AGA0414
Photometry

Prof. Alessandro Ederoclite

Measuring the brightness of the stars

What does it mean?

How do we measure the brightness of a star?

How do we measure the brightness of a galaxy?

How do we get the “full” flux of a star (or a galaxy)?

Aperture Photometry

The easiest way:

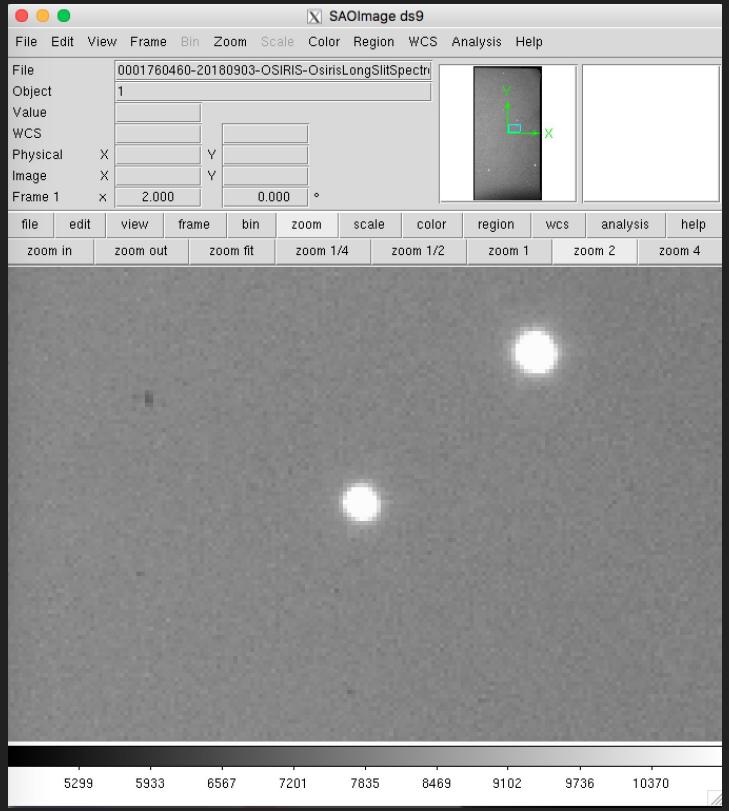
- You draw an aperture and you sum the counts you have in the aperture
- Make sure you subtract the background!

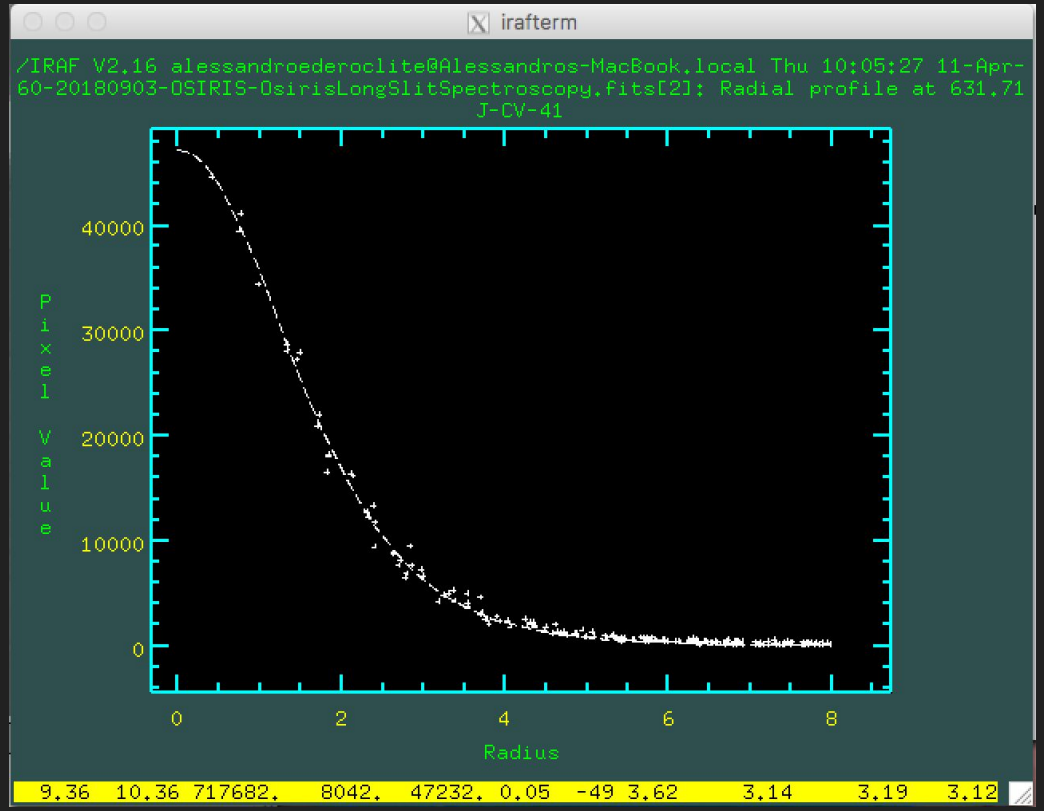
You subtract the background measuring it in an annulus around your object.

