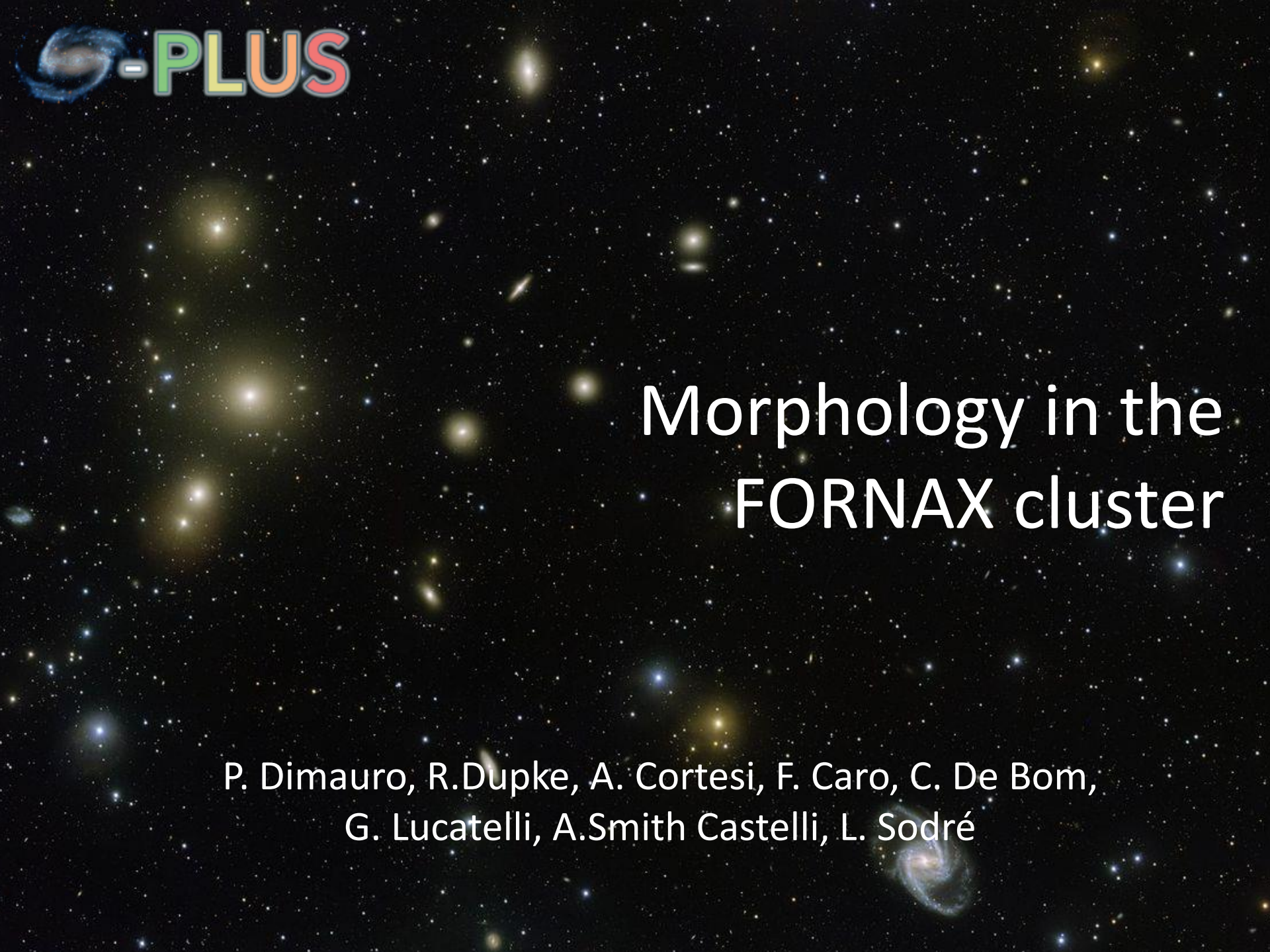
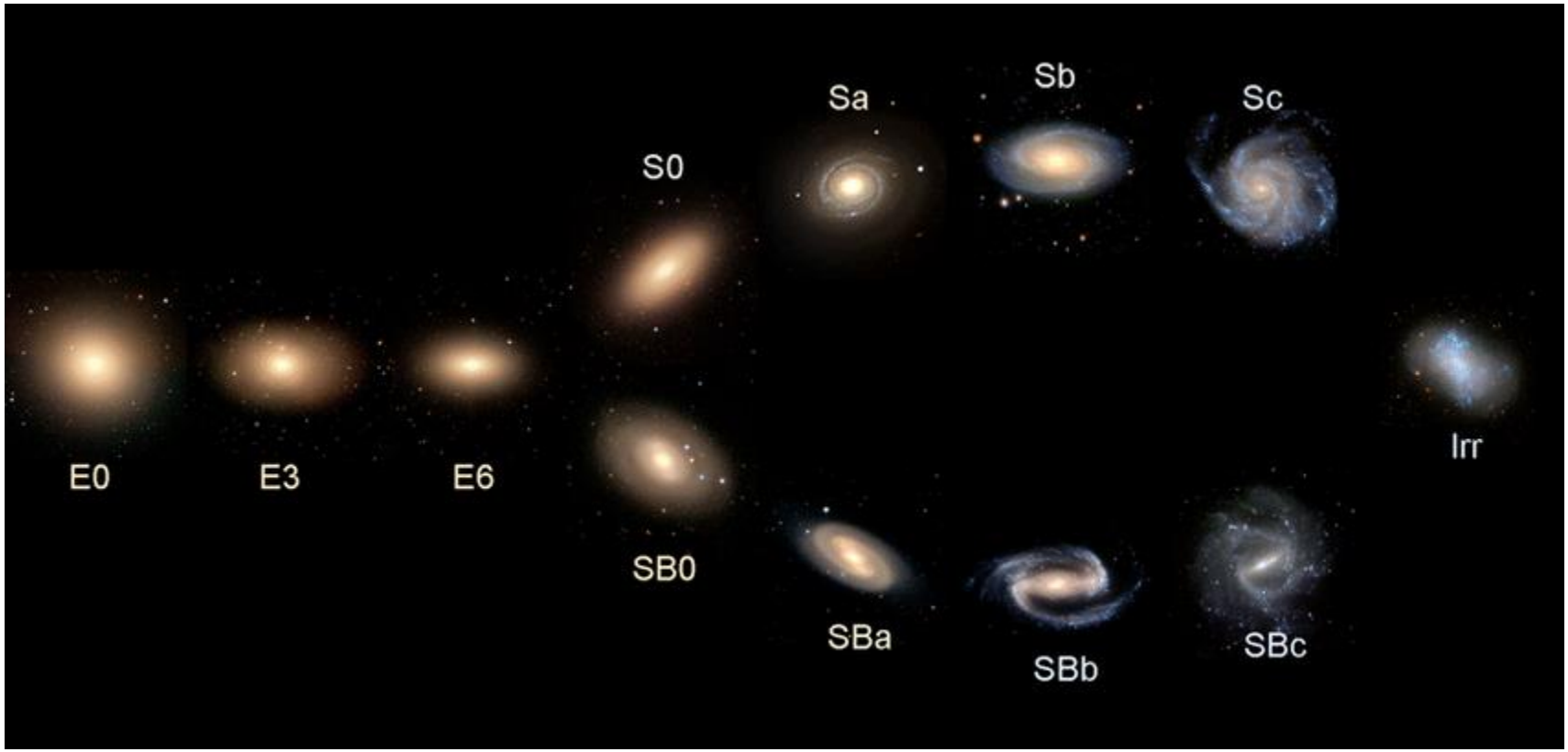


