Measuring Sizes & Shapes of Galaxies

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Introduction

- **Galaxy morphometrics** is quantizing properties of galaxies.
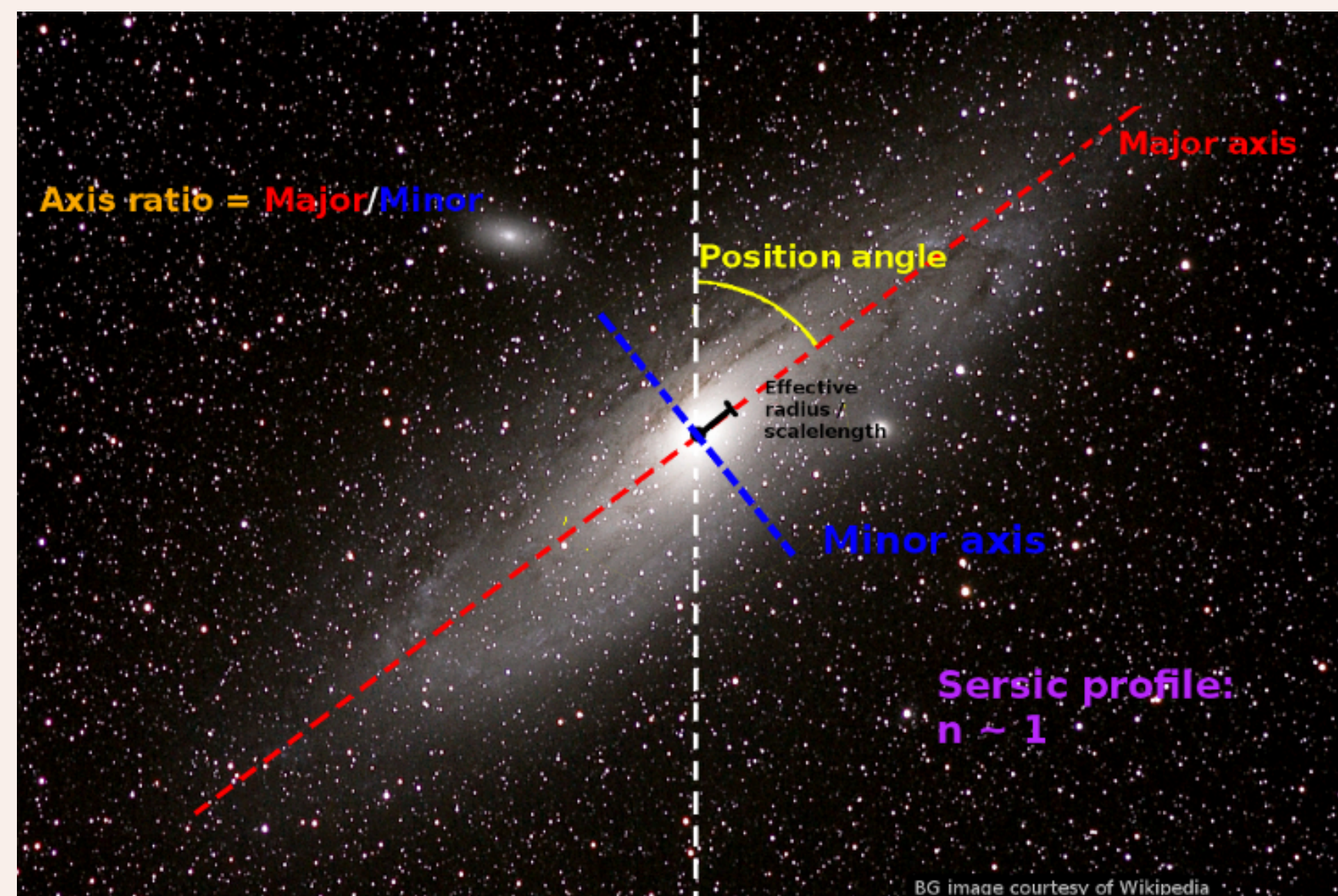

Figure: The particular properties we look for, Andromeda as a model example

- **Sèrsic profile** is mathematical way to categorize galaxies. $n \sim 4$ is elliptical, $n \sim 1$ is spiral.
- Soon we are expected to get 1000 times more galaxies with new surveys
- **We need something fast and efficient, and we look into Source Extractor.**

Data

- Hubble image files (CANDELS)
- GALFIT catalogs [1]
- Distance and time data (Spectroscopic redshift)

Methods

- Extract and prepare images, catalogs.
- Run Source Extractor for two different occasions: for GALFIT, then redshift.
- Extract data from new Source Extractor catalogs, graph and table.

