



Extra Tidal Region of Globular Cluster NGC 5466

Presented by:
Deepanshi Singh

What are Globular clusters? and why study Extra-Tidal region?

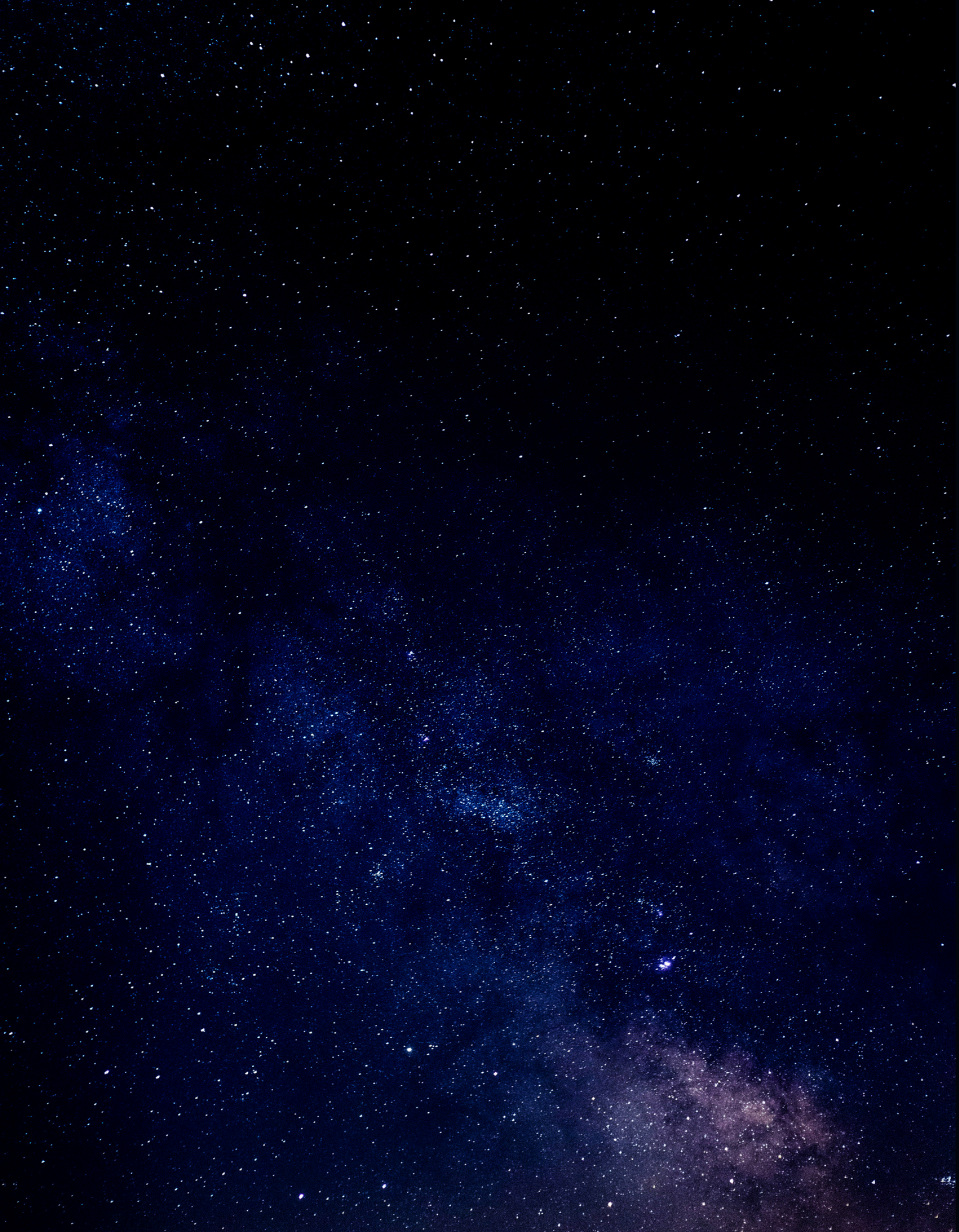


Introduction



Globular clusters, defined by their spherical configuration and gravitational binding, are conglomerates of stars that orbit the galactic center.