Getting the right size of aperture and background annulus is a form of art.

To begin with, you need to measure the psf of the star.

Aperture photometry





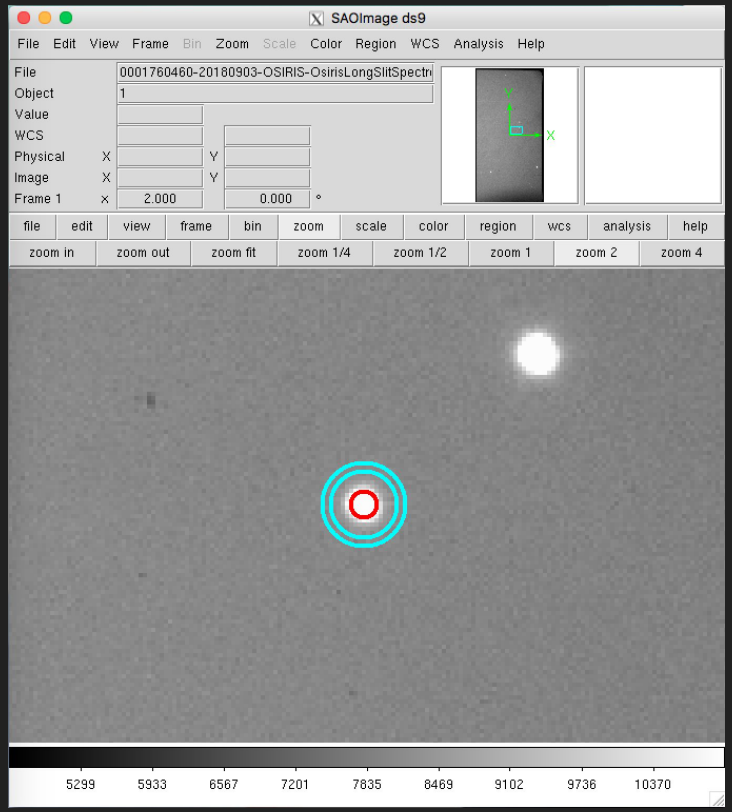
Aperture Photometry

Radius = 3.2 pixels

Annulus:

-) inner radius= 8 pixels

-) inner radius= 10 pixels



psf-photometry

In some cases, you cannot do aperture photometry plane and simple.

You need to model the psf.

