Dwarf galaxies in the ACS Virgo Cluster Survey

a bachelor research project by

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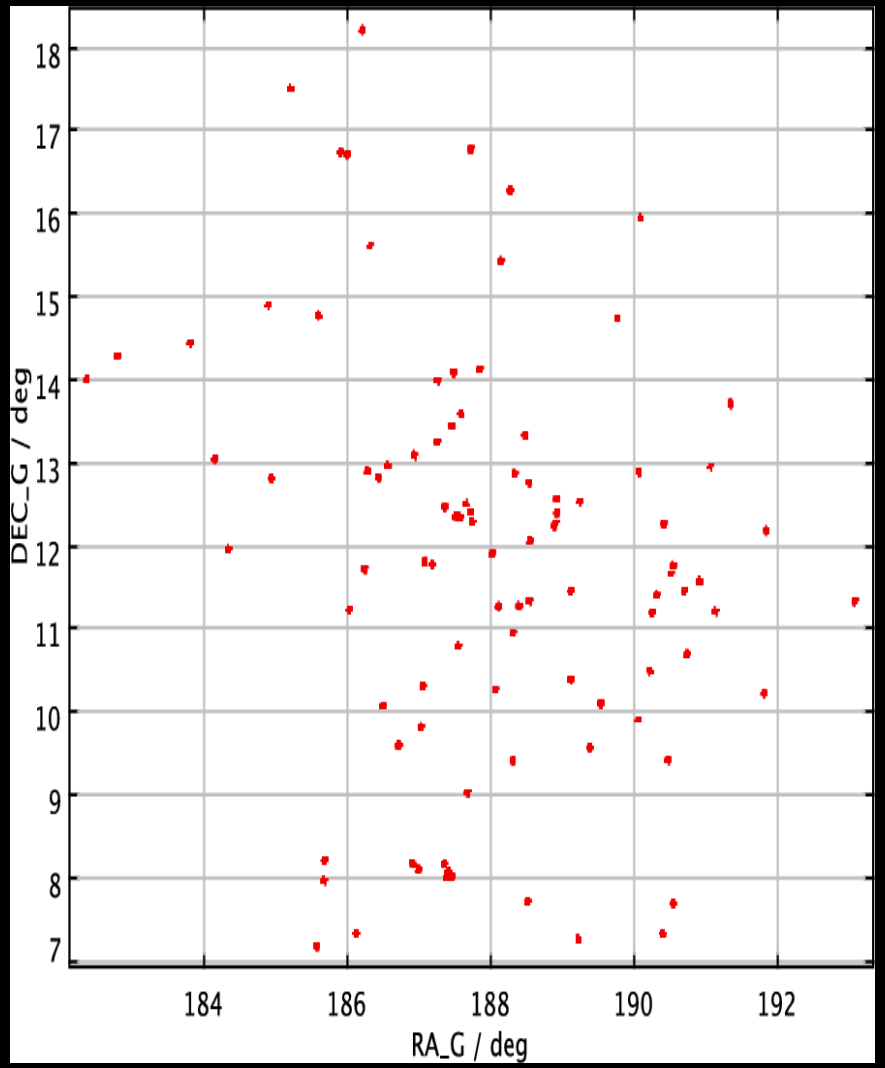
Overview

- The ACS Virgo Cluster Survey project
- This project
- Data reduction using Astro-WISE
- Identifying dwarfs using TopCat and Aladin
- Astro-WISE in a one-man project

ACS Virgo Cluster Survey project

- Patrick Coté et al.
- 100 early-type VCC galaxies (SDSS g- and z-bands)
- $(4k)^2$ pixels, 0.05”/pixel
- Goals:
  - central structure & nuclei
  - globular cluster properties
  - SBF / distances



