CS 455 Project Proposal

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1 Problem Statement

Our project idea incorporates Jacob's research with Dr. Gillam, studying rapidly oscillating Ap (roAp) stars. Their mission is to find more roAps by imaging clusters while also collecting data for current field roAps. This project will take the data from Jacob's research and gaia archives and plot a Hertzsprung-Russel diagram (HRD) of the cluster they are observing, NGC 2264, and known field roAps. Normalizing the two, finding roAp candidates in the cluster by fitting a regression. This will also be able to incorporate other clusters to find more roAp candidates in the future. This will help identify candidate roAp stars more accurately using Machine Learning (ML)to identify the similarities rather than the human eye.

2 Approach

Our project will take the data, field roAps and cluster stars from gaia archive, and fit different regression models to it. The libraries we will be using for the regression models are scikit-learn, numpy, and pandas and matplotlib for plotting the data. This will most likely be a linear regression model, due to the steep slope of the curve on the HRD. But for the project we will fit multiple regression models (i.e. lasso, ridge, polynomial, etc.). We will

classify the roAp candidates by using the K-Nearest Neighbors (KNN) algorithm, which is a form of supervised ML. The KNN algorithm chooses the cluster stars closest to the field roAps. An example of a HRD from Jacob's research is given:

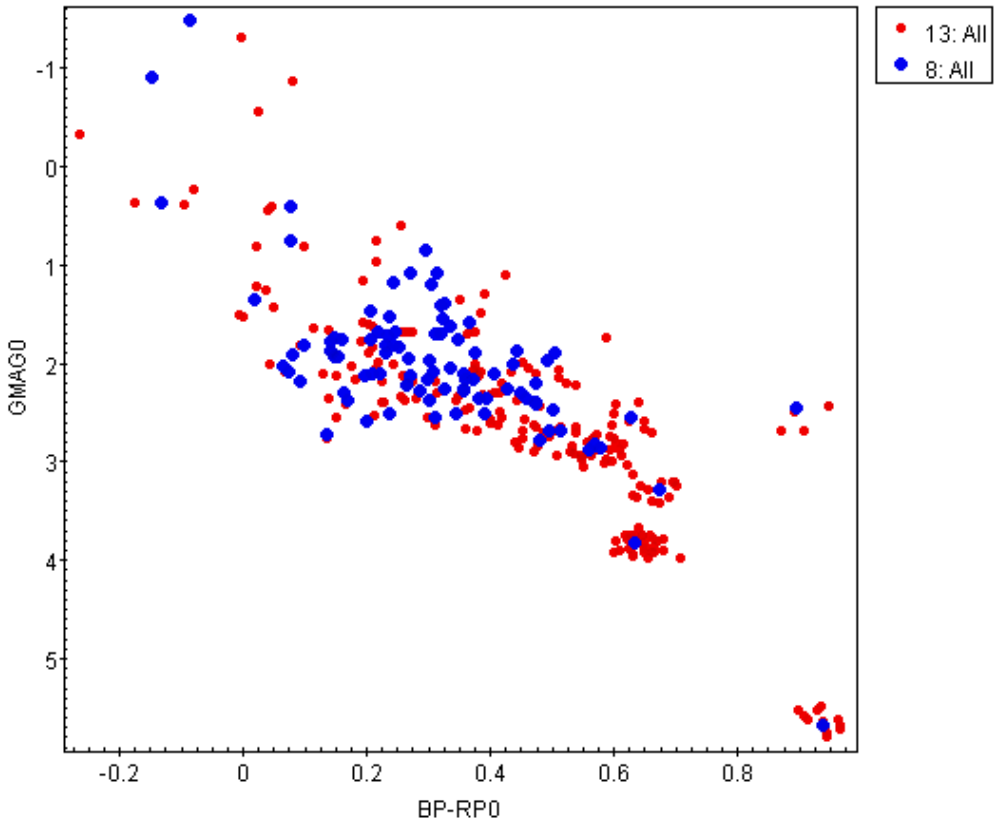

Figure 1: The Red are the roAp candidates and Blue are the field roAps

3 Team Structure

The team members for this project are Jacob Romeo, David Serfaty, and Aliyah Trussell. Jacob is an Astronomy and Astrophysics major, hence the astronomy project, with experience in python and AI. David is a Computer Science major with background in C with experience in game design and simulations. Aliyah is also a Computer Science major and has an extensive background in C,C++, and python, designing a multitude of programs. Since it is Jacob's research, he will be team lead handling the structure and organizing while

Aliyah will be handling more of the compiling side and training the algorithm. David will focus on both documentation and coding/training the algorithm.

4 References

There were no external resources used in the write-up of this proposal besides our knowledge. The image is from Jacob's research which he made in the software TopCat, which is a java extension used in astronomy.