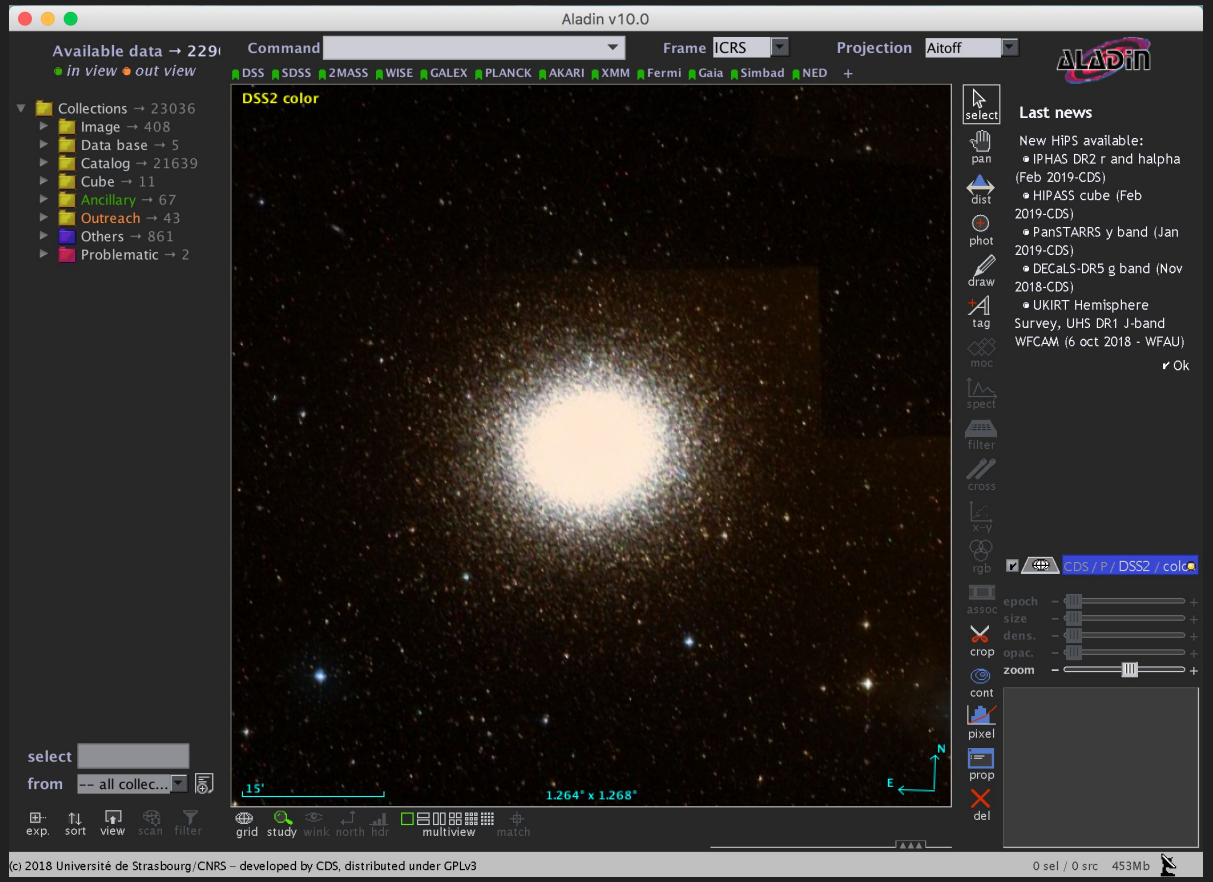
Model of isolated stars of different brightness across the field of view.

Why stars?

Because a star is the closest to the psf of the telescope!