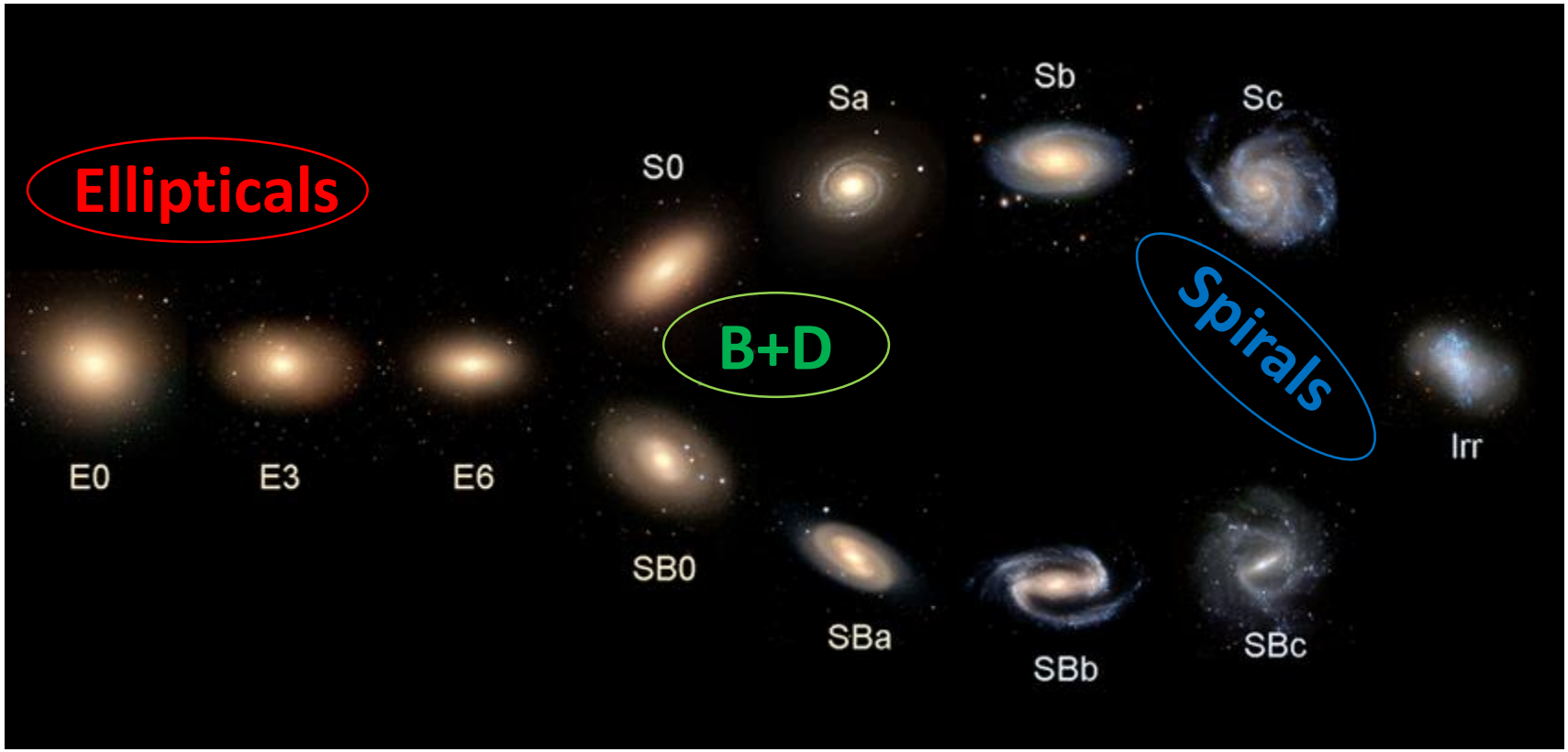
Morphology in the FORNAX cluster

P. Dimauro, R.Dupke, A. Cortesi, F. Caro, C. De Bom,
G. Lucatelli, A.Smith Castelli, L. Sodré

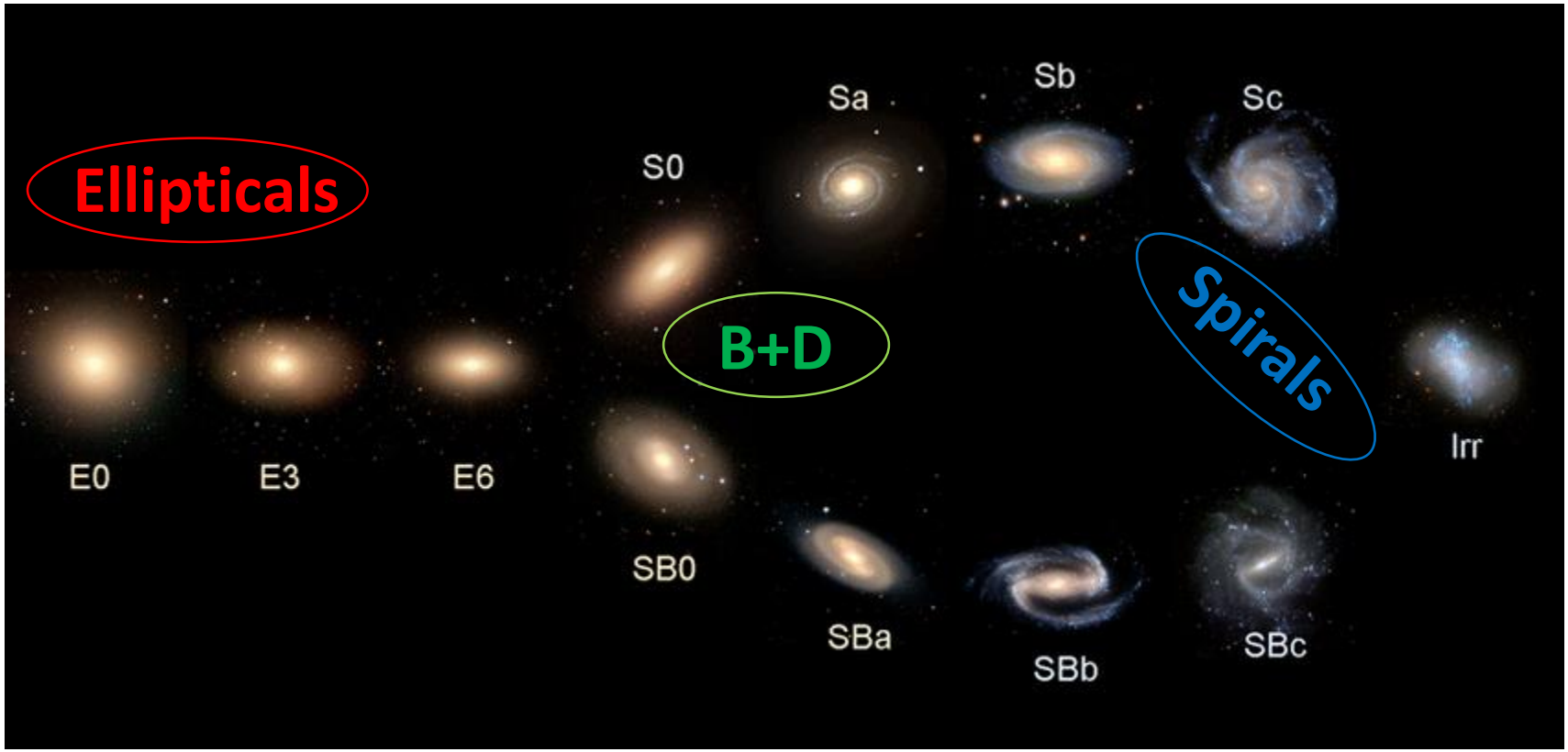
Hubble sequence



Hubble sequence



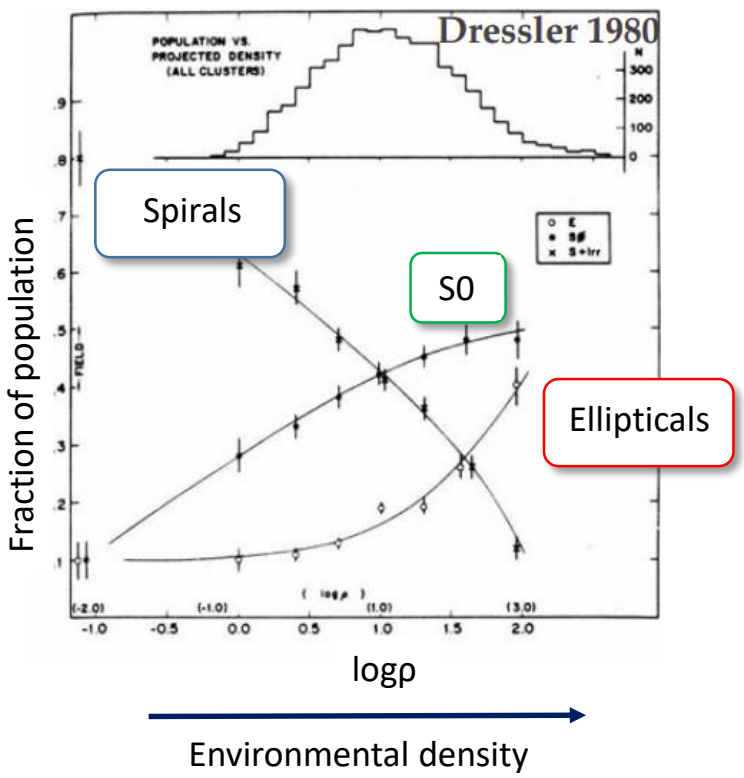
Hubble sequence

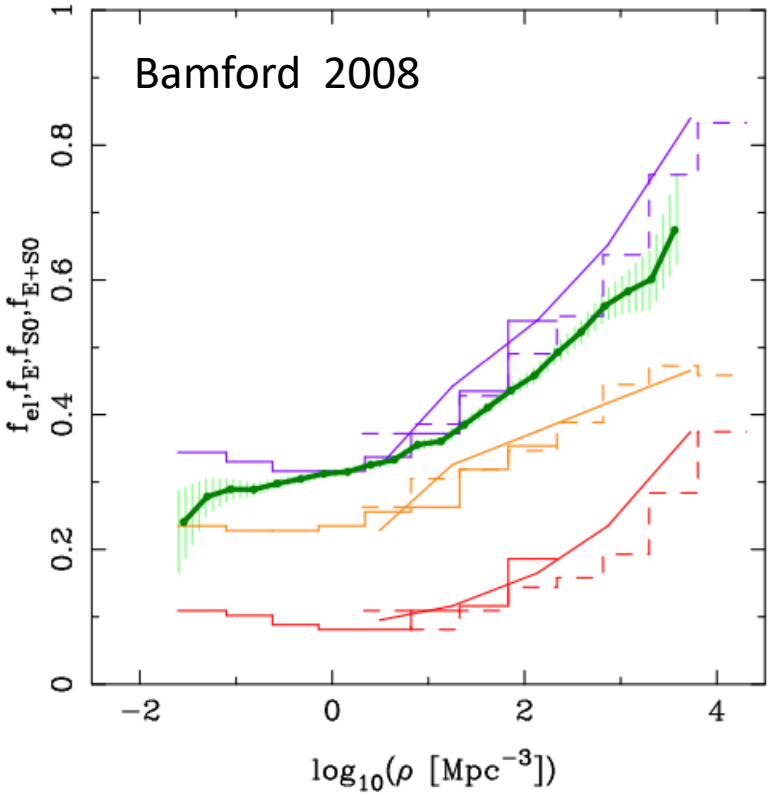


If galaxies move from one class to another one, how do they do that?