The exploration of the Extra-Tidal Region, an integral component of these clusters, imparts significant knowledge about their dynamical evolution. This study also sheds light on the impact of galactic tidal forces on their stellar constituents, thereby offering a rough sketch of galactic evolution. Moreover, these ancient globular clusters serve as cosmic timekeepers, setting a minimum age for the Universe. This information is pivotal in enhancing our comprehension of the cosmos and the complex forces that govern its formation and evolution.

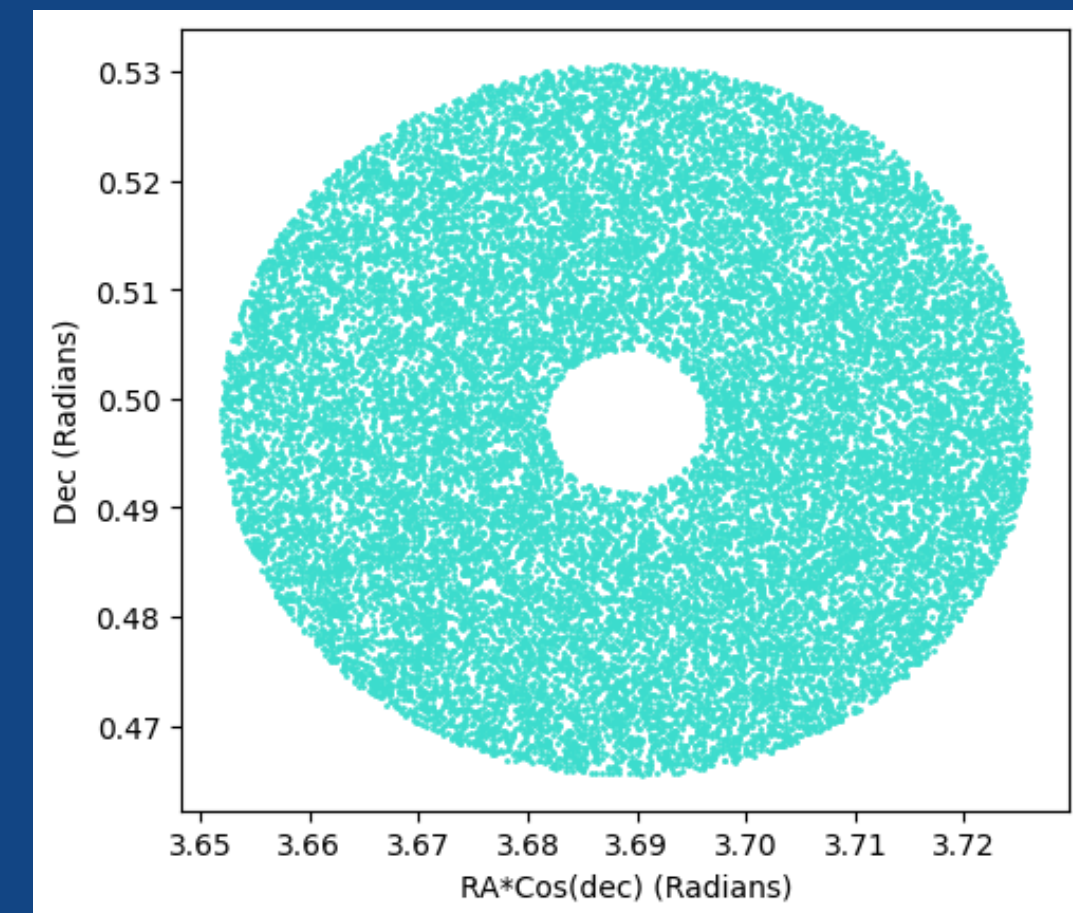
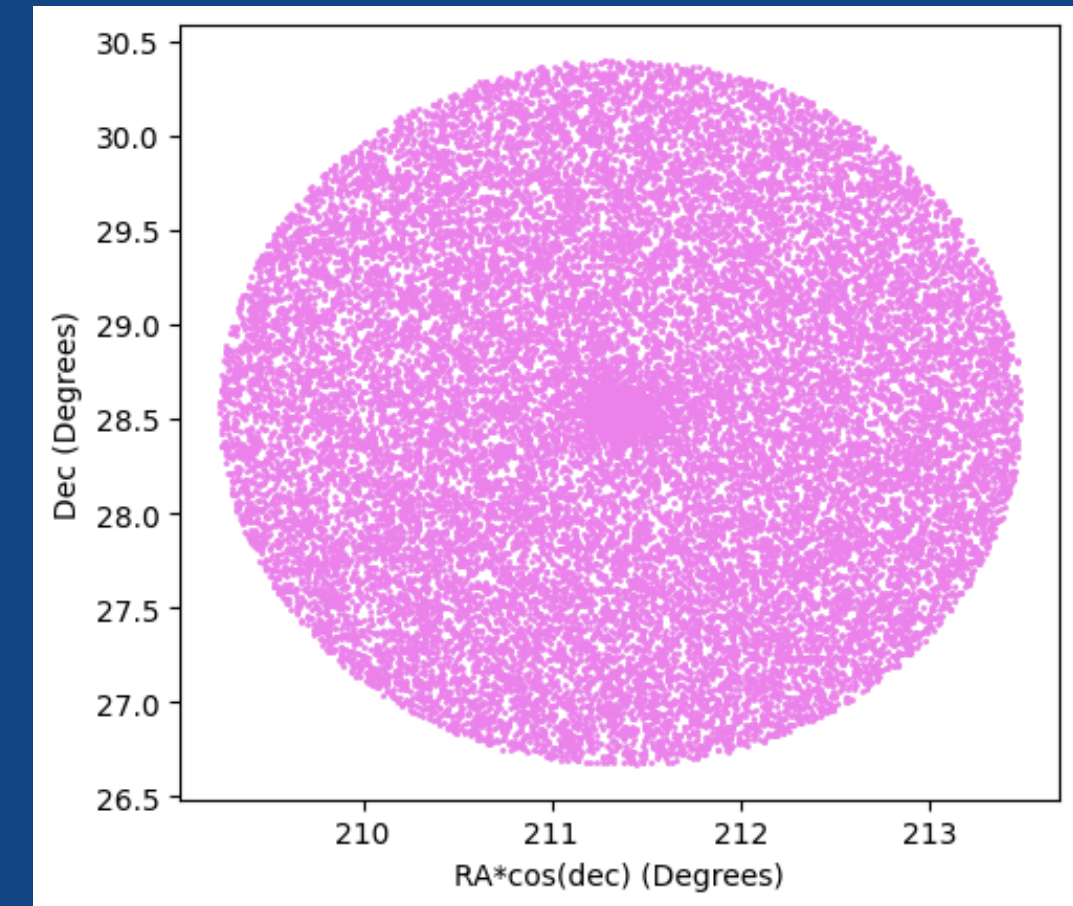


Objection:

To study the extra tidal region of the globular cluster known as NGC 5466 and identify its potentially run-away stars using data from the Gaia data release 3.

Data from the Gaia space mission:

- We have taken the cluster star data from GAIA DR3 and performed the first stage filtering by using the conditions given in the paper (Kundu, 2022).
- isochrone and horizontal branch data of the cluster CMD is taken from CDM 3.7 and ZAHB database respectively.



Methodology:

- Download the data from Gaia DR3.
- Separate the Intra-tidal and Extra-tidal stars.
- Selection of stars from the extra-tidal region using membership probability.
- Plotting Color Magnitude Diagram (CMD) for selected stars.
- Select the stars using the CMD by fitting the isochrone.
- Plot the filtered point's density plot.