ω Cen

DSS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Outreach → 43
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Last news
New HiPS available:
IPHAS DR2 r and halpha (Feb 2019-CDS)
HIPASS cube (Feb 2019-CDS)
PanSTARRS y band (Jan 2019-CDS)
DECaLS-DR5 g band (Nov 2018-CDS)
UKIRT Hemisphere Survey, UHS DR1 J-band WFCAM (6 oct 2018 - WFAU)
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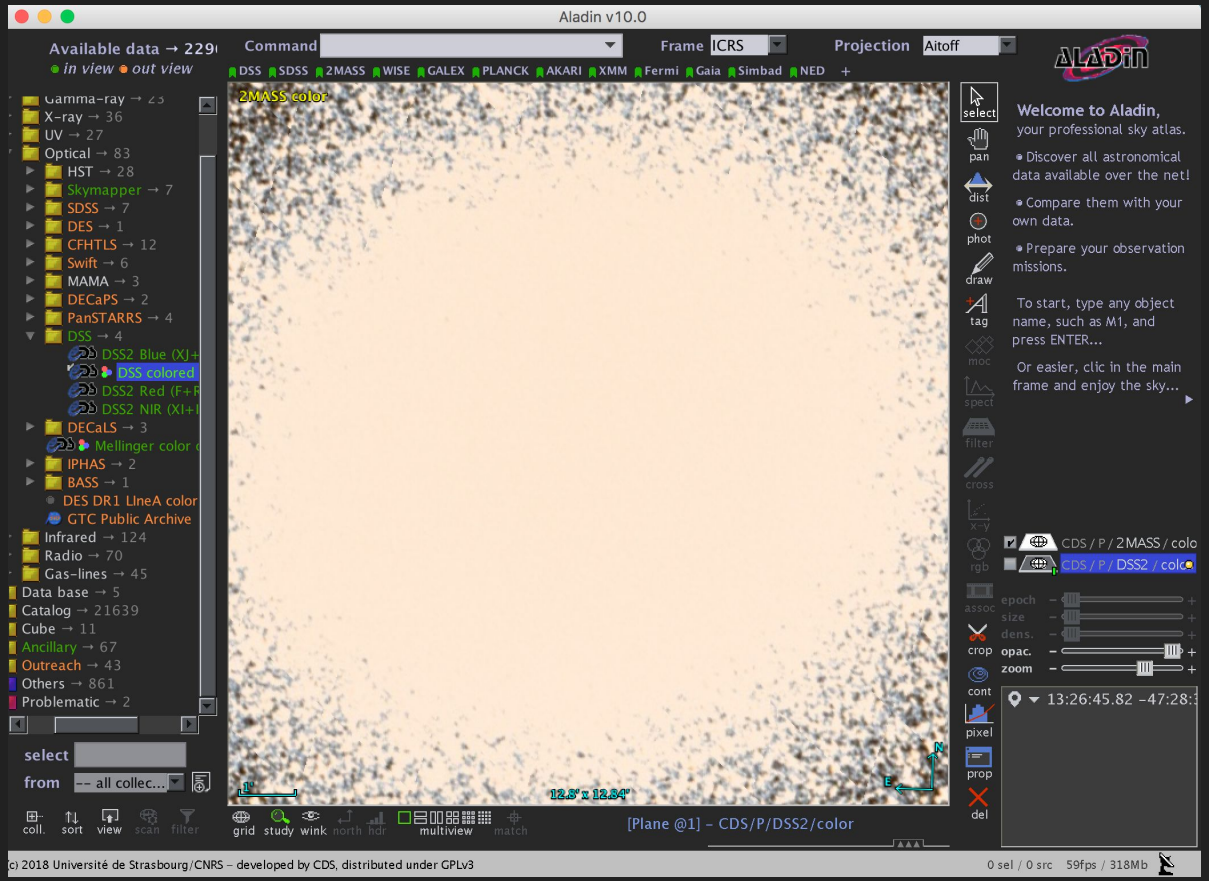
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2MASS color
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X-ray → 36
UV → 27
Optical → 83
HST → 28
Skymapper → 7
