AS35 Lab Book

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Introduction

A colour-magnitude diagram, in astronomy, is a graph showing the relation between the absolute magnitudes (brightnesses) of stars and their colours, which are closely related to their temperatures and spectral types. It is similar to the Hertzsprung-Russell diagram except that the latter plots spectral types instead of colours.

Both a cluster's age and its distance can be derived from such a diagram.

Data

Data was collected from the Philip Wetton Telescope (PWT) in Oxford to study the colour-magnitude diagram (CMD) and density of open stellar clusters

Calibrating the Images

Bias Frames

The bias frames are almost uniform black images. Shown below is the first bias frame (using the z scale) across a range of pixels. We observe that there is a slight gradient along the x-axis.
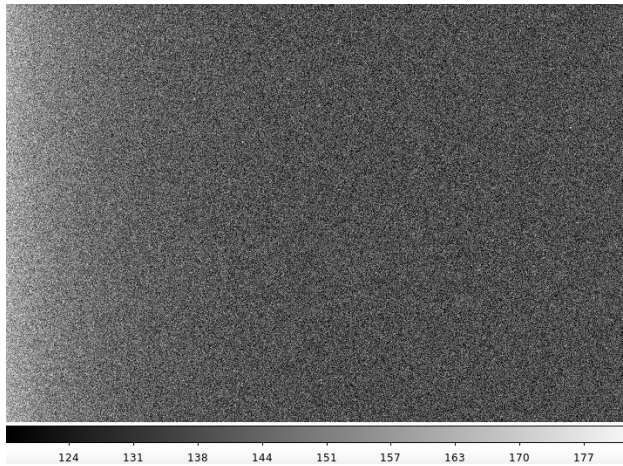

We increase the number of files used (from 1 to all 10) to calculate the mean bias value and standard deviation.

Number.of.Bias.Files	Mean.Bias.Value	Standard.Deviation
1	138.3076	8.679114
2	136.9180	6.153685
3	136.3991	5.041416
4	136.6386	4.370012

Number.of.Bias.Files	Mean.Bias.Value	Standard.Deviation
5	136.6633	3.913194
6	136.8138	3.807744
7	136.6021	3.511632
8	136.8225	3.267752
9	136.9190	3.067260
10	137.0548	2.899682

Mean Bias Value as Number of Files Increase
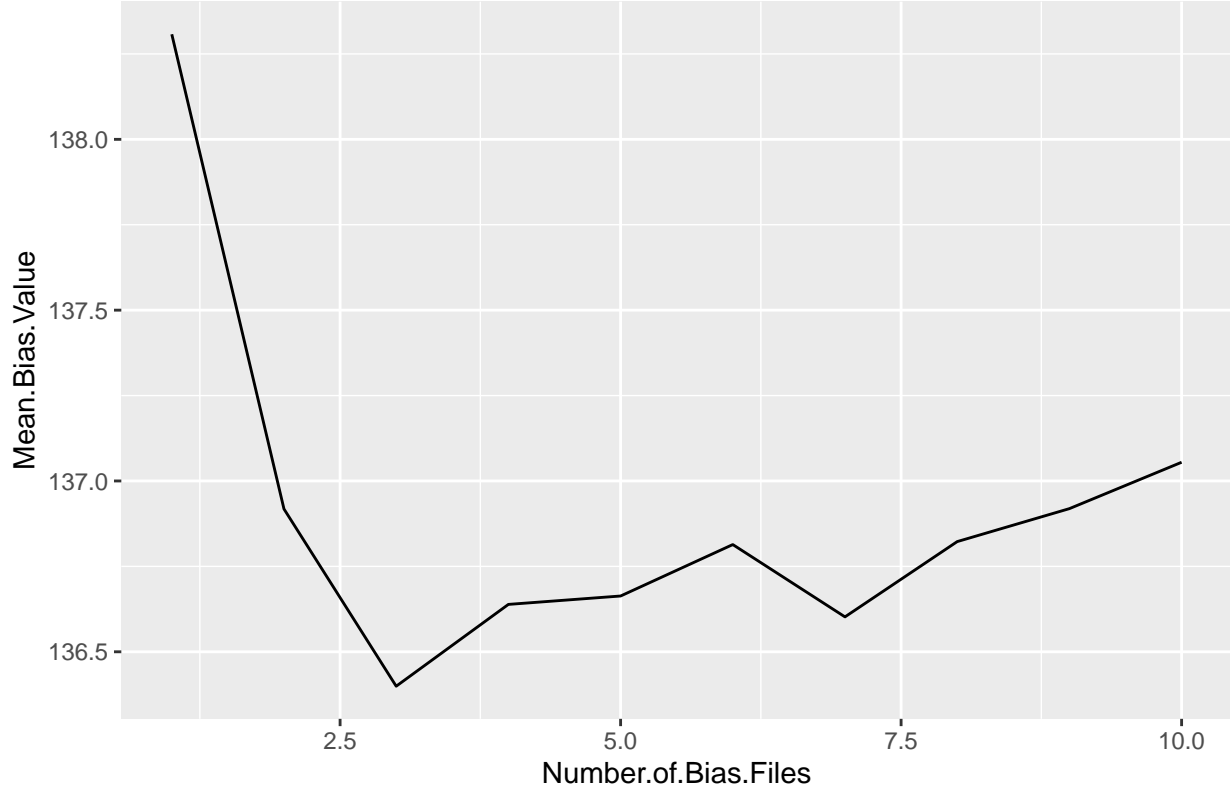
Mean $\bar{x} = \frac{1}{N} \sum_{i=1}^{N} x_i$

Standard Deviation $\sigma = \sqrt{\frac{1}{N-1} \sum_{i=1}^{N} (x_i - \bar{x})^2}$

Standard Error of the Mean $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{N}}$

We note that for large N, $\sigma \propto \frac{1}{\sqrt{N}}$