DATA299 Final Project

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01 Introduction

What we're up to

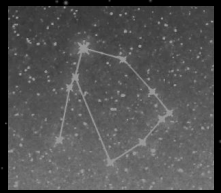
The Constellations

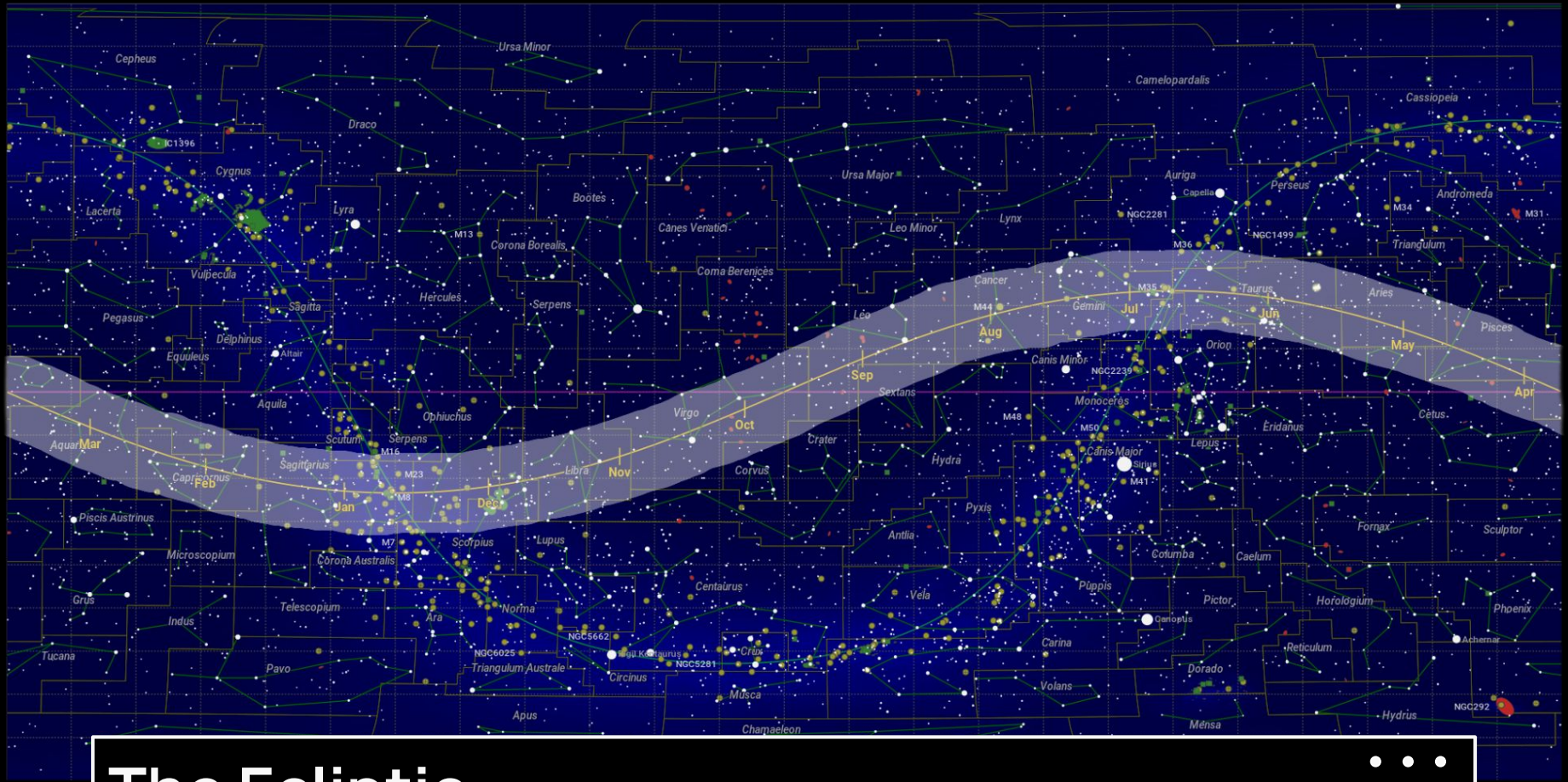
(Not all of them, just the Zodiacs)

The zodiac is the band of sky that extends about 8° on either side of the ecliptic, meaning that that's the part of the sky the sun, moon, and planets pass through.

There is one more constellation in that band than just the twelve commonly recognized zodiacs, but those twelve (Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricorn, Aquarius, and Pisces) are the ones that we're gonna focus on.