Results

- SE-GAL runtime: ≈ 10 hr. SE-z runtime: ≈ 8 hr.

How well does Source Extractor recover?

It recovers well. 79.24%, 100% with redshift data (mainly bright ones, and faint ones hard to get redshift data).
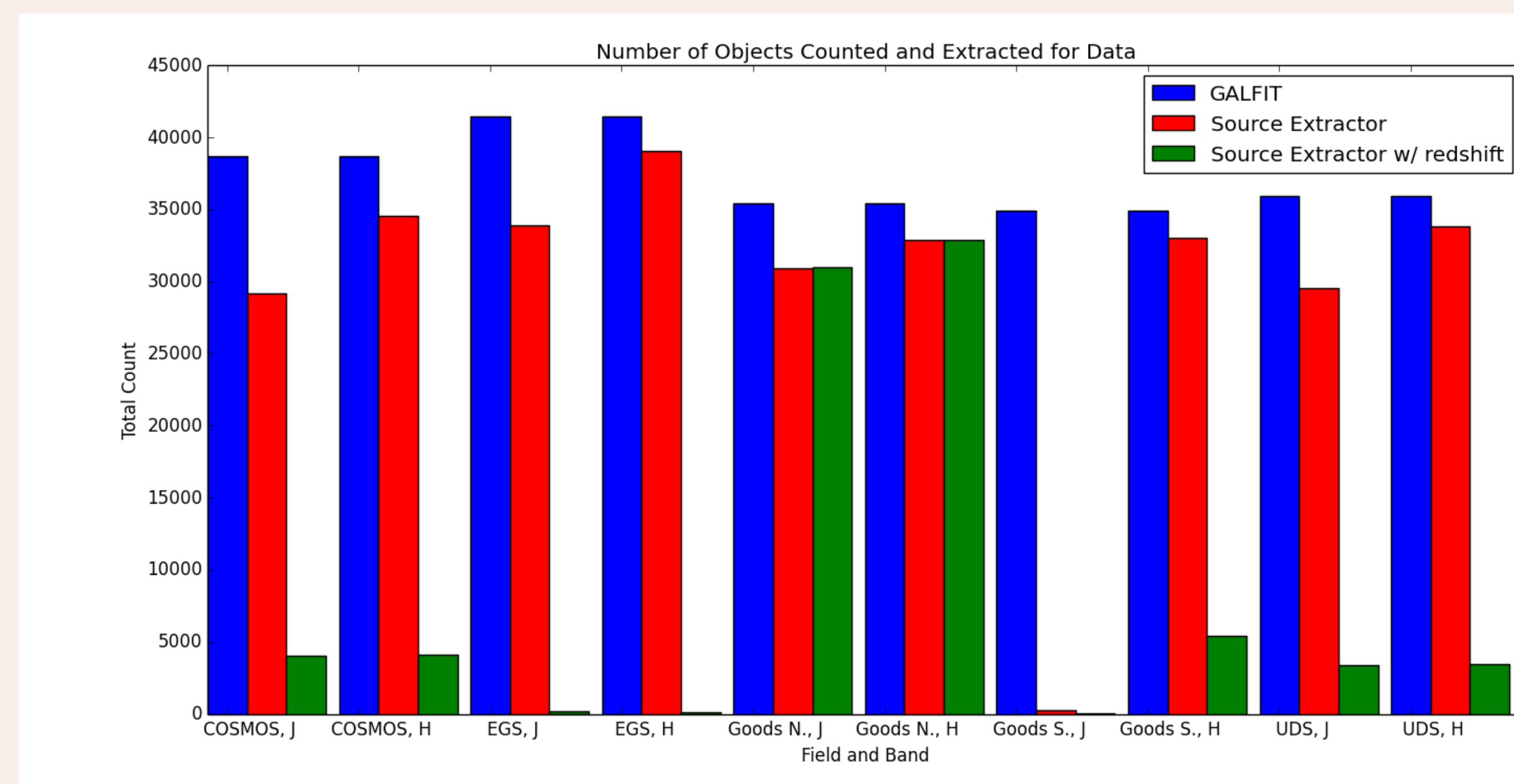

Can we tell disks and blobs apart?