This project: Goals

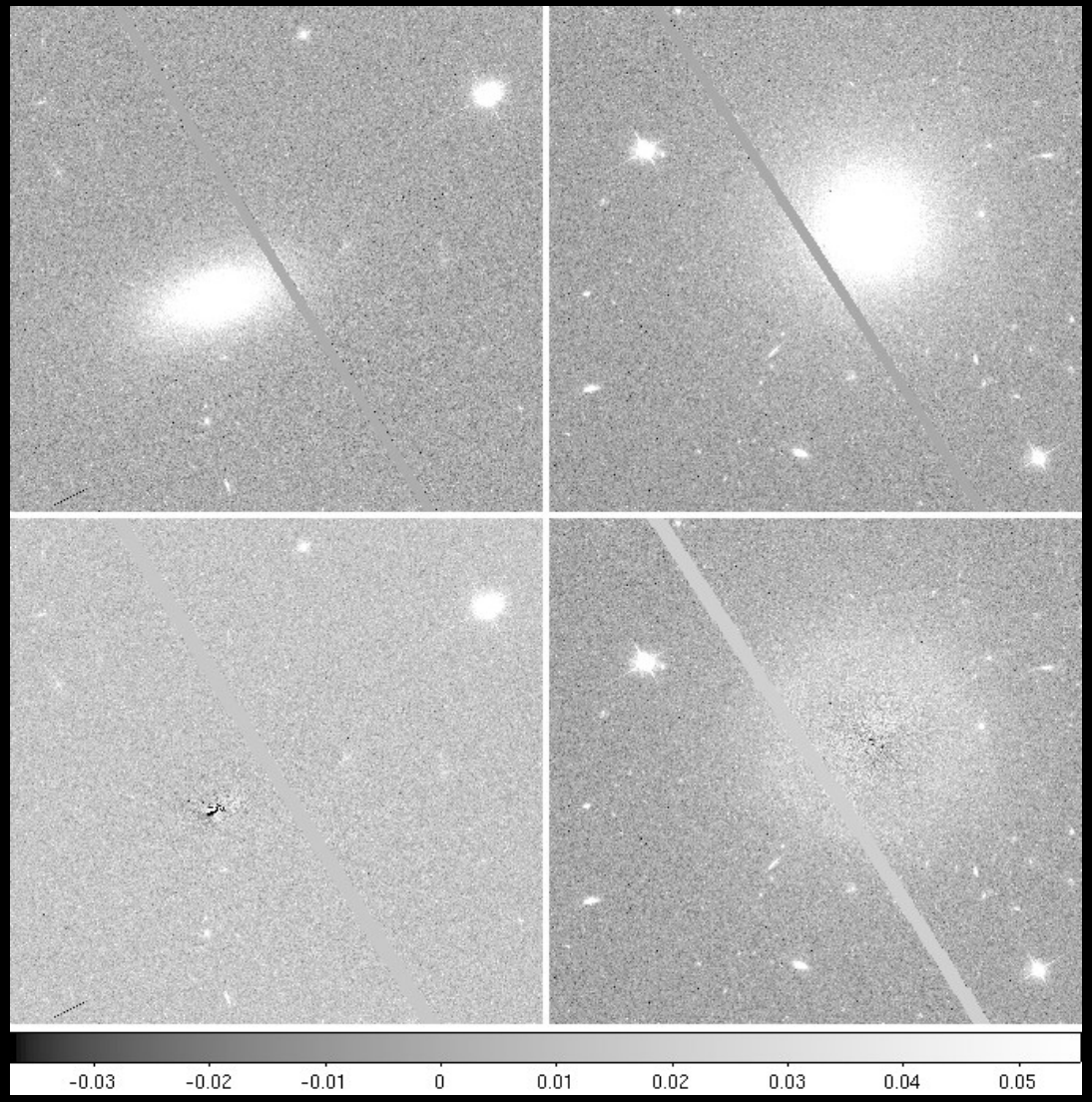
- Study the fainter ACS galaxies
- Scientific questions:
  - Color-magnitude relations for the fainter galaxies; scatter; when did these galaxies form their stars?
  - Color/age dispersion; star formation?
  - Distribution; distance to Virgo Cluster center
  - Separating cluster from field galaxies

This project: what do we expect?

