

Semester 2 2024
Astroinformatics II
Graded Practice 2

- Content: Application of what has been learned in class.
- Finished code, plots (if applicable to the tasks) and a short report in English summarizing your work is to be submitted within one week to this e-mail address: `nina.hernitschek@uantof.cl`
- Using information from the internet is allowed. Cite everything properly.
- Working together/ sharing solutions among students is not allowed.

1 Tasks

All code is to be written in C/C++.

You can search the internet and reuse code (because it is realistic to do so). Always test, properly cite and document reused code.

Submit your solution via e-mail: code files, plots, and everything put together into a text document (LaTeX) where you also describe what you did and possible problems (and solutions) you discovered.

1.1 Task 1: Distance to globular cluster stars

So far, we have looked at globular clusters in general. We are now taking a look at the stars in globular clusters.

There is a **Catalogue of Variable Stars in Galactic Globular Clusters** available: <https://www.astro.utoronto.ca/~cclement/read.html>

Clicking on the link "The individual cluster files" you can select the globular cluster. We are here working with NGC 1851. Download the file and save it as `C0512m400.dat`.

We can generally calculate the distance to each star in NGC 1852 from its apparent and absolute magnitude. Variable stars, in particular periodic variable stars like RR Lyrae (RRL) have the benefit of following a period-luminosity relation that gives us the absolute magnitude based on their period. We will thus only focus on the RRL stars in the file `C0512m400.dat`.

Look up which equations you will use for this. Include them in your solution file.

Look up which columns from the file for NGC 1851 are useful for this. Is there any information missing? If yes, try to find it online.

1.2 Task 2: Reading in the file

Write a program in C++ that reads in `C0512m400.dat`. You can either read it in completely or only the columns you will be using for calculating the distance to the individual stars.

Hint: If you have problems reading in the file with C++, you can edit it in a text editor, i.e. removing the rows and columns not needed.

1.3 Task 3: Calculating the distance to globular cluster stars with C++

Extend the program you have written in Task 2 so that the distance to each RRL star is calculated. Chose a distance unit that makes sense. Output a list of distances, that looks like the following:

```
ID distance
1 3.2
3 4.1
4 1.8
```

(The above are only example distance values and not the real values.)