We say yes, by comparing size and luminosity ratios between the two Source Extractor models: disk and spheroid (see unbiased and biased graph respectively). More parameter input seem to be needed.
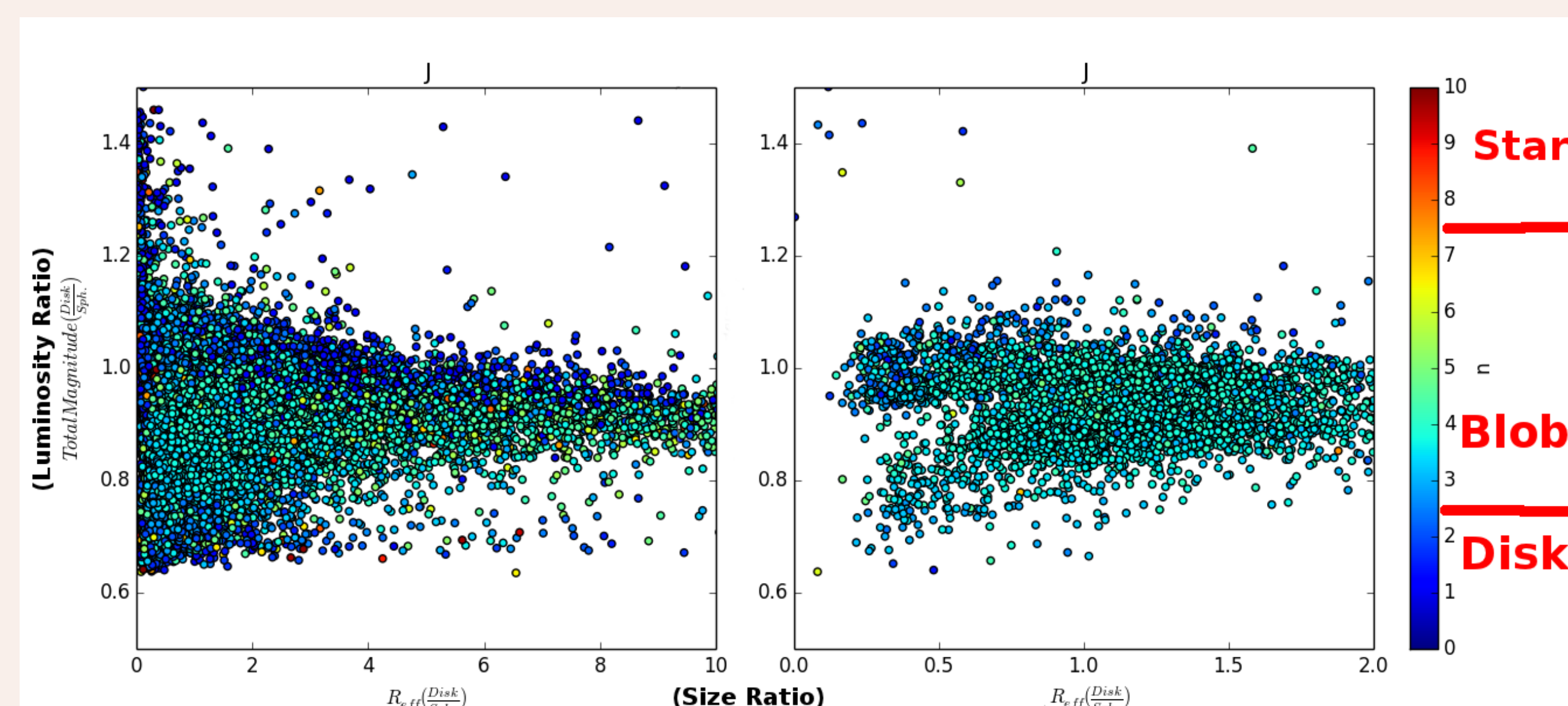
How well does it fit with GALFIT?