How does the environment affect the star formation and **morphology** of galaxies?

Morphology & environment





Why galaxies stop forming stars?
quenching mechanisms

The main source to produce stars is the gas content

Preventing cooling

Halo mass quenching

stops the accretion of new cold gas

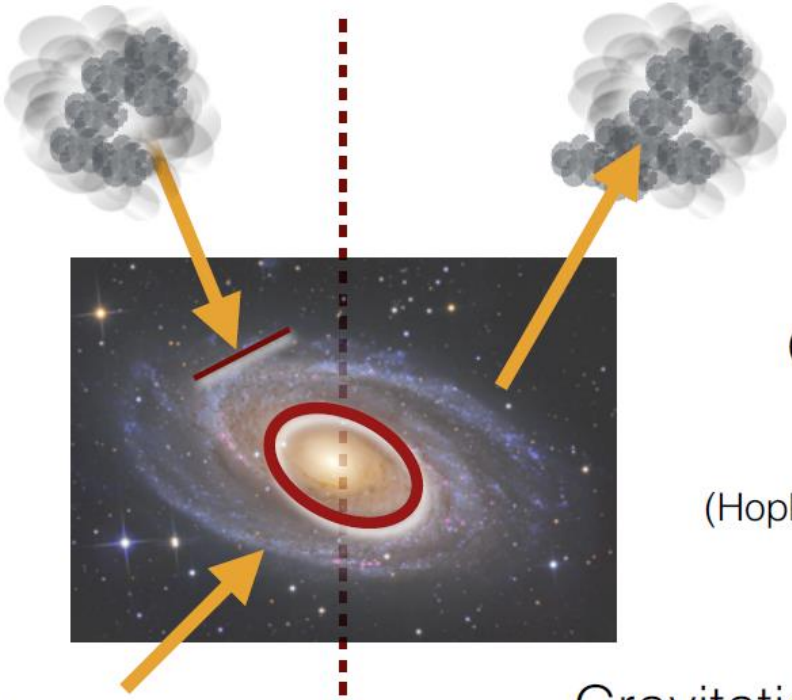
(Birboim & Dekel 2003, Peng 2015)

Strangulation

Morphological quenching

The accretion of a central density stabilizes the gas in the disk

(Martig 2008)



Gas removal

Outflows of gas

AGN, supernove

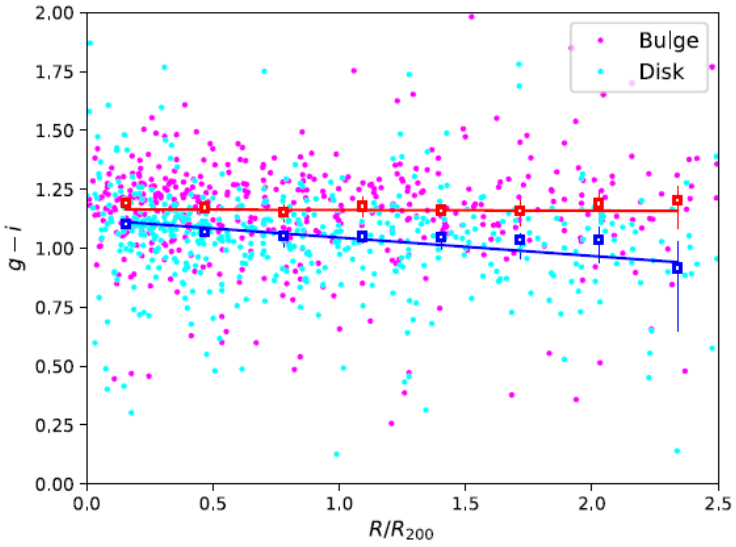
(Hopkins 2014, Cattaneo 2009)

Gravitational interactions

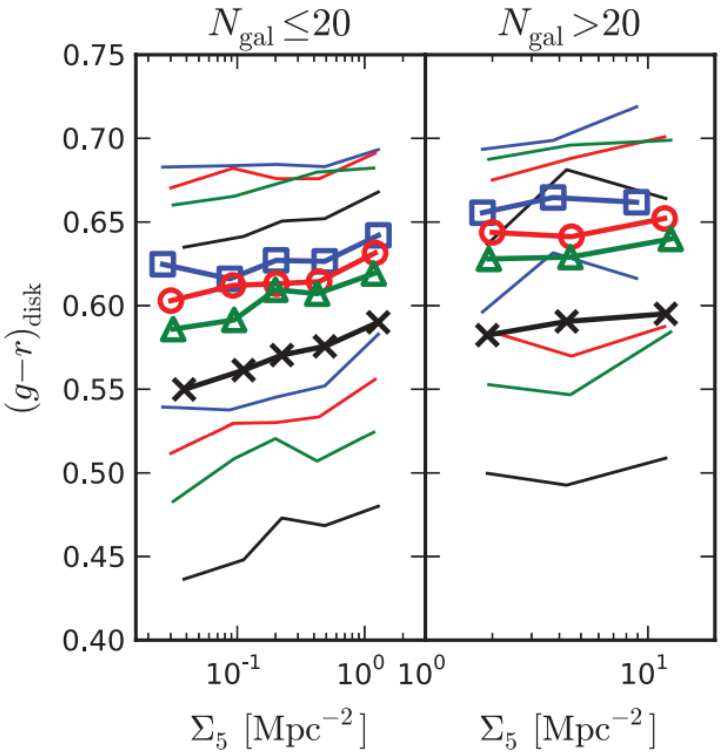
(ram pressure stripping, tidal interaction, etc)

(Gunn & Gott 1972, Nulsen 1982, Moore et al. 1996)

Star Formation & environment



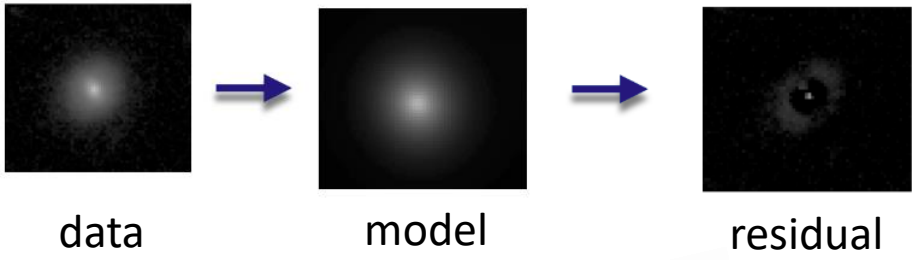
[Barsanti et al, 2021]



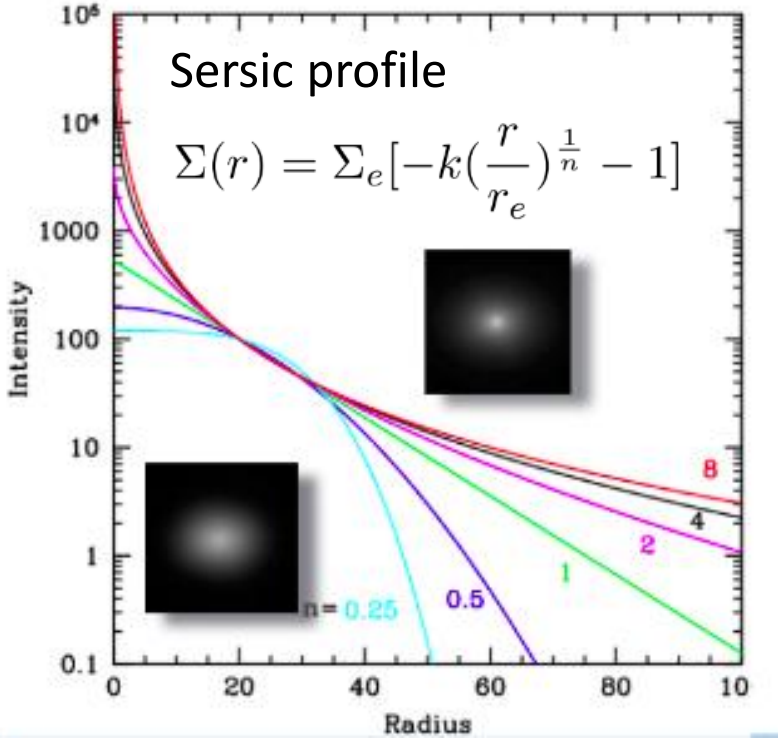
[Lackner & Gunn 2013]