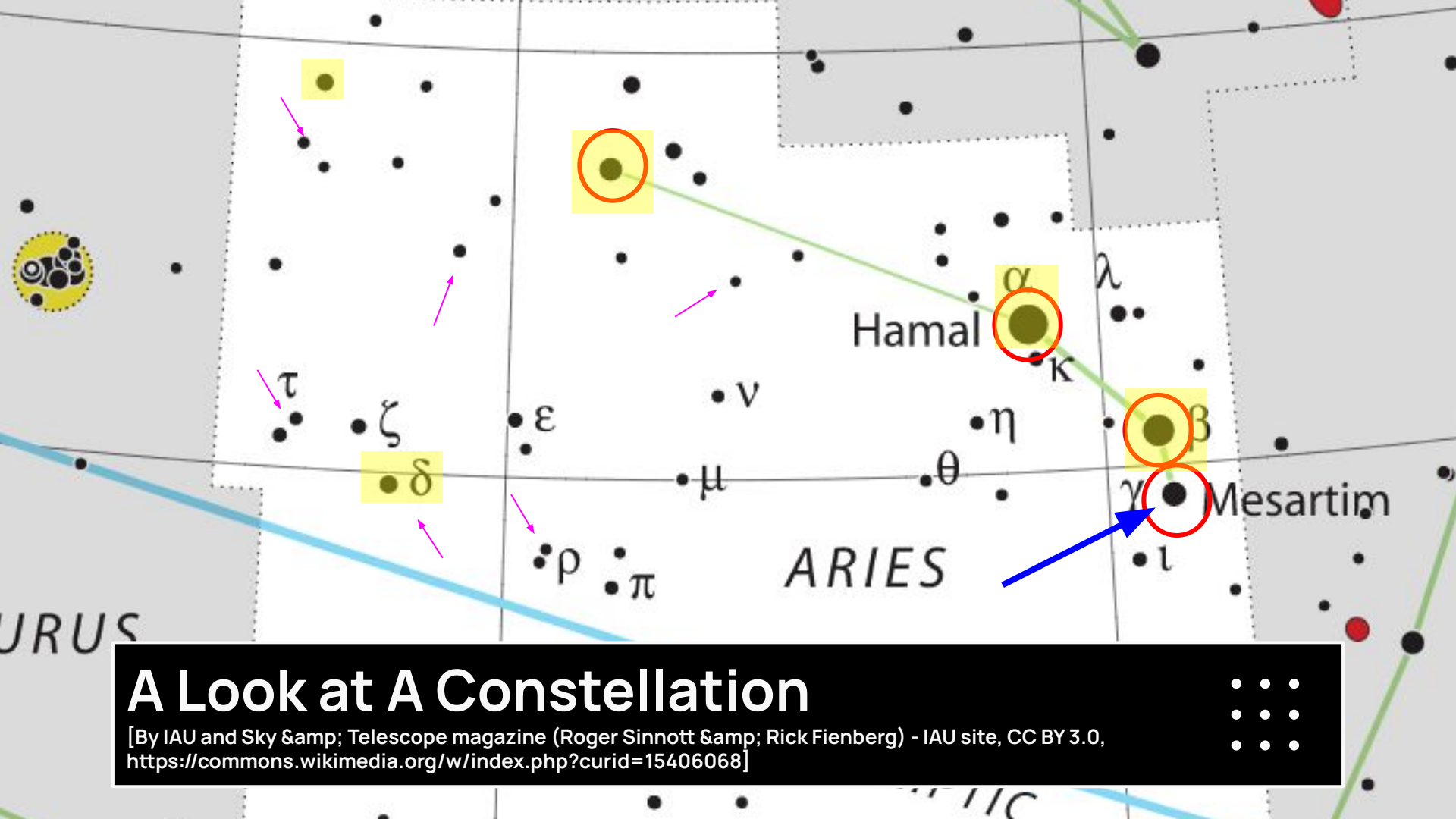
(Rip Ophiuchus)