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DES → 1
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Swift → 6
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DECaPS → 2
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Ancillary → 67
Outreach → 43
Others → 861
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Welcome to Aladin,
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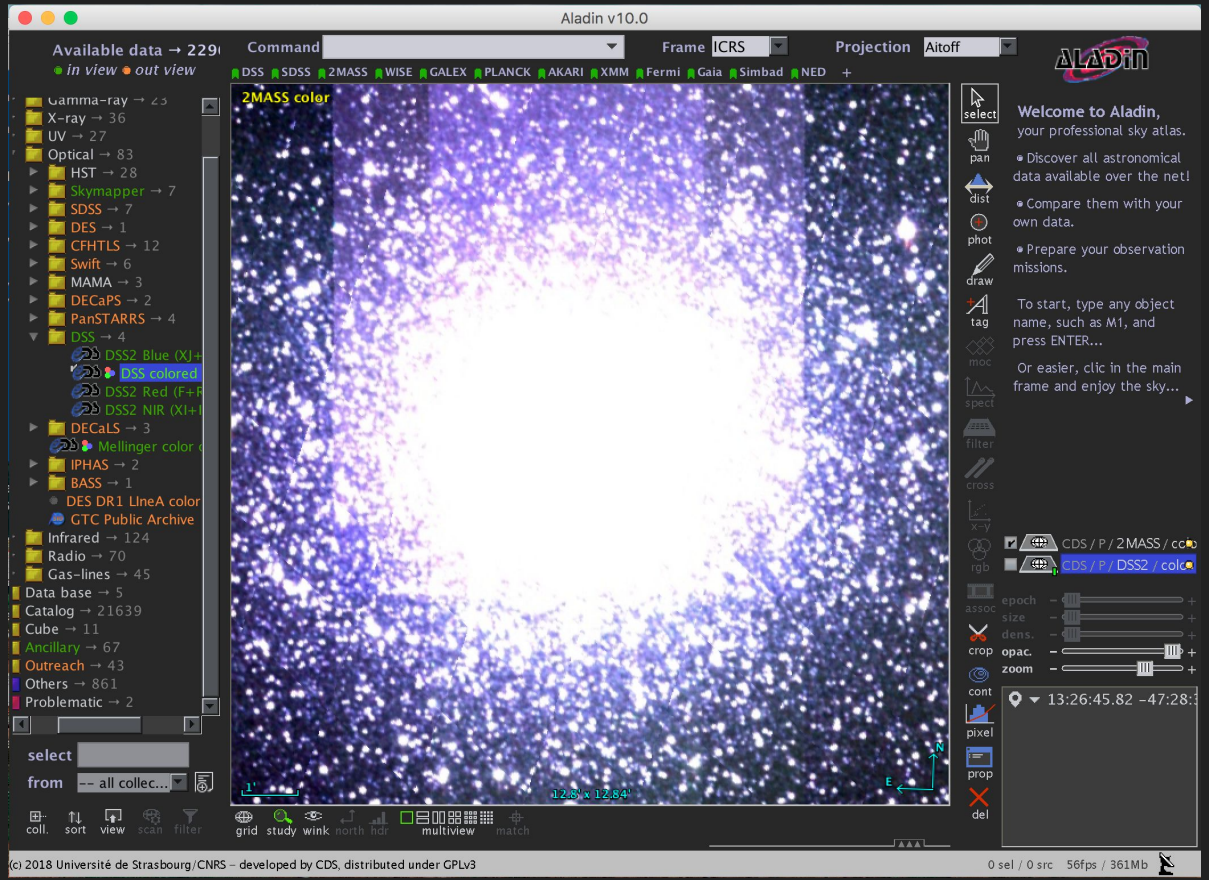
2MASS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CDS / P / 2MASS / color
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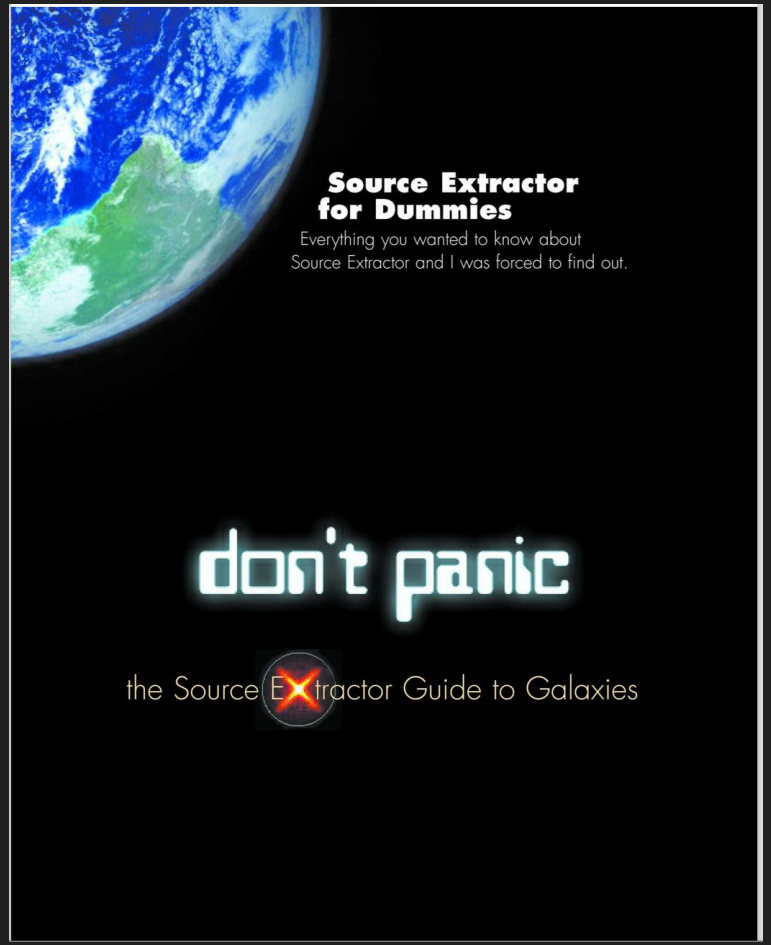
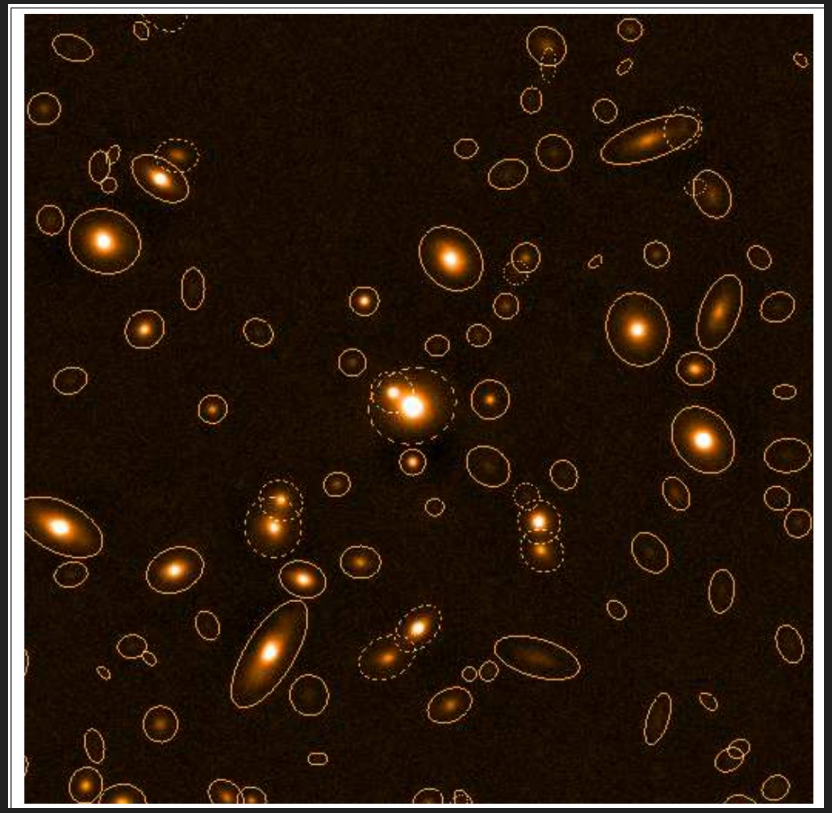
SExtractor

