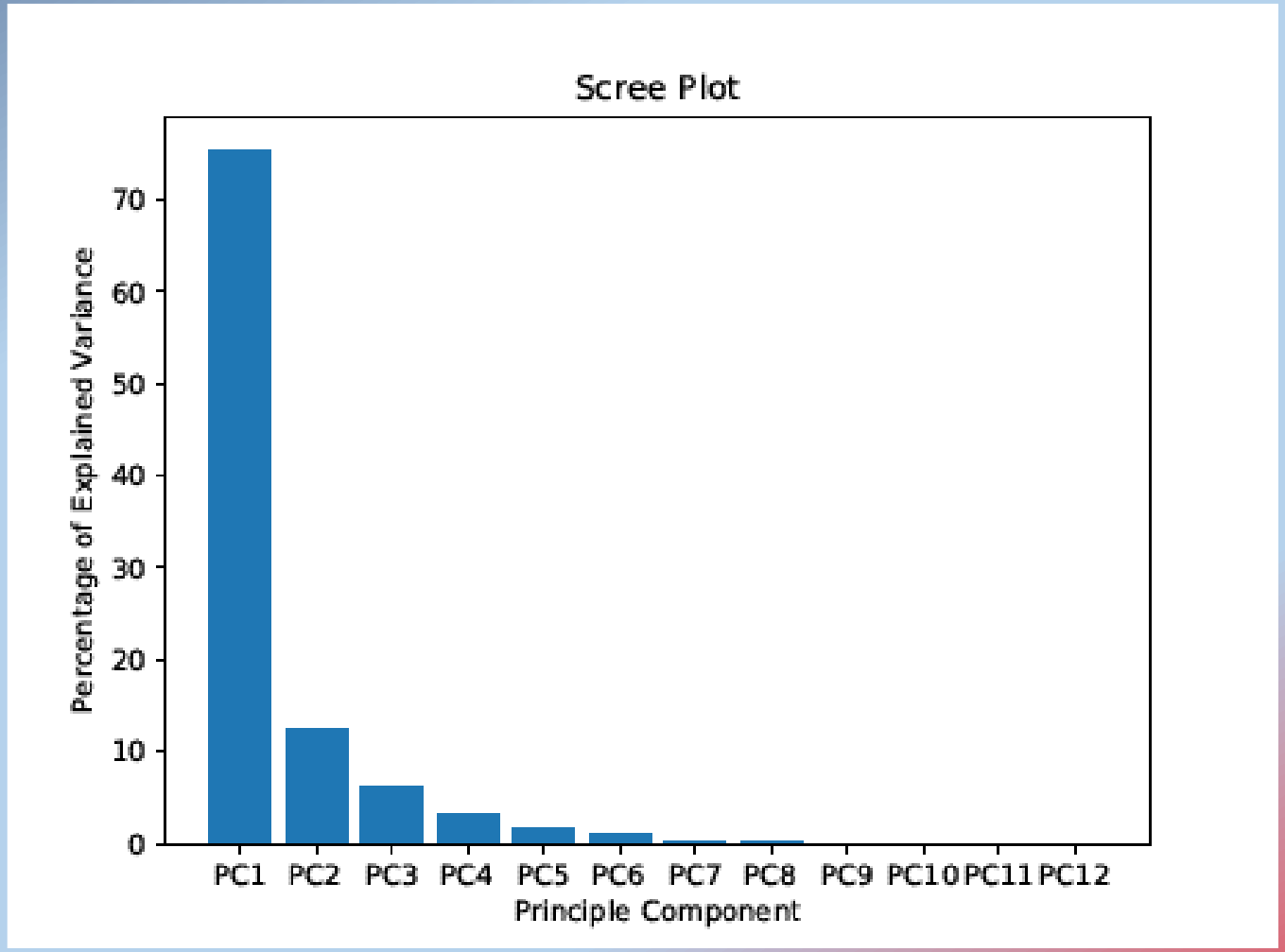
What is PCA

- Takes scatterplot
- Normalizes it around the origin
- Determines dimensions around the origin
- Sorts by how much each variable affects each other
- Groups them into scatterplot

PCA Results


PCA Graph
Log HI Mass Fraction
HDeltaA
Log Stellar M
Halpha/Hbeta emission
OIII/Hbeta within 1RE
NaD
NUV-r
Environment
PC2 - 12.4%
PC1 - 75.3%
20
15
10
5
0
−5
−10
−40
−20
0
20
40
60

PCA Results


Scree Plot
Percentage of Explained Variance
0
10
20
30
40
50
60
70
PC1
PC2
PC3
PC4
PC5
PC6
PC7
PC8
PC9
PC10
PC11
PC12
Principle Component

Summary

- HI in galaxies was determined by PCA to be affected by metallicity, stellar mass, NUV-r color, and g-r color.

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Questions?