Proper Motion

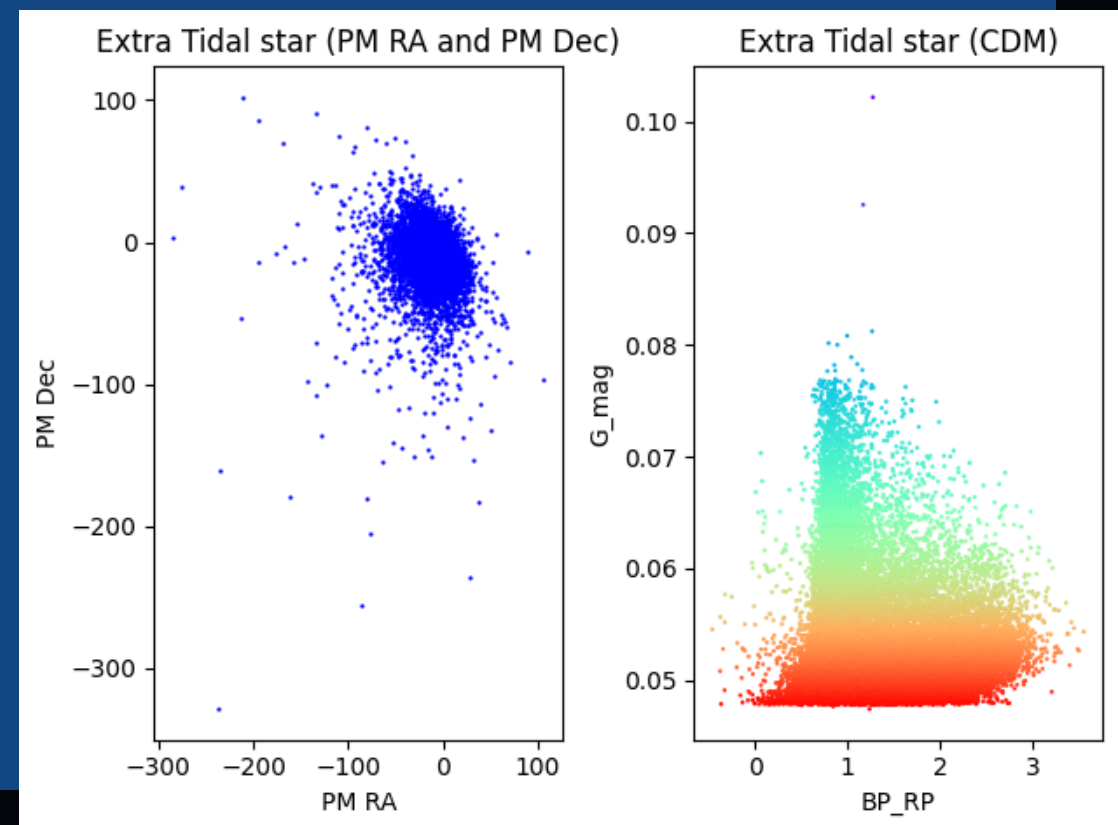
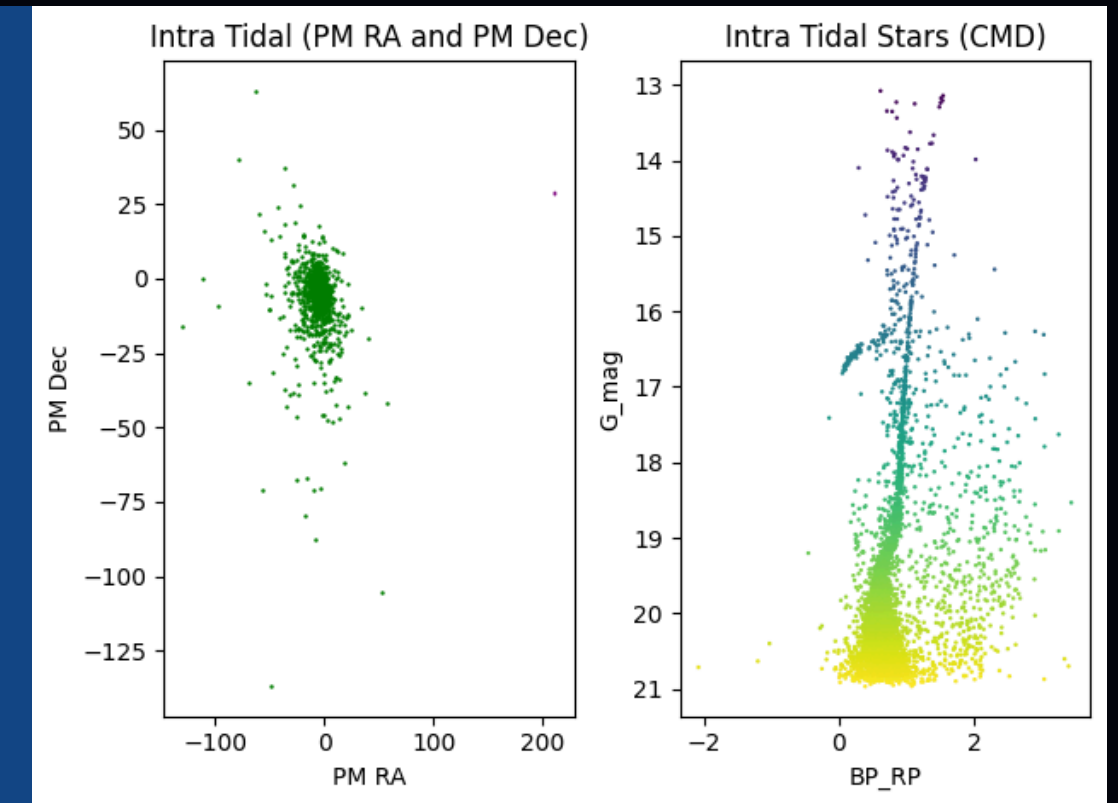
Proper motion refers to the angular velocity across the sky exhibited by a celestial body compared to the abstract background of the more distant stars.