Not well. The general spread between the two is large. Thresholds help a bit, but not much. Also, notice the line of objects. These are extractions from unwanted objects (i.e. stars)
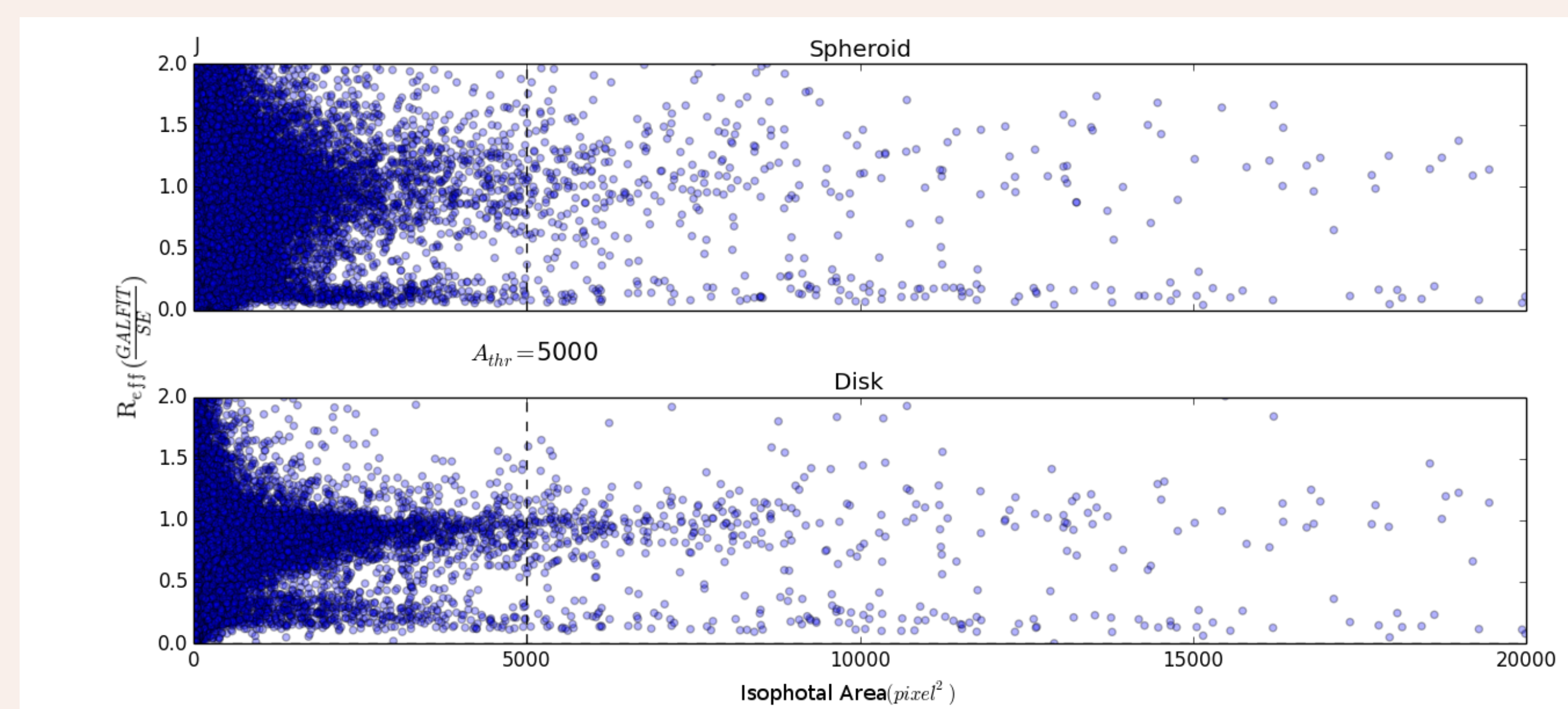
Conclusion

- Source Extractor highly dependent on input catalog, but is 79.24% effective at recovery.
- Two thresholds determined. Threshold magnitude determined: $M_{thr} = 20$. Threshold isophotal area: $A_{thr} = 1000 pix^2$.
- Isophotal area is ideal threshold. It's large in error, but has larger count.
- Spheroid model for ellipticals, disk model for spirals.
- Source Extractor ideal for finding radii and axis ratio, not effective for position angle or Sèrsic index.

References

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Acknowledgements

BG: Goods N.