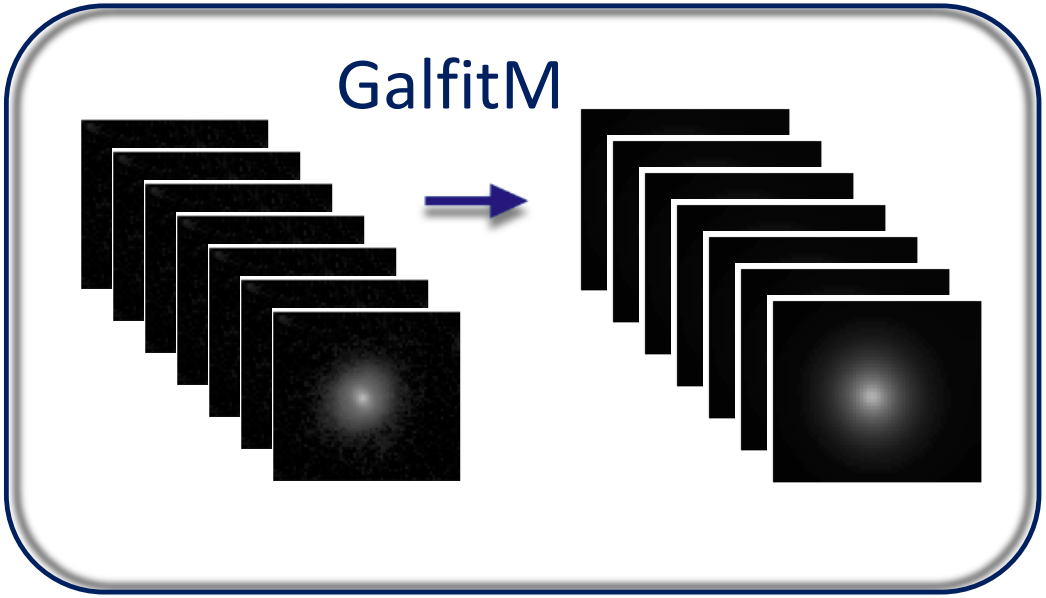
[Hudson et al. 2010, Head et al. 2014, Poggianti et al. 2009, Bamford et al. 2009]