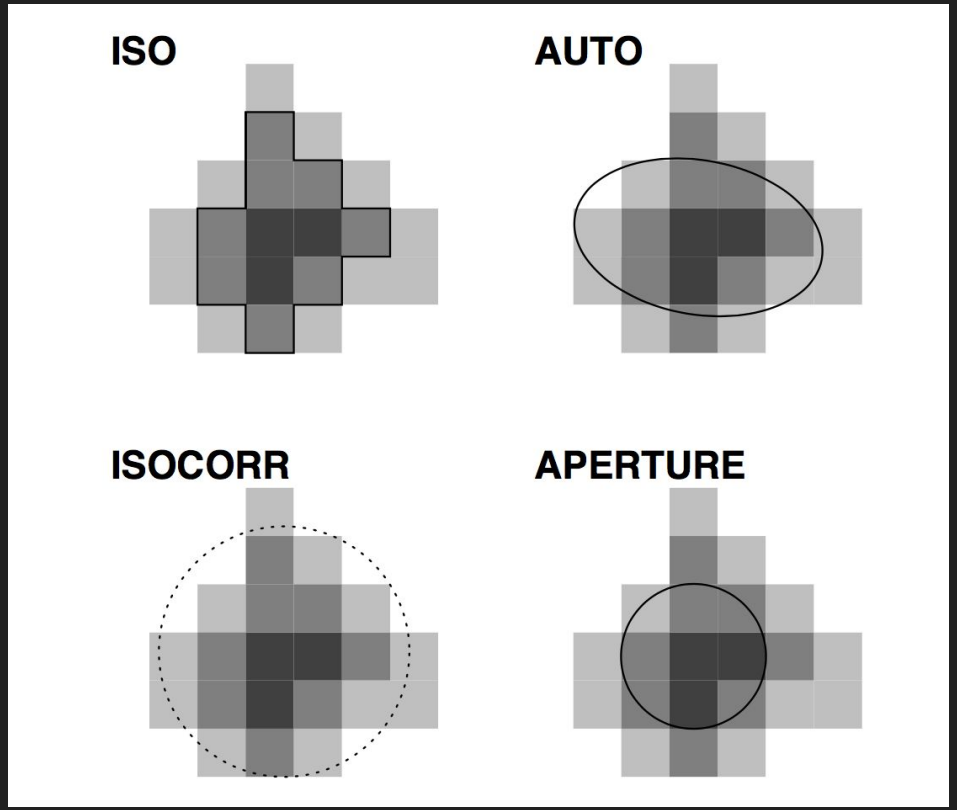
Nothing of what I have explained so far works in the case of galaxies.