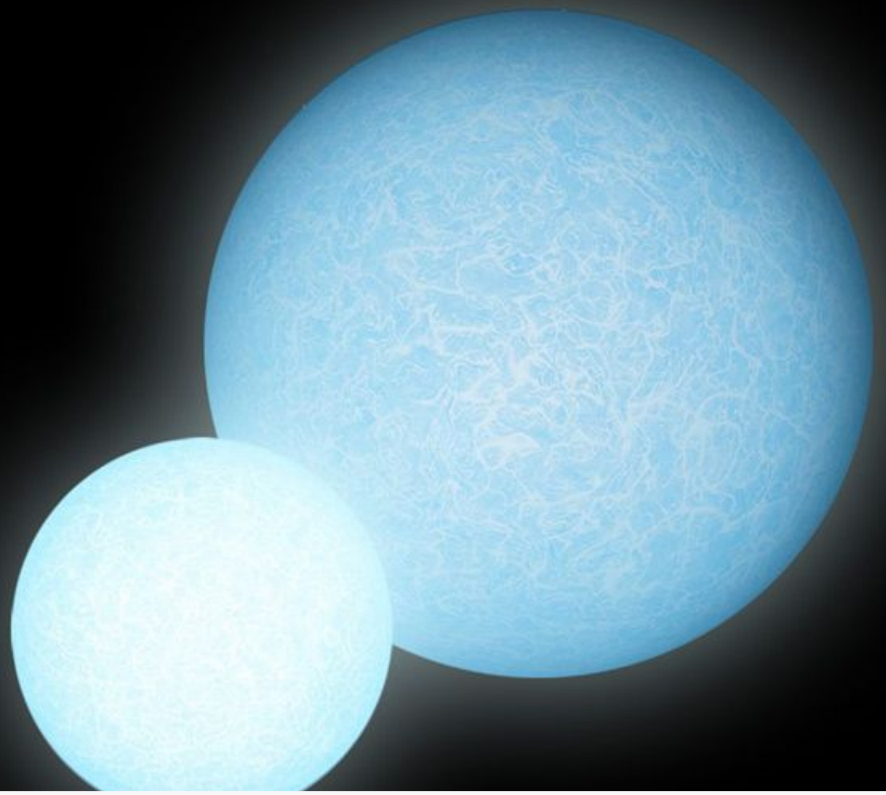


The Ecliptic

[By Dominic Ford, downloaded from https://in-the-sky.org]