Morphology with MegaMorph



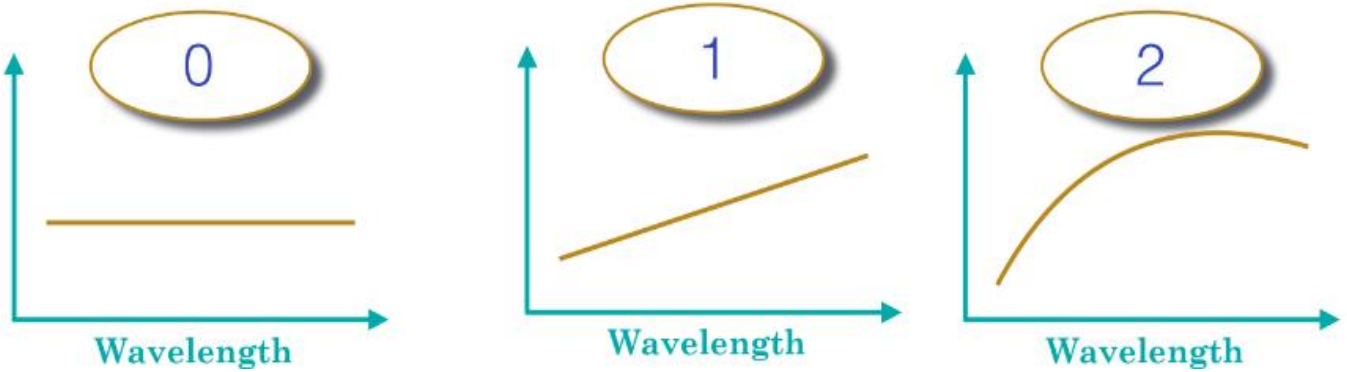
data model residual

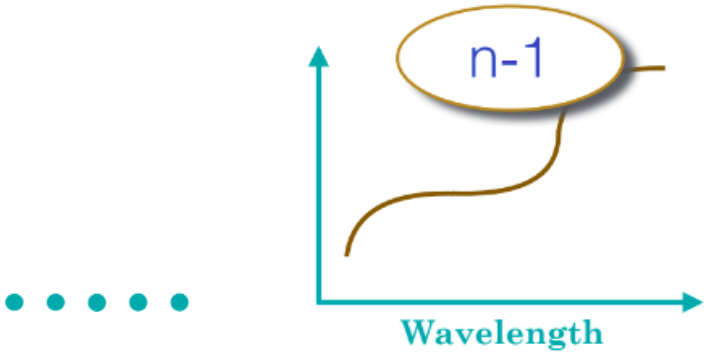


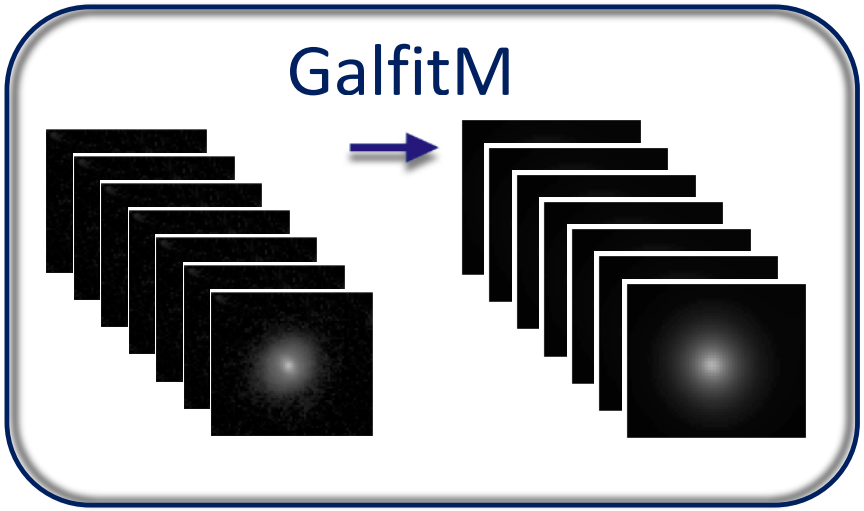


Morphology with MegaMorph

GalfitM - polynomial functions

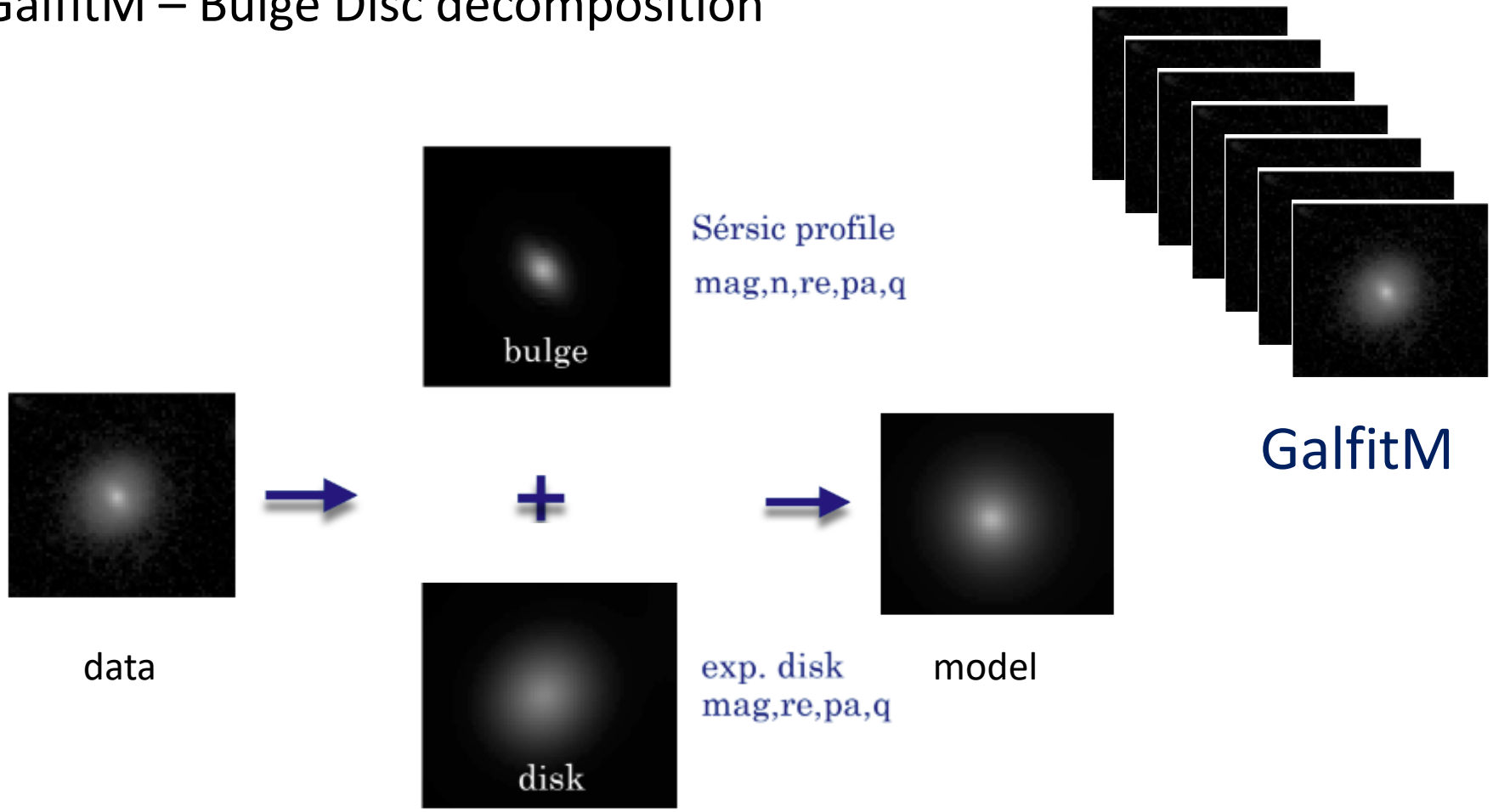






Morphology with MegaMorph

GalfitM – Bulge Disc decomposition

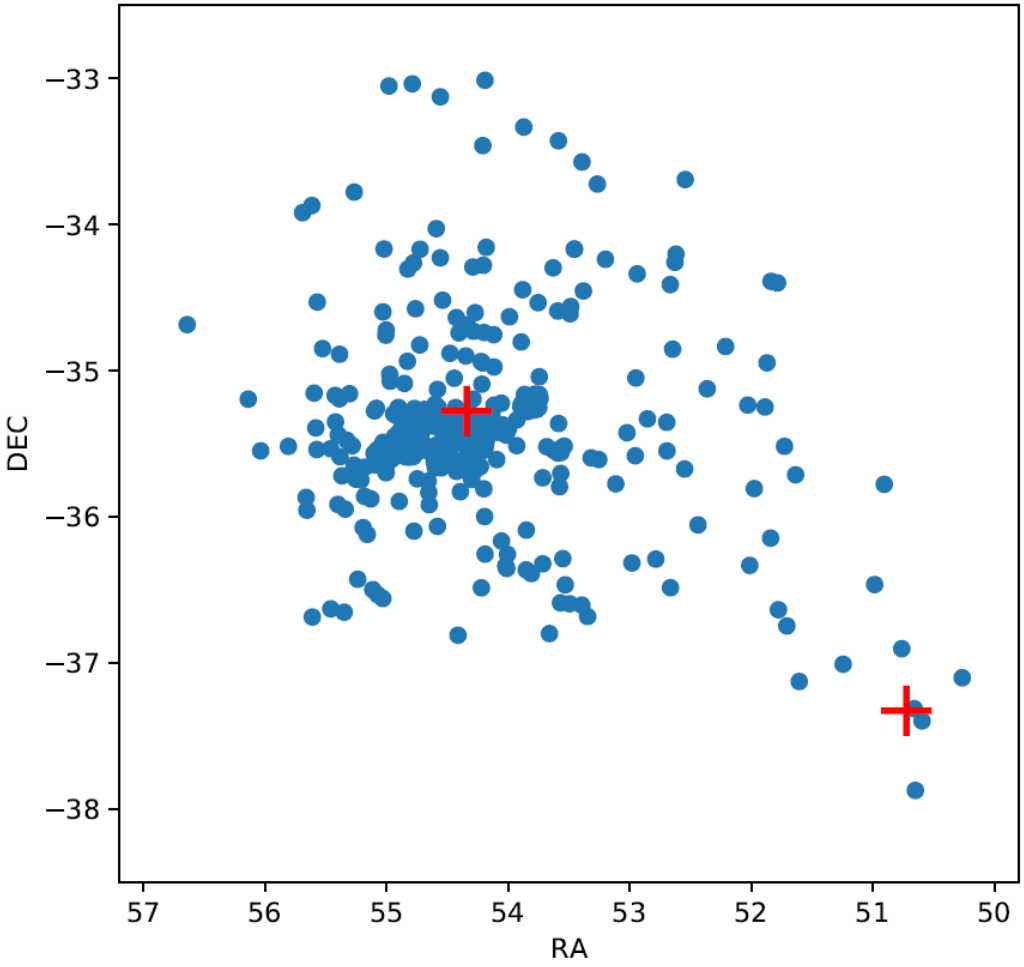


Morphology with MegaMorph

GALAPAGOS → Sextractor + GalfitM

	Mag	Re	N	AR	PA
Tot	12	2	2	1	1
Bulge	12	2	2	1	1
Disc	12	2	0	1	1

FORNAX cluster



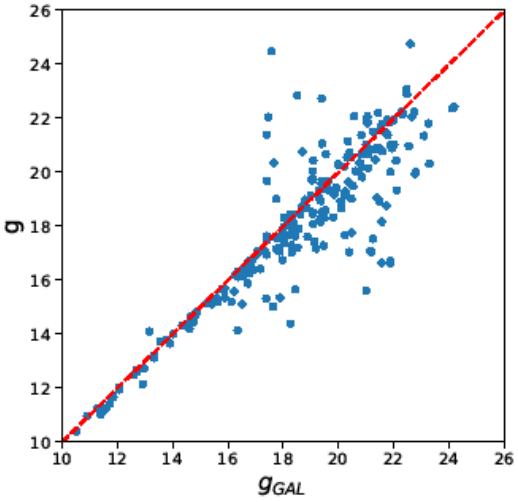
Catalog: match from literature catalogs

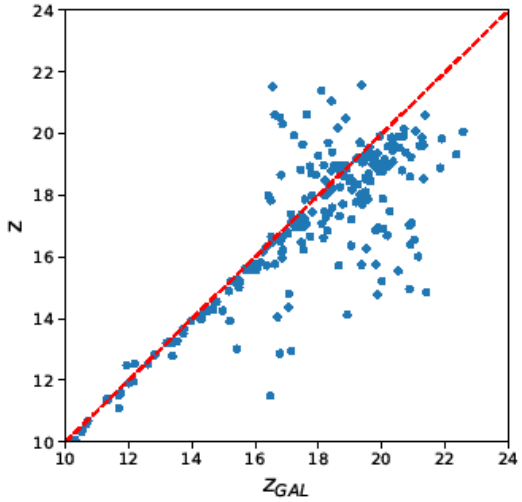
[Ferguson et al, 1989 Jordan et al, 2007 Schroeder et al, 2009 Venhola et al, 2017-2018 Maddox et al, 2019]

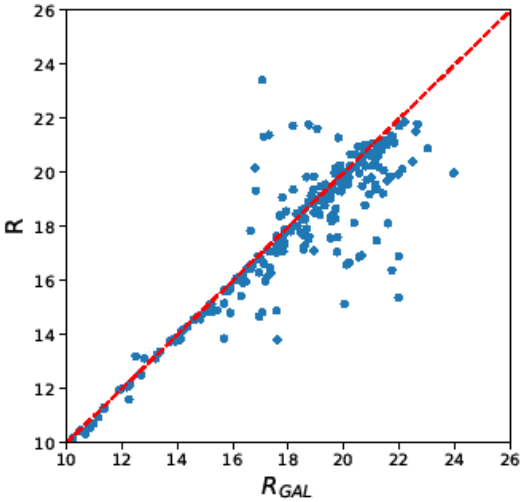
[Thanks Analia and Laerte!]