For galaxies, it is better to use other programs. One which is widely used is SExtractor.



SExtractor





Differential photometry

Compare a star with a neighbouring star.

You normally use three stars:

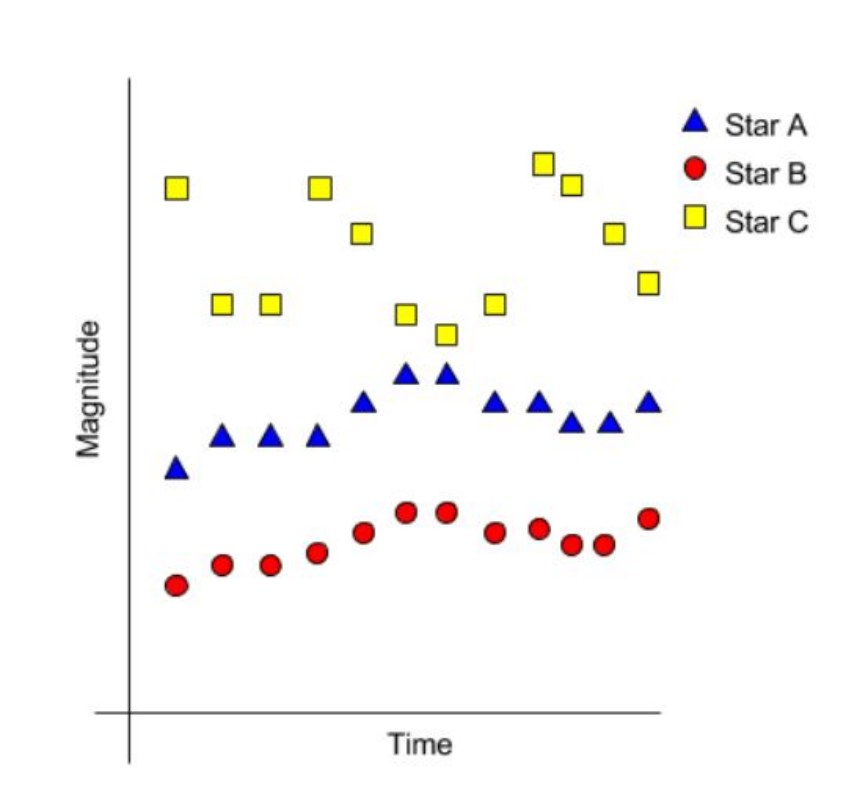
- The science star
- The comparison star
- The “check star”

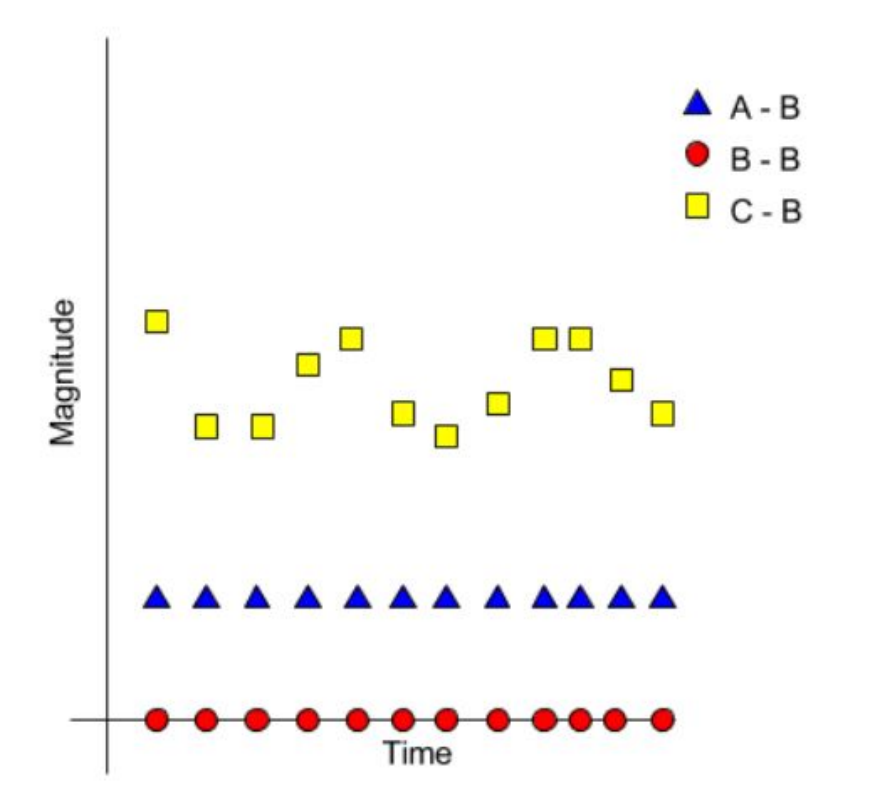
Comparison and check star are **supposed to be** non-variables.