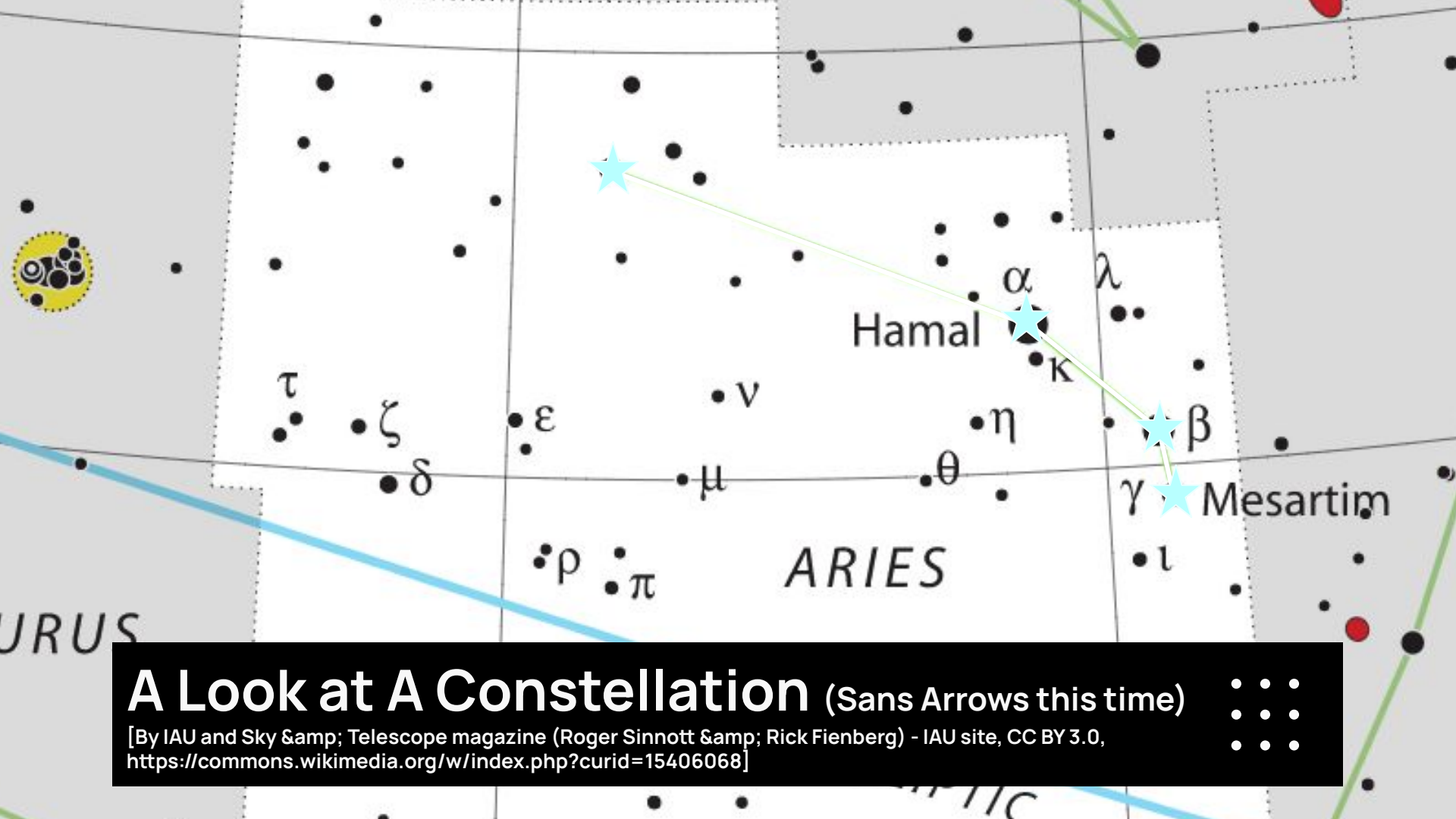


A Look at A Constellation



Gamma Arietis (Mesarthim)

[By Wayne McGraw, downloaded from https://gardenastronomer.com]



A Look at A Constellation (Sans Arrows this time)