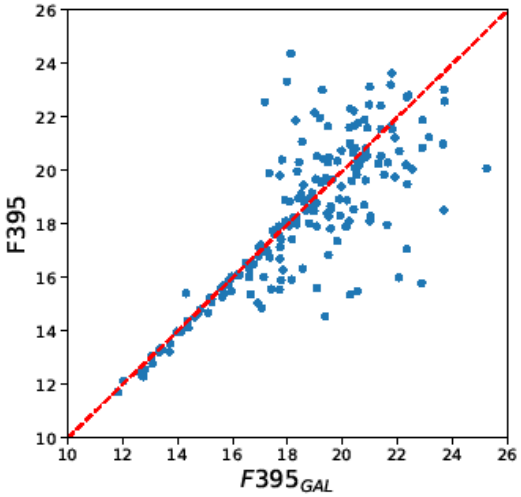
Sample: 500 galaxy members

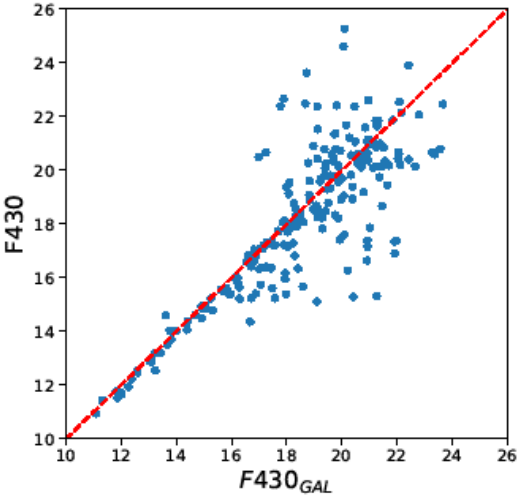
Magnitude comparison with SPLUS iDR3





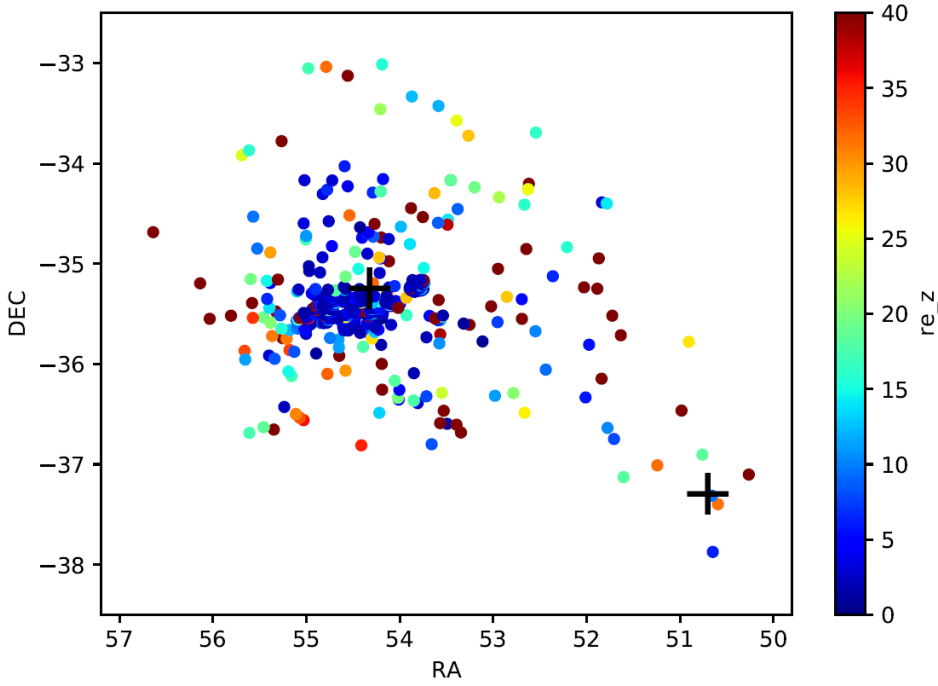


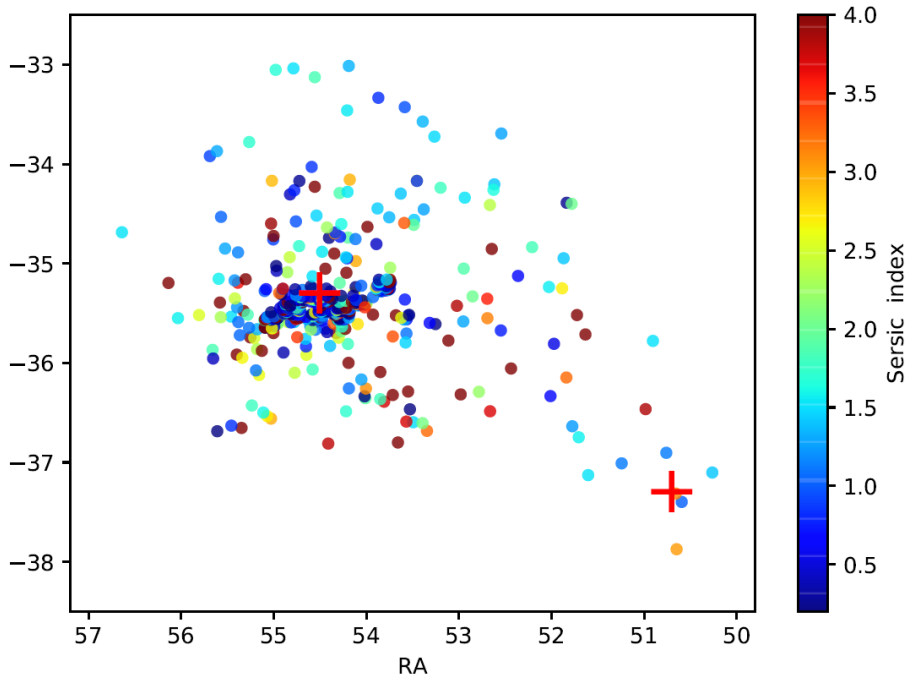




Morphology – limits

Spatial distribution of morphologies inside the cluster



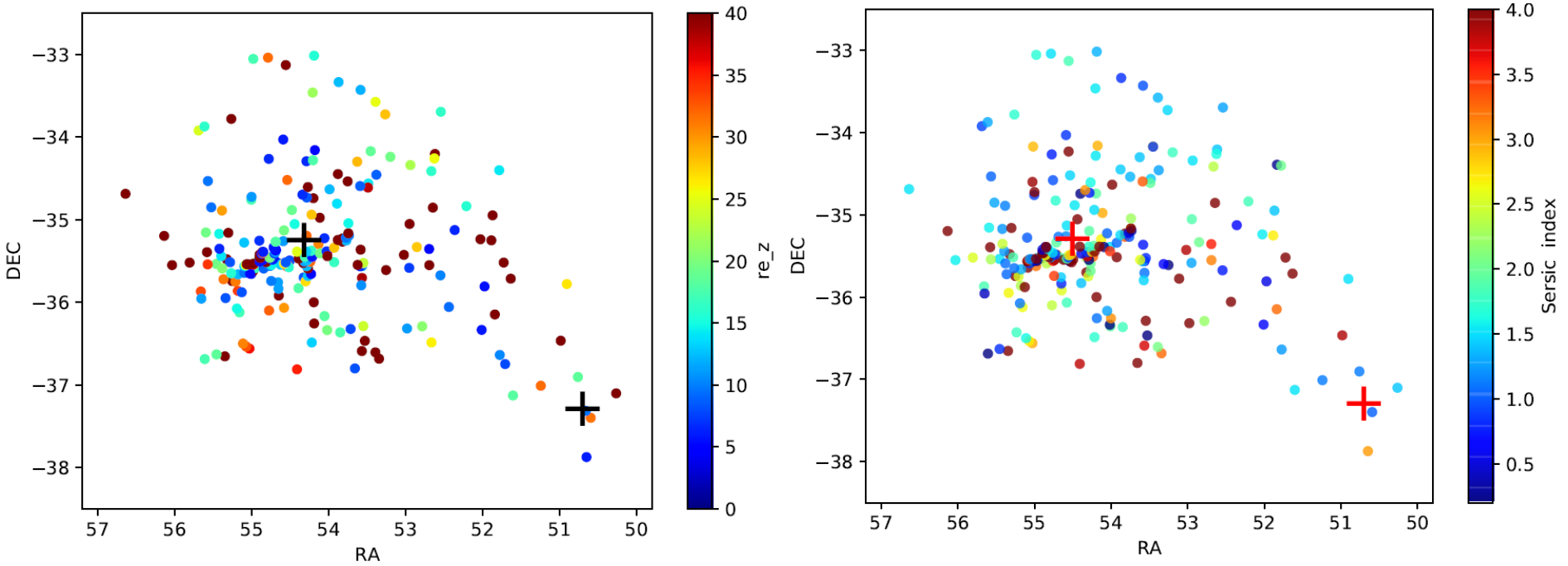


Compact object with size comparable with the psf sizes are removed

Sample: 300 galaxy members

Morphology – limits

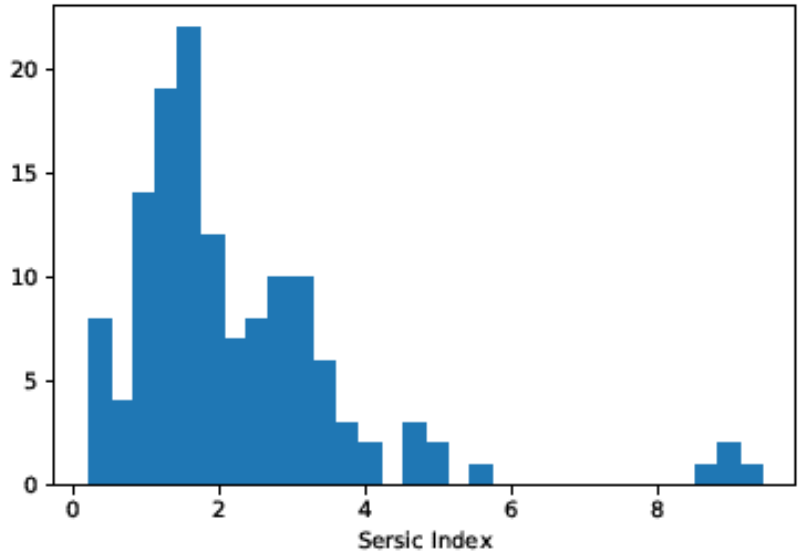
Spatial distribution of morphologies inside the cluster

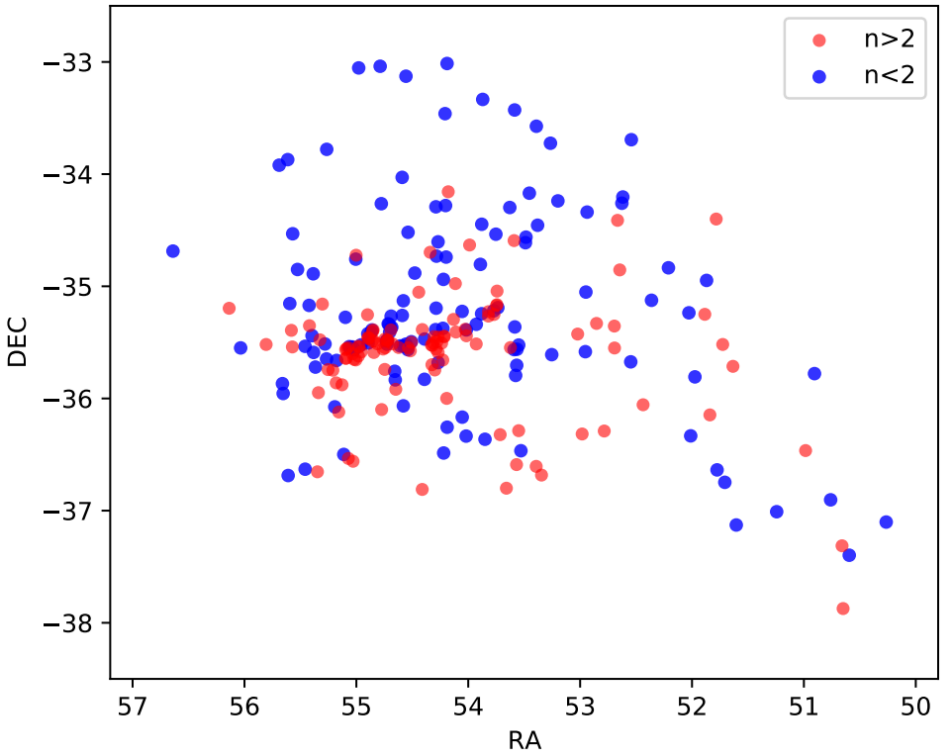


Small spheroidal objects populate the central region

Morphology – Sérsic index

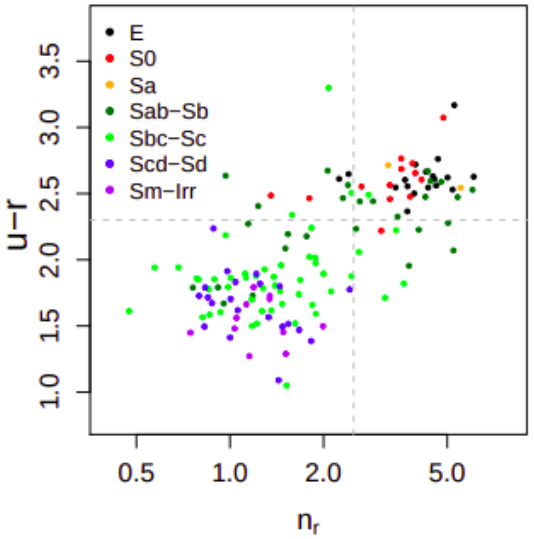
Spatial distribution of the Sérsic index/morphologies inside the cluster