Science star is a variable.

This method “absorbs” extinction variations (really cool!)

Differential photometry





Absolute photometry

What you measure is called “instrumental magnitudes”.

You give a value of the brightness of your object in an absolute sense.

It is tricky.

Even trickier, since we measure things in magnitudes…

Magnitudes

Need to go from counts to flux!

Magnitude (Vega; the Pogson's equation):

$$mag_2 - mag_1 = -2.5 \text{ Log } f_2 / f_1$$

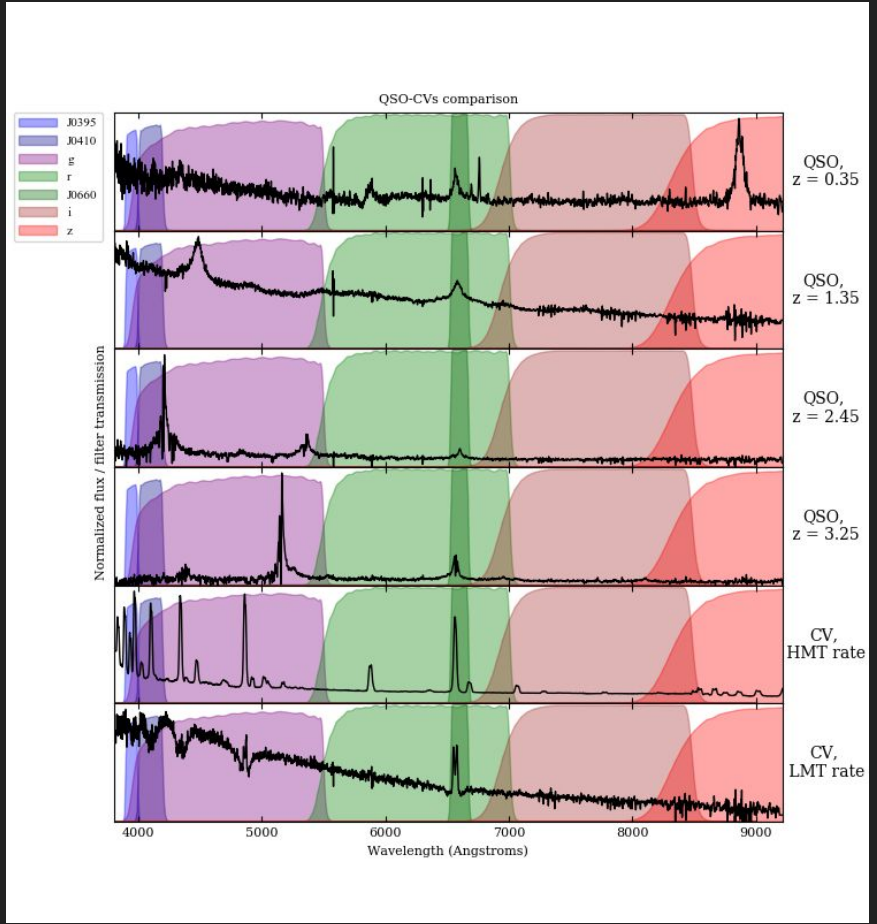
f_v is the "spectral flux density"

Magnitude (AB):

$$Mag = -2.5 \text{ Log } f_v - 48.6$$

What’s in a magnitude...

Convolution of the filter of an object with a filter.



… see you in two weeks

I don’t give you homeworks but I will try to send you the IRAF “manual”.

Before I forget

For those interested in “instrumentation” (in fact, astronomical techniques, as a whole):

You are welcome to join

ISS7

Instrumentation Group

Thursdays, 4pm, room F-307