02

Data

Where we're wrangling the numbers from

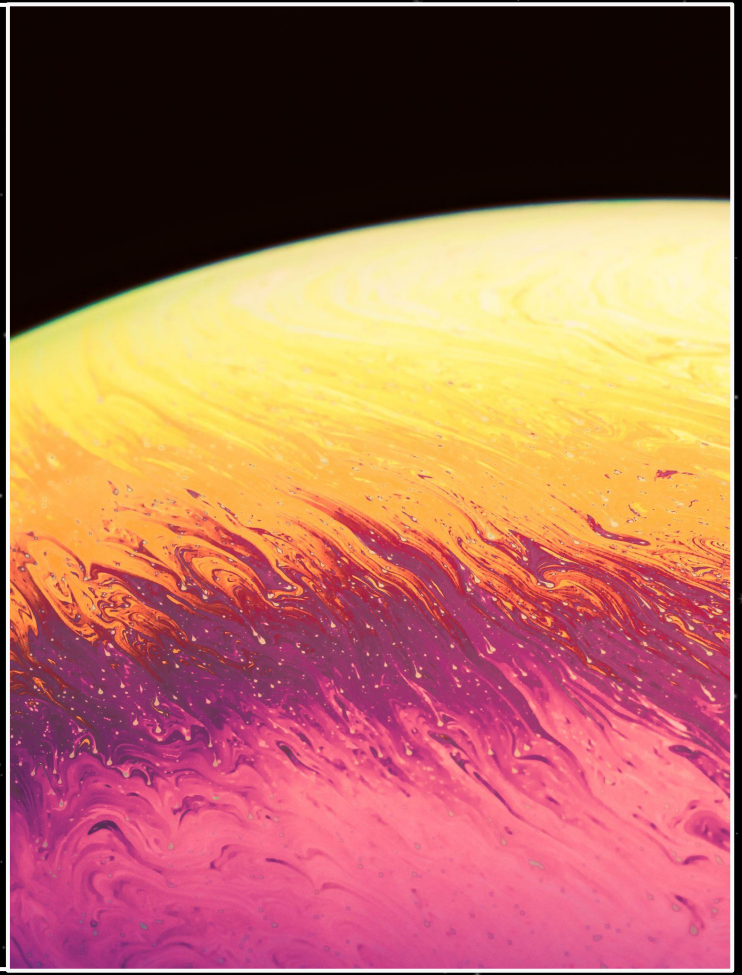
Two Sources

03 Questions and Code

What we wanted and
how we got it

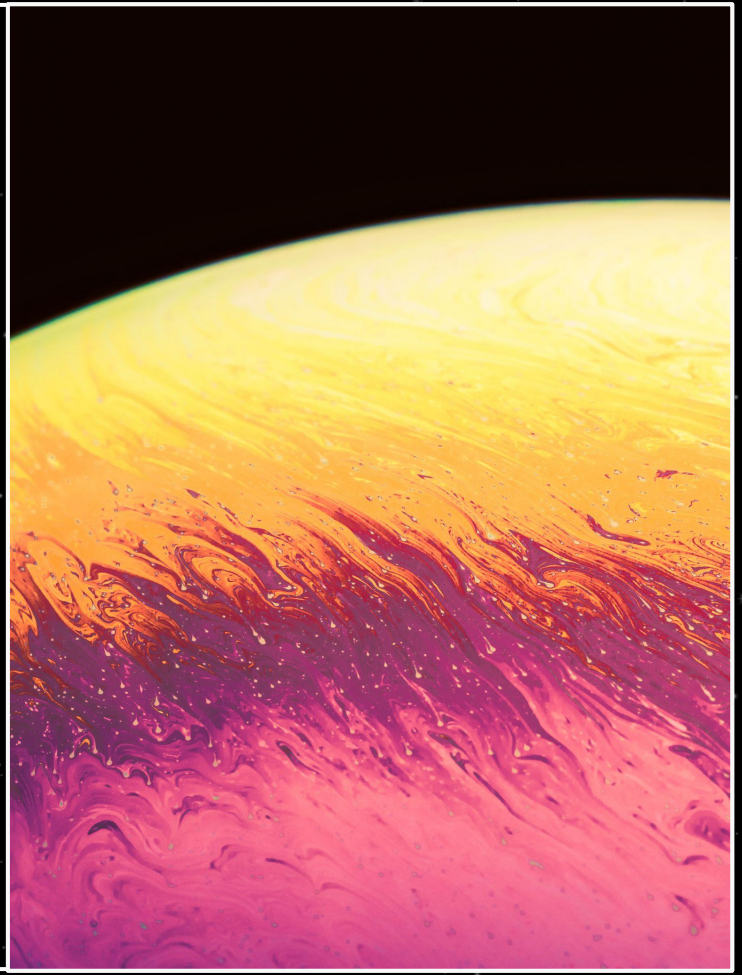
Questions

- We wanted to investigate aggregates about the top 5 ‘brightest’ (apparent magnitude) stars in the constellations



More Specifically

- “Best” in each zodiac constellation
  - Brightest
  - Farthest
- “Worst” in each zodiac constellation
  - Dullest
  - Closest



Coding Process

Web Scraping

We first had to web scrape the star names and lists off of Go Astronomy.

Pulling Star Information

Extracting the information form SIMBAD was done using a python extension module, 'Astroquery'

Utilizing Our Notes!

Distance, Absolute Mag, and Luminosity were all calculated using equations from our notes and previous projects in python!

Compiling The Data

Once we got all the metrics we needed we got to plotting our points

Coding Process

```
# All of our stars
star = ["Alpha Arietis", "Beta Arietis", "41 Arietis", "Delta Arietis", "HD
"Alpha Leonis", "Beta Leonis", "Gamma Leonis", "Delta Leonis", "Epsilon Leo
"Epsilon Sagittarii", "Sigma Sagittarii", "Zeta Sagittarii", "Delta Sagitta
"Alpha Tauri", "Beta Tauri", "Zeta Tauri", "Eta Tauri", "Theta2 Tauri",
"Alpha Virginis", "Gamma Virginis", "Epsilon Virginis", "Zeta Virginis", "D
"Delta Capricorni", "Beta Capricorni", "Alpha Capricorni", "Gamma Capricorn
"Beta Geminorum", "Alpha Geminorum", "Gamma Geminorum", "Mu Geminorum", "Ep
"Beta Librae", "Alpha Librae", "Sigma Librae", "Upsilon Librae", "Tau Libra
"Beta Aquarii", "Alpha Aquarii", "Delta Aquarii", "Zeta Aquarii", "88 Aquar
"Beta Cancri", "Delta Cancri", "Iota Cancri", "Alpha Cancri", "Gamma Cancri
"Alpha Scorpii", "Lambda Scorpii", "Theta Scorpii", "Delta Scorpii", "Epsil
"Gamma Piscium", "Omega Piscium", "Iota Piscium", "Omicron Piscium", "Epsil
]

# Corresponding Constellation of all of those stars
constellation = ["Aries", "Aries" ,"Aries" ,"Aries" , "Aries",
"Leo", "Leo", "Leo", "Leo", "Leo",
"Sagittarius", "Sagittarius", "Sagittarius", "Sagittarius", "Sagittarius",
"Taurus", "Taurus", "Taurus", "Taurus", "Taurus",
"Virgo", "Virgo", "Virgo", "Virgo", "Virgo",
```