- Schechter luminosity function
  - alpha ~ 1.5 (average of *Trentham* and *Sabatini*)
- Gives an estimated number of galaxies in range $-14 < M_B < -7$ of roughly 40
  - Covered area only ~ 0.3 deg^2
  - Total area Virgo ~ 100 deg^2

Data reduction using Astro-WISE

- ACS data pre-reduced (Drizzle)
- Removing central galaxies with GalPhot
- Residuals ingested into AW



Data reduction using Astro-WISE

- SourceLists; optimize SExtractor for weak & extended (*Benítez*)

Detection and Blending	Photometry and Analysis	Output
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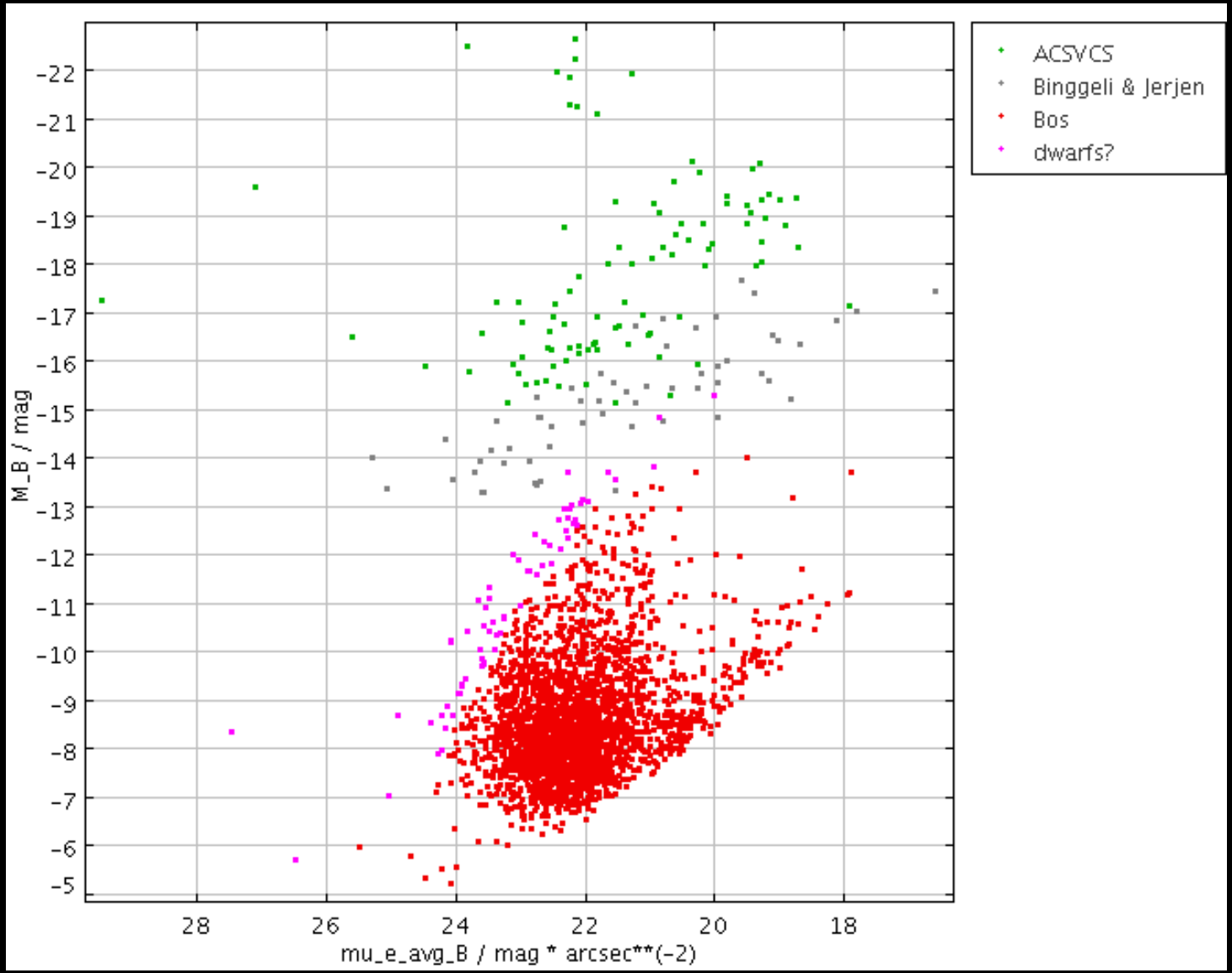