We applied membership probability to filter out the stars whose proper motion is matching with the cluster in the vicinity of 0.5 probability.

Color Magnitude Diagram (CMD)

A Color-Magnitude Diagram (CMD) is a scatter plot that shows the relationship between the absolute magnitudes (brightness) of stars and their colors, which are closely related to their temperatures and spectral types.

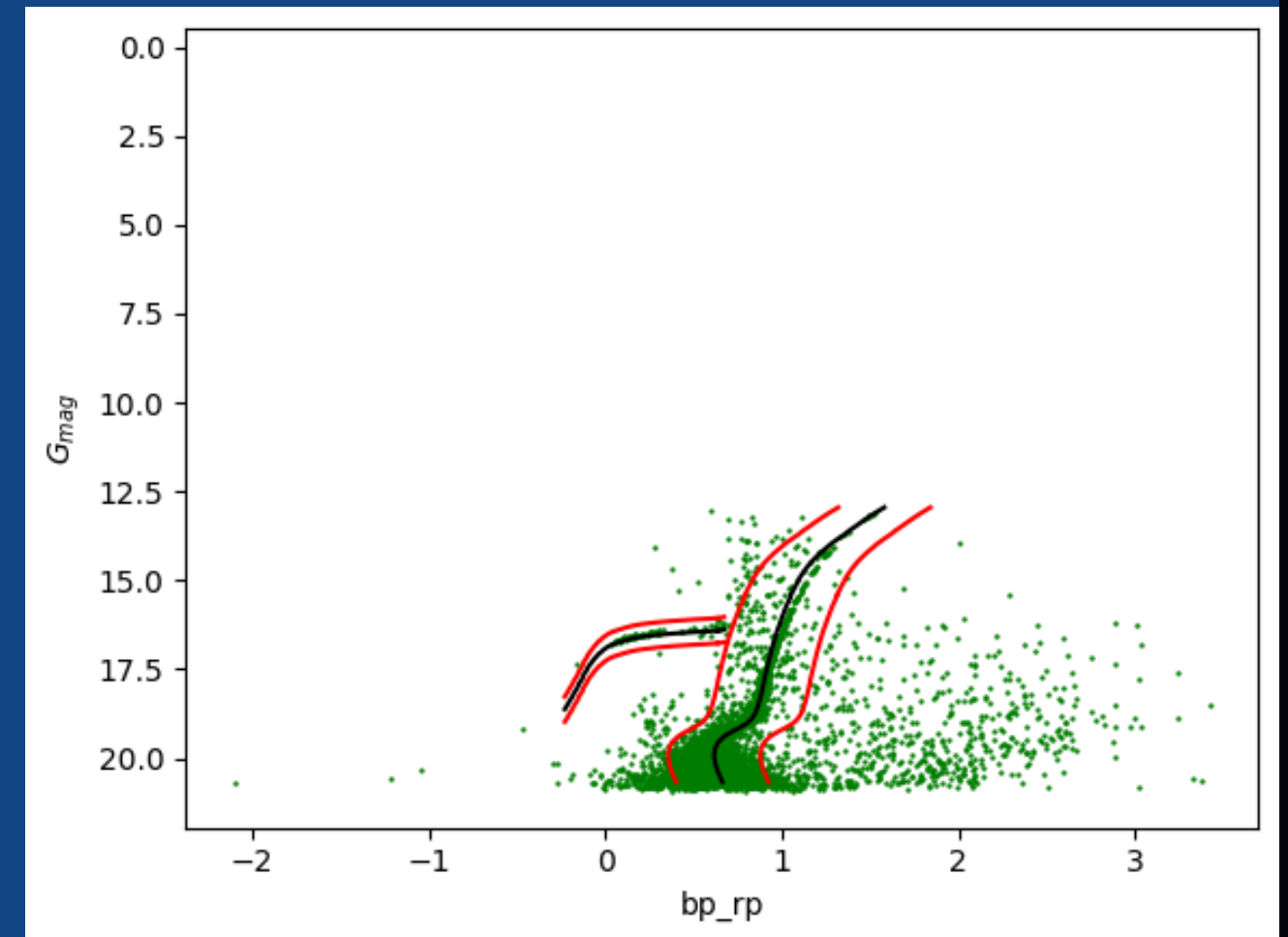
The CMD is often used in astronomy to study the properties of star clusters and galaxies. The CMD is a powerful tool for understanding stellar evolution and the structure of the Milky Way Features such as the main sequence, giant branch, subgiant branch, and white dwarf cooling sequence can be identified and analyzed in the CMD.



Isochrone Fitting:

An isochrone is a curve that shows the relationship between the color and brightness of stars that are the same age but have different masses.

- Downloaded the data (from CMD 3.7 and ZAHB) that fit the intra-tidal stars CMD curve perfectly.
- Then plotted the selected extra-tidal stars on top of it and selected the stars which are in the range of the 1 sigma of the isochrone data points and eliminated the remaining stars which are randomly distributed on the plot.



Result:

- Optimal isochrone fit for NGC 5466 at $[\text{Fe}/\text{H}] = -1.8$ dex and an age 14 Gyr, indicating it as a metal-poor star cluster.
- Identification of extra-tidal star candidates in NGC 5466. We got 879 stars out of $\sim 25,600$ stars after filtering out the stars using membership probability.

Further Work:

- We can now filter out the stars within 1 Sigma of the isochrone curve and then plot the density graph for the same
- Look for the forces acted on it in the past.

FEEL FREE TO ASK ANY QUERIES

THANK YOU

VERY MUCH