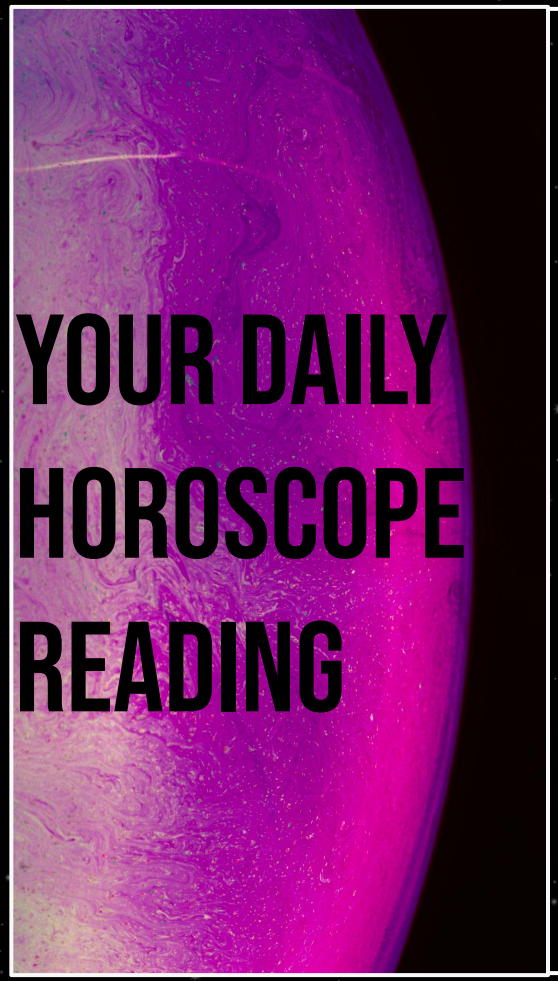
```
# Define the Simbad object we'll need
customSimbad = Simbad()

# The fields we want to retrieve: 'flux(V)' for magnitude and 'parallax' for distance
customSimbad.add_votable_fields('flux(V)', 'parallax')
```

```
# Initialize an empty list for the results
results = []

# Query the stars
for _, row in df.iterrows():
    # Query by star name only
    result = customSimbad.query_object(row['star'])

    # Convert the result to a DataFrame and append it to the results list
    df_result = result.to_pandas().iloc[0]  # Only take the first row
    df_result['star'] = row['star']  # Add star back to the result
    results.append(df_result)
```



04 Findings

What your sign says
about you

Aries

If you're an Aries, you've got an average **Luminosity** of 117.266 and an average **Distance** of 61.473 pc.

By Star

Alpha Arietis *(El Nath)*

Brightness: 0.48
Luminosity: 54.66
Distance: 20.18 pc

Beta Arietis

Brightness: 1.37
Luminosity: 24.09
Distance: 17.98 pc

41 Arietis

Brightness: 0.06
Luminosity: 80.52
Distance: 50.78 pc

Delta Arietis

Brightness: 0.78
Luminosity: 41.35
Distance: 52.03 pc

HD 20644

Brightness: -1.63
Luminosity: 385.70
Distance: 166.39 pc

Taurus

If you're a Taurus, you've got an average **Luminosity** of **492.123** and an average **Distance** of **73.473 pc**.

By Star

Alpha Tauri *(Aldebaran)*

Brightness: -0.69
Luminosity: 161.68
Distance: 20.43 pc

Beta Tauri

Brightness: -1.41
Luminosity: 315.24
Distance: 41.05 pc

Zeta Tauri

Brightness: -2.64
Luminosity: 976.76
Distance: 136.43 pc

Eta Tauri

Brightness: -2.59
Luminosity: 929.18
Distance: 123.61 pc

Theta2 Tauri

Brightness: 0.10
Luminosity: 77.73
Distance: 45.85 pc

Gemini

If you're a Gemini, you've got an average **Luminosity** of **983,190** and an average **Distance** of **79,633 pc**.

By Star

Beta Geminorum *(Castor)*

Brightness: 1.06
Luminosity: 32.10
Distance: 10.36 pc

Alpha Geminorum *(Pollux)*

Brightness: 0.61
Luminosity: 48.53
Distance: 15.59 pc

Gamma Geminorum

Brightness: -0.70
Luminosity: 163.83
Distance: 35.51 pc

Mu Geminorum

Brightness: Unknown
Luminosity: Unknown
Distance: Unknown

Epsilon Geminorum

Brightness: -4.09
Luminosity: 3688.29
Distance: 259.07 pc

Cancer

If you're a Cancer, you've got an average **Luminosity** of **130,240** and an average **Distance** of **69,882 pc**.

By Star

Beta Cancri *(Tarf)*

Brightness: -1.32
Luminosity: 289.19
Distance: 93.02 pc

Alpha Cancri

Brightness: 0.56
Luminosity: 50.82
Distance: 54.55 pc

Delta Cancri

Brightness: 0.92
Luminosity: 36.38
Distance: 40.03 pc

Gamma Cancri

Brightness: 0.93
Luminosity: 36.36
Distance: 55.55 pc

Iota Cancri

Brightness: -1.11
Luminosity: 238.45
Distance: 106.24 pc

Leo

If you're a Leo, you've got an average **Luminosity** of **129.649** and an average **Distance** of **33.751 pc**.

By Star

Alpha Leonis (Regulus)

Brightness: -0.52
Luminosity: 139.21
Distance: 24.31 pc

Beta Leonis (Denebola)

Brightness: 1.92
Luminosity: 14.54
Distance: 10.99 pc

Gamma Leonis

Brightness: -0.63
Luminosity: 153.35
Distance: 39.88 pc

Delta Leonis

Brightness: 1.26
Luminosity: 26.70
Distance: 17.91 pc

Epsilon Leonis

Brightness: -1.41
Luminosity: 314.43
Distance: 75.65 pc

Virgo

If you're a Virgo, you've got an average **Luminosity** of **459,210** and an average **Distance** of **41,175 pc**.

By Star

Alpha Virginis (Spica)

Brightness: -3.45
Luminosity: 2051.69
Distance: 76.56 pc

Gamma Virginis

Brightness: 2.34
Luminosity: 9.90
Distance: 12.02 pc

Epsilon Virginis

Brightness: 0.16
Luminosity: 73.73
Distance: 33.60 pc

Zeta Virginis

Brightness: 1.58
Luminosity: 19.86
Distance: 22.86 pc

Delta Virginis

Brightness: -0.54
Luminosity: 8.88
Distance: 60.83 pc

Libra

If you're a Libra, you've got an average **Luminosity** of 231,264 and an average **Distance** of 69,897 pc.

By Star

Beta Librae

Brightness: -1.14
Luminosity: 246.60
Distance: 56.75 pc

Alpha Librae

Brightness: 0.91
Luminosity: 36.69
Distance: 23.24 pc

Sigma Librae

Brightness: -1.52
Luminosity: 347.59
Distance: 88.41 pc

Upsilon Librae

Brightness: -0.59
Luminosity: 377.91
Distance: 68.59 pc

Tau Librae

Brightness: -1.61
Luminosity: 377.91
Distance: 112.48 pc

Scorpio

If you're a Scorpio, you've got an average **Luminosity** of **4030.503** and an average **Distance** of **121.425 pc**.

By Star

Alpha Scorpii *(Antares)*

Brightness: -5.24
Luminosity: 10660.29
Distance: 169.77 pc

Lambda Scorpii

Brightness: -4.58
Luminosity: 5844.24
Distance: 175.13 pc

Theta Scorpii

Brightness: -2.97
Luminosity: 1319.30
Distance: 92.08 pc

Delta Scorpii

Brightness: -3.56
Luminosity: 39.59
Distance: 150.62 pc

Epsilon Scorpii

Brightness: 0.83
Luminosity: 39.59
Distance: 19.53 pc

Sagittarius

If you're a Sagittarius, you've got an average **Luminosity** of 371.991 and an average **Distance** of 54.277 **pc**.

By Star

Epsilon Sagittarii *(Thalith al Warida)*

Brightness: -1.40
Luminosity: 311.43
Distance: 43.94 pc

Sigma Sagittarii

Brightness: -2.15
Luminosity: 621.23
Distance: 69.83 pc

Zeta Sagittarii

Brightness: 0.42
Luminosity: 57.55
Distance: 27.04 pc

Delta Sagittarii

Brightness: -2.47
Luminosity: 832.52
Distance: 106.61 pc

Lambda Sagittarii

Brightness: 0.91
Luminosity: 36.92
Distance: 23.96 pc

Capricorn

If you're a Capricorn, you've got an average **Luminosity** of 122.735 and an average **Distance** of 52.665 pc.