BACK_SIZE = 128	BACKPHOTO_TYPE =	MU_THRESHOLD
FILTER = 'Y'	'LOCAL'	FLUX_ISOCOR
FILTER_NAME =	BACKPHOTO_THICK = 26	FLUXERR_ISOCOR
'gauss_2.0_5x5.conv'	MASK_TYPE = 'CORRECT'	MAG_ISOCOR
WEIGHT_TYPE = 'NONE'	PHOT_APERTURES = 50	MAGERR_ISOCOR
INTERP_TYPE = 'NONE'	PHOT_AUTOPARAMS =	ELONGATION
DETECT_MINAREA = 10	[2.5,3.3]	ELLIPTICITY
DETECT_THRESH = 1.5	PIXEL_SCALE = 0.05	FLUX_AUTO
THRESH_TYPE = 'RELATIVE'	GAIN = target.EXPTIME	FLUXERR_AUTO
DEBLEND_NTHRESH = 16	PHOTFLUX_FRAC = 0.5	MAG_AUTO
DEBLEND_MINCONT = 0.025	STARNNW_NAME =	MAGERR_AUTO
CLEAN = 'Y'	'default.nnw'	MAG_BEST
CLEAN_PARAM = 1.2	SEEING_FWHM = 0.105	MAGERR_BEST
		FLUX_BEST
		FLUXERR_BEST

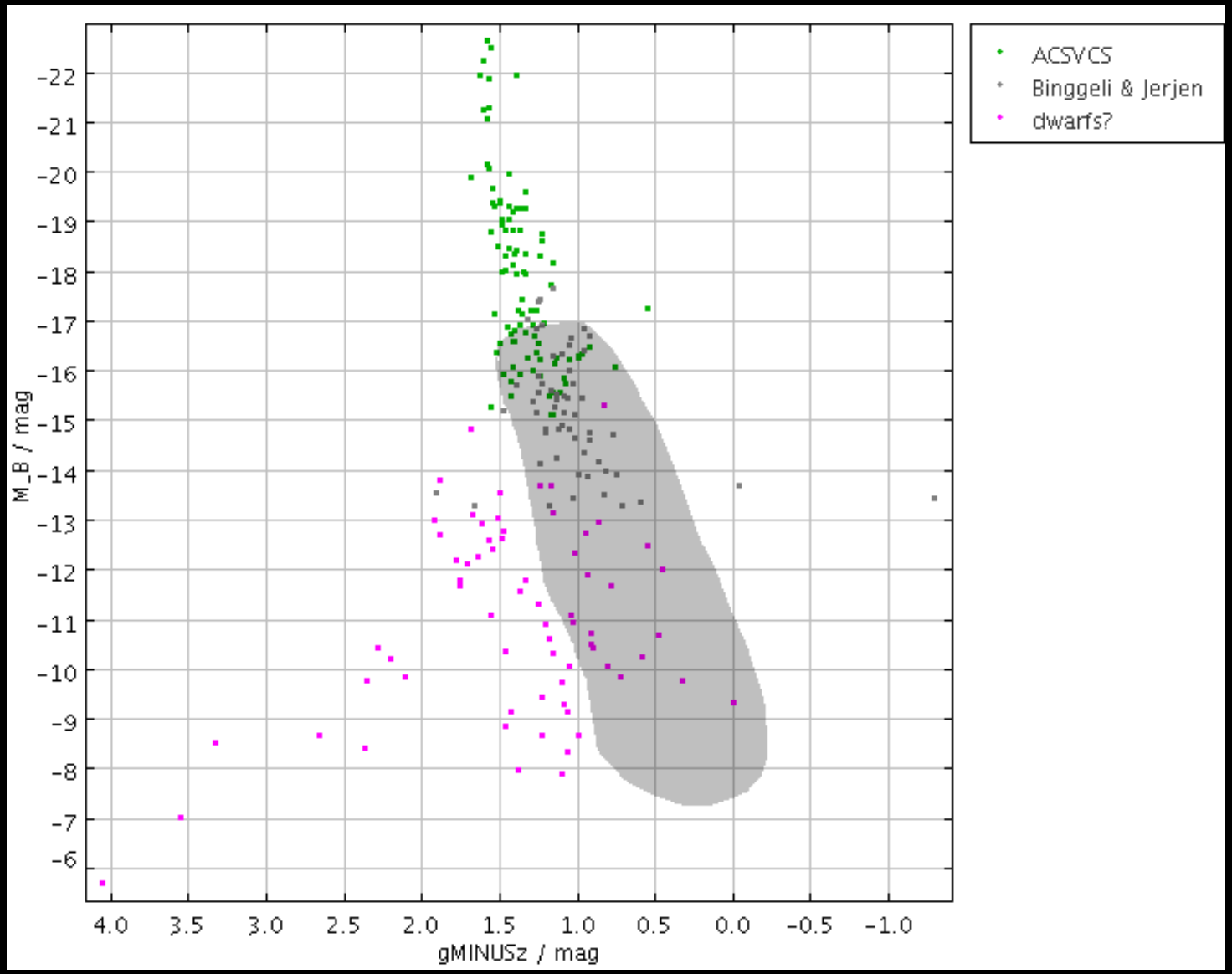
Identifying dwarfs

- Comparing parameters to those found in *Graham & Guzman* (who used data by *Binggeli & Jerjen*) and *Ferrarese et al.*
  - Surface magnitude vs. absolute magnitude
  - Color vs. absolute magnitude
- Identifying dwarfs and background sources

Identifying dwarfs: mu vs M



Identifying dwarfs: color (g - z) vs M



Results

- 22 sources of which 14 identified as dwarfs
- Next steps:
  - Running GalFit to obtain better photometry
  - Plot relations between parameters (single and multi parameter)

Astro-WISE in a one-man project

- Pros:
  - Python, DPU and database storage are great time-savers for groups and individuals alike
- Cons:
  - Database speed; in individual projects where no one else needs your data it's faster to use data locally (especially when working at home)
  - Lack of flexibility; ingesting custom frames / sourcelists

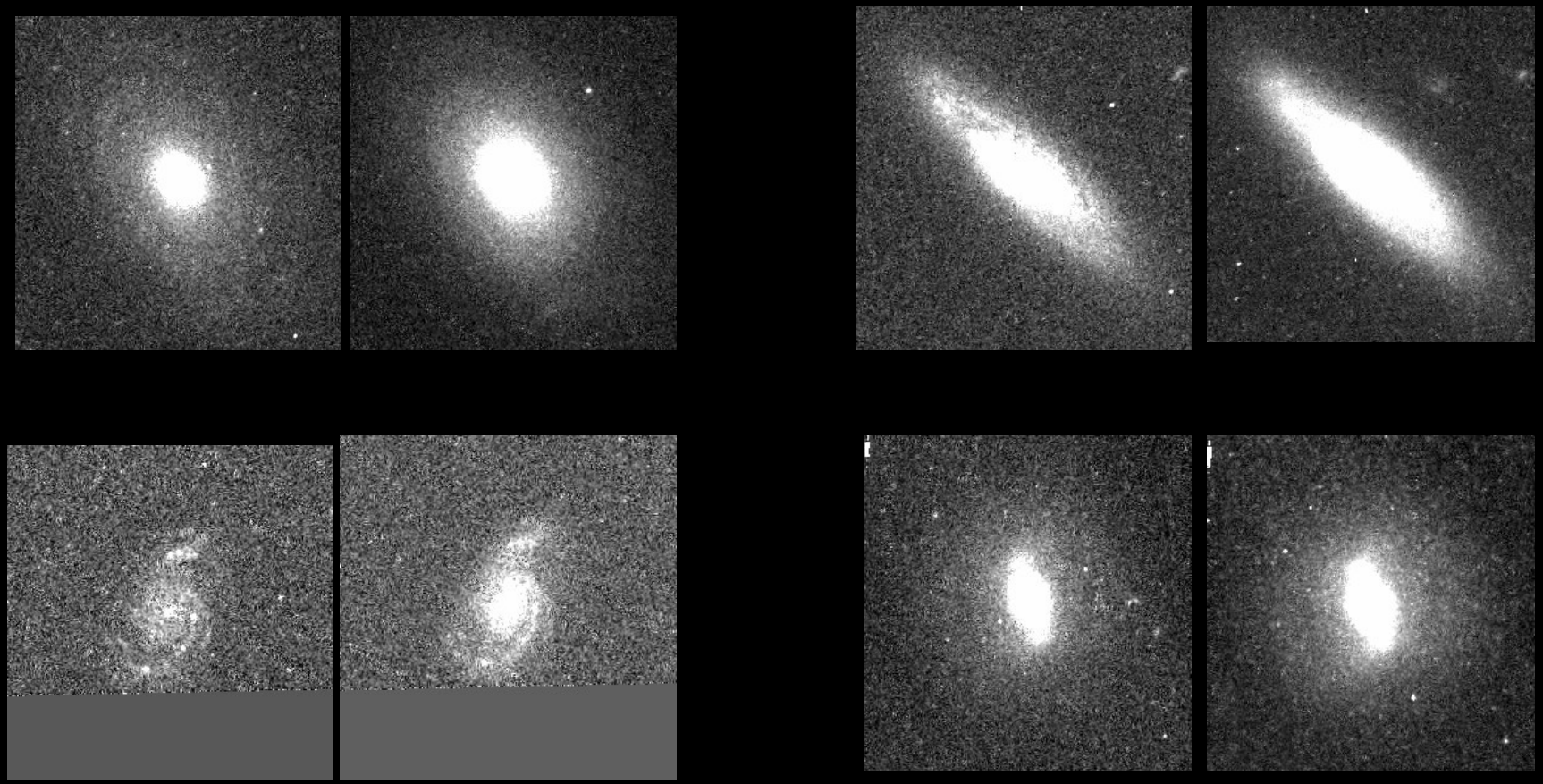
Astro-WISE in a one-man project

- Some suggestions for improvement:
  - **Enable users to ingest their own frames (at least in MyDB), SourceLists and other data**
  - Local storage of MyDB data (periodic synchronization with global dataservers?)

References

- Benítez et al. 2004, ApJS, 150:1-18
- Binggeli & Jerjen 1998, AA, 333:17-26
- Ferrarese et al. 2006, ApJS, 164:334-434
- Graham & Guzman 2003, AJ, 125:2936-2950
- Sabatini et al. 2003, MNRAS, 341:981-992
- Trentham & Hodgkin. 2002, MNRAS, 333:423-442
- NC 2008 Heidelberg workshop talk by Patrick Coté

Some random background sources



Some random dwarfs?