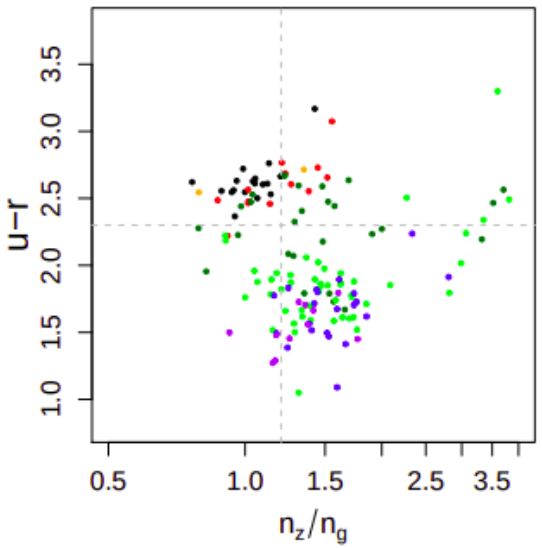


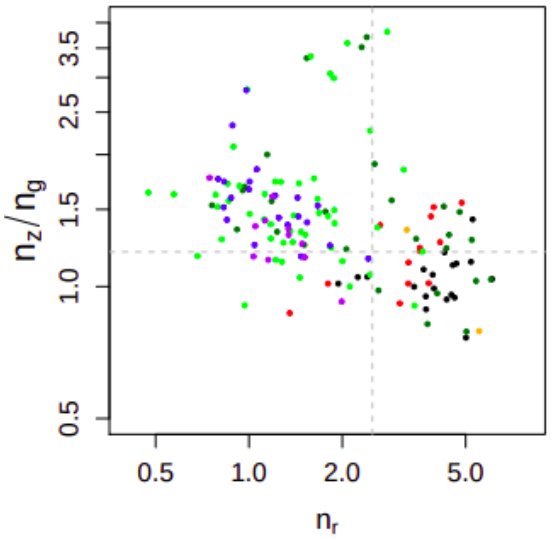


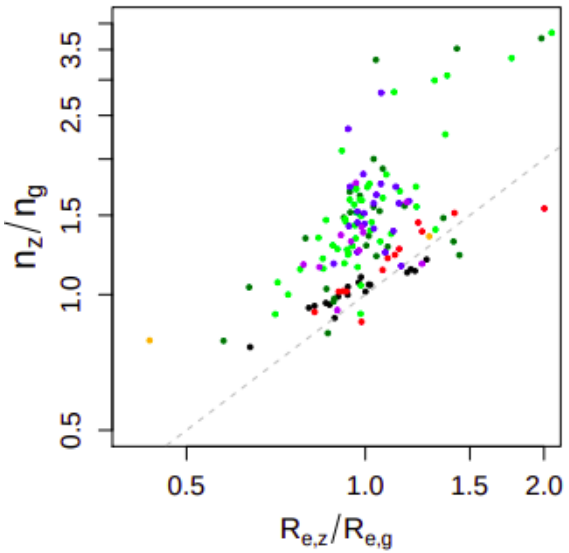
Multi-wavelength dependences to classify

Vika et al, 2014



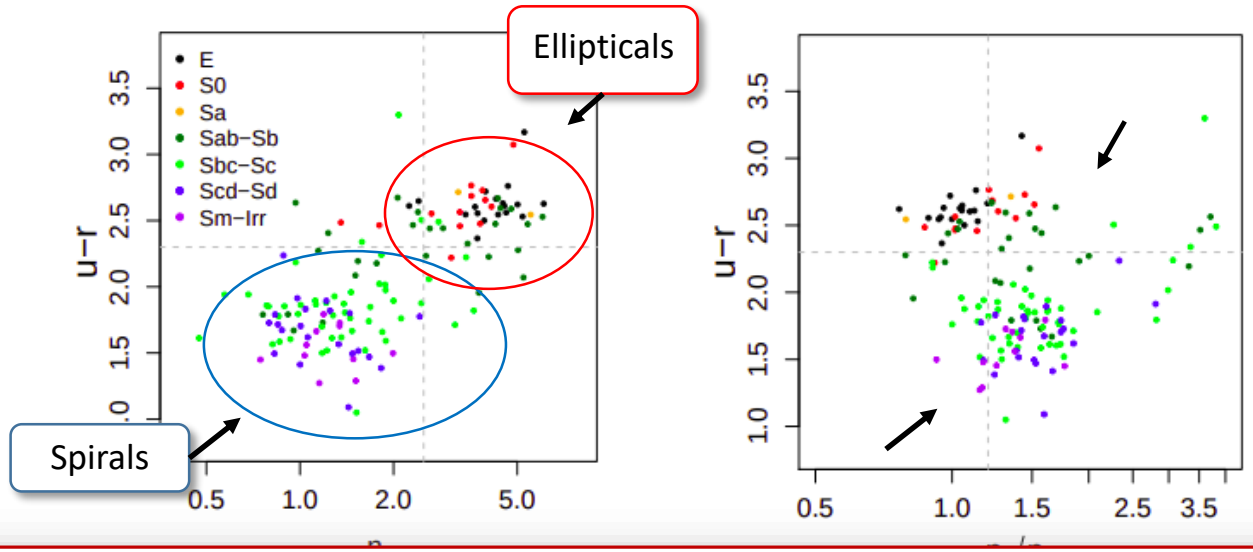




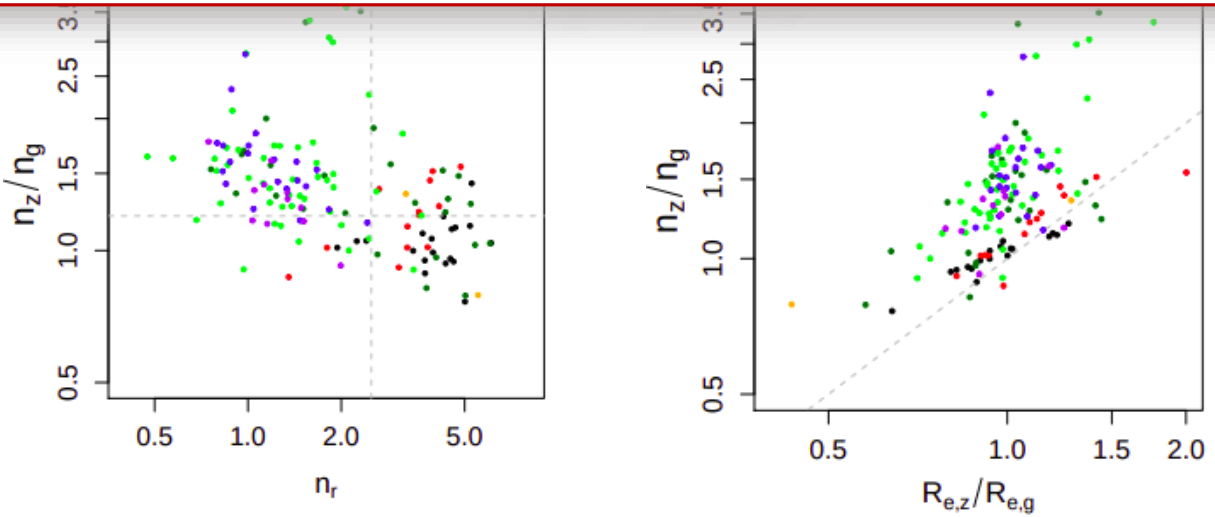


Multi-wavelength dependences to classify

Vika et al, 2014

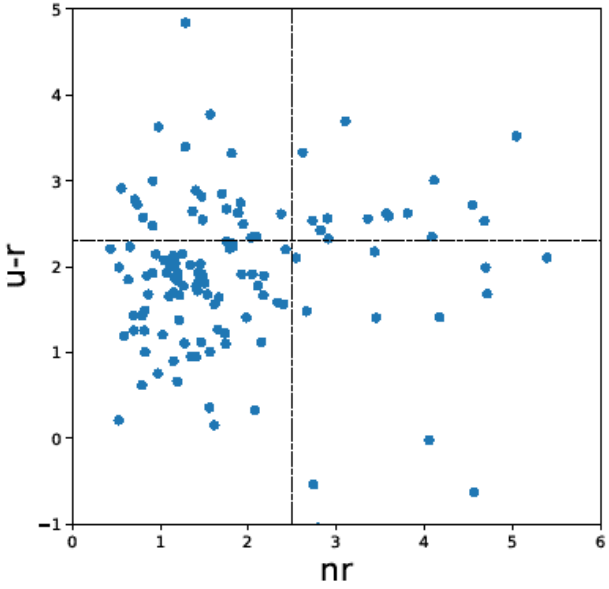


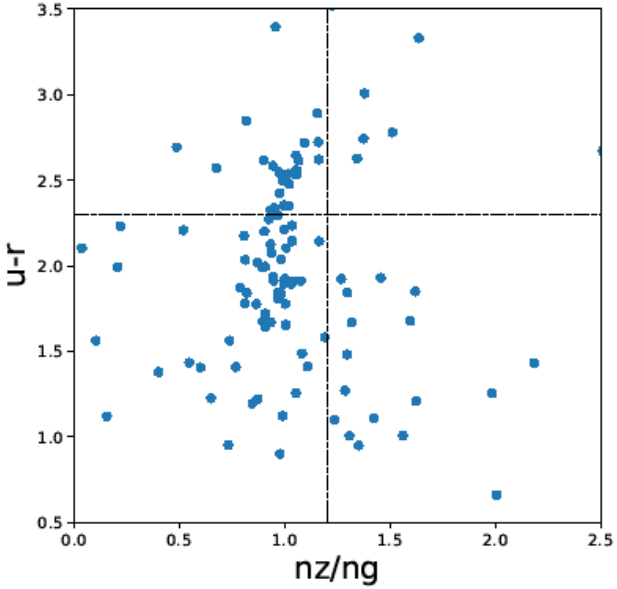
Disentangle morphological types thanks to the wavelength dependence of the Sérsic profile

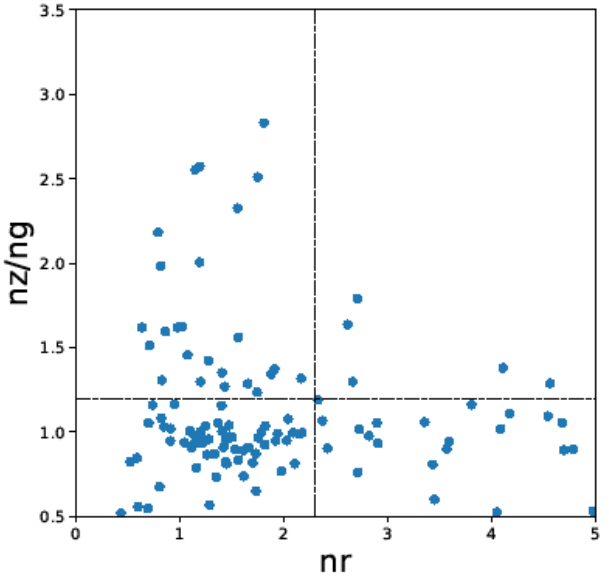


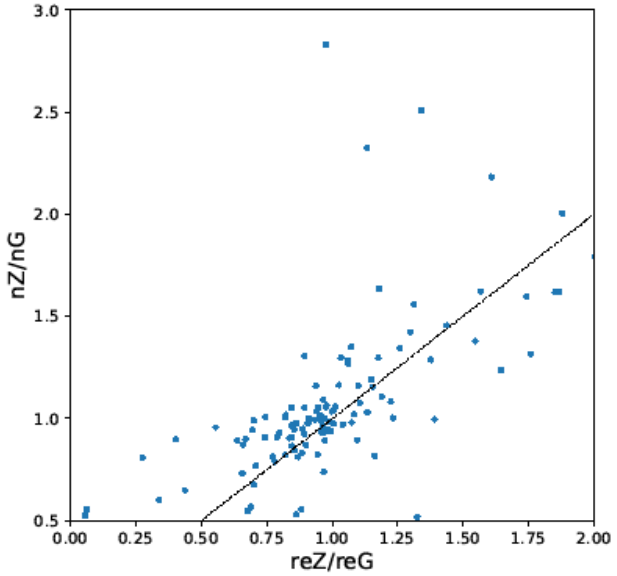
Multi-wavelength dependences to classify

Vika et al, 2014



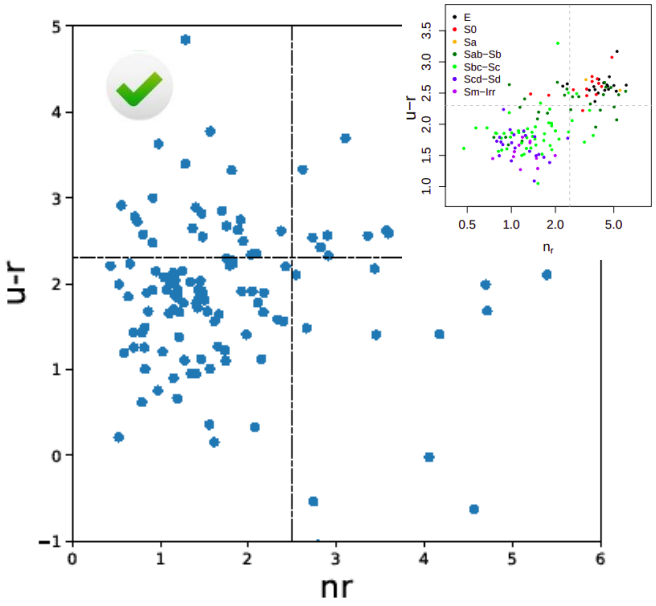


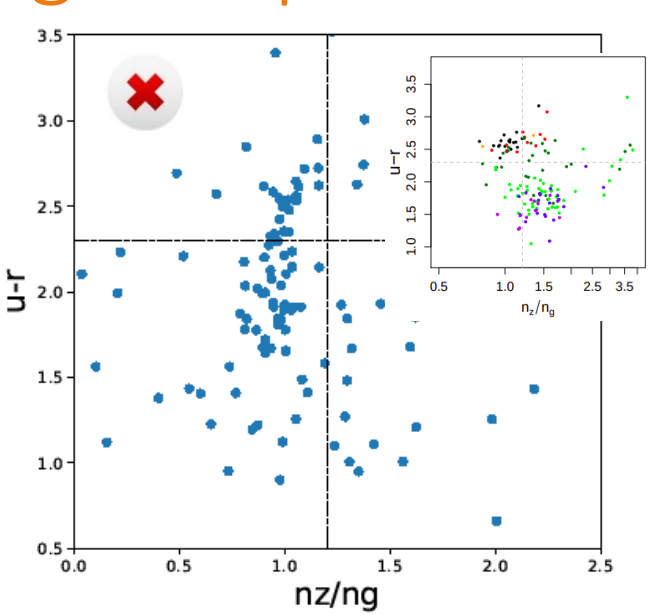


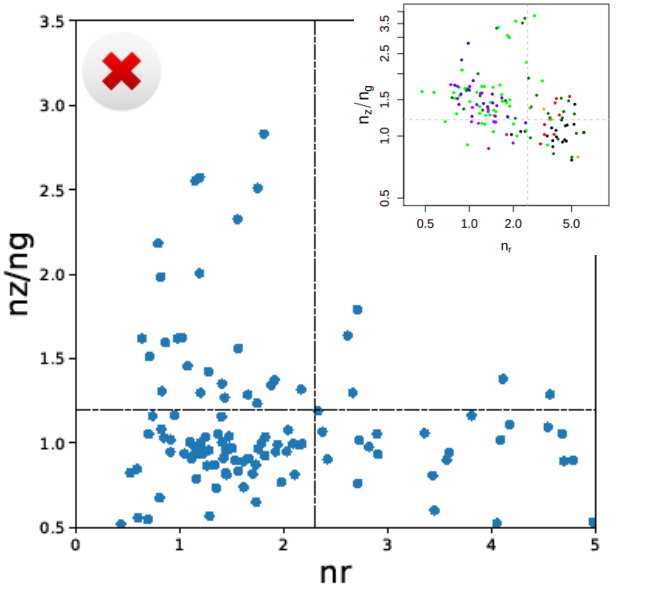


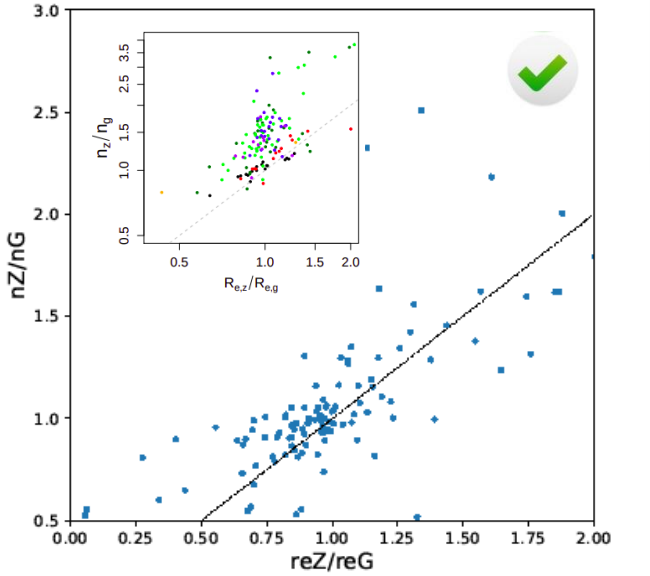
Multi-wavelength dependences to classify

Vika et al, 2014