By Star

Delta Capricorni *(Deneb)*

Brightness: 2.45
Luminosity: 8.88
Distance: 11.87 pc

Beta Capricorni

Brightness: Unknown
Luminosity: Unknown
Distance: Unknown

Alpha Capricorni

Brightness: 1.02
Luminosity: 33.29
Distance: 32.45 pc

Gamma Capricorni

Brightness: 0.25
Luminosity: 67.47
Distance: 48.15 pc

Zeta Capricorni

Brightness: -1.62
Luminosity: 381.30
Distance: 118.20 pc

Aquarius

If you're an Aquarius, you've got an average **Luminosity** of **675,424** and an average **Distance** of **95,110 pc**.

By Star

Beta Aquarii *(Sadalsuud)*

Brightness: -3.19
Luminosity: 1620.40
Distance: 164.74 pc

Alpha Aquarii *(Sadalmelik)*

Brightness: -3.08
Luminosity: 1469.01
Distance: 160.51 pc

Delta Aquarii

Brightness: 0.10
Luminosity: 77.82
Distance: 42.20 pc

Zeta Aquarii

Brightness: 1.40
Luminosity: 23.52
Distance: 28.16 pc

88 Aquarii

Brightness: -0.84
Luminosity: 186.38
Distance: 78.92 pc

Pisces

If you're a Pisces, you've got an average **Luminosity** of **53,380** and an average **Distance** of **44,711 pc**.

By Star

Gamma Piscium
(Pī Lì) (Thunderbolt)

Brightness: 0.57
Luminosity: 50.66
Distance: 42.30 pc

Omega Piscium

Information Disputed (different missions and spectral analysis)

Iota Piscium

Brightness: 3.43
Luminosity: 3.61
Distance: 13.71 pc

Omicron Piscium

Brightness: -0.25
Luminosity: 107.68
Distance: 79.81 pc

Epsilon Piscium

Brightness: 0.54
Luminosity: 51.56
Distance: 55.74 pc

Awards!

Farthest Constellation

Scorpio at 121.435 parsecs away!

Most Luminous Constellation

Also Scorpio at 4030.503!

Awards!

Closest Constellation

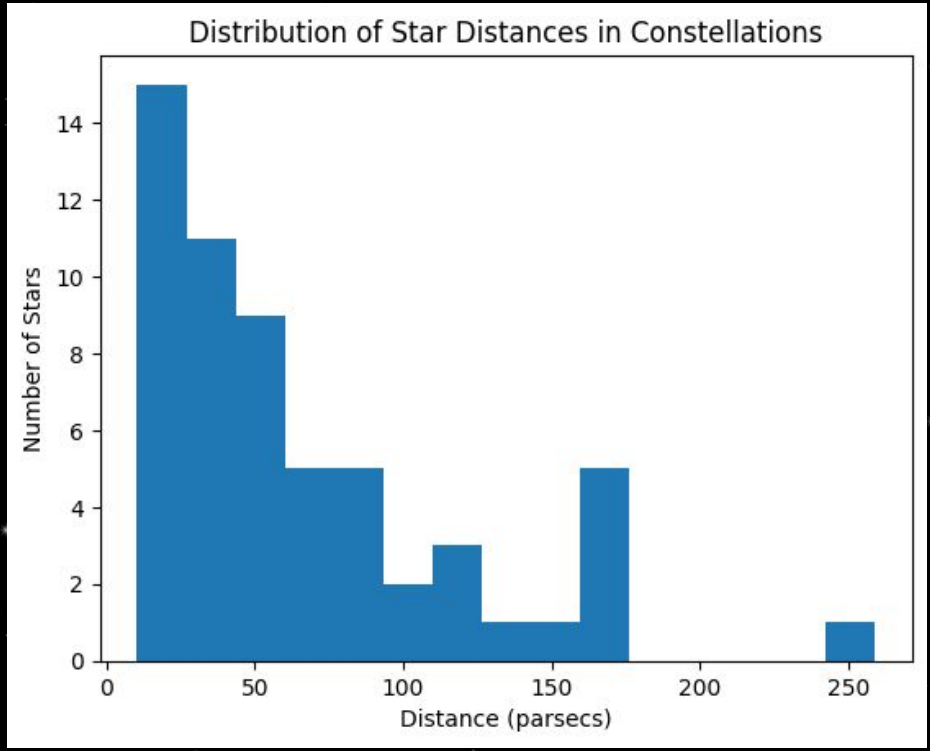
Leo at 33.751 parsecs away!

Least Luminous Constellation

Pisces at 53.381!

Weird Observation

There appears to be an almost bimodal distribution in stars that are in the constellation!



Thanks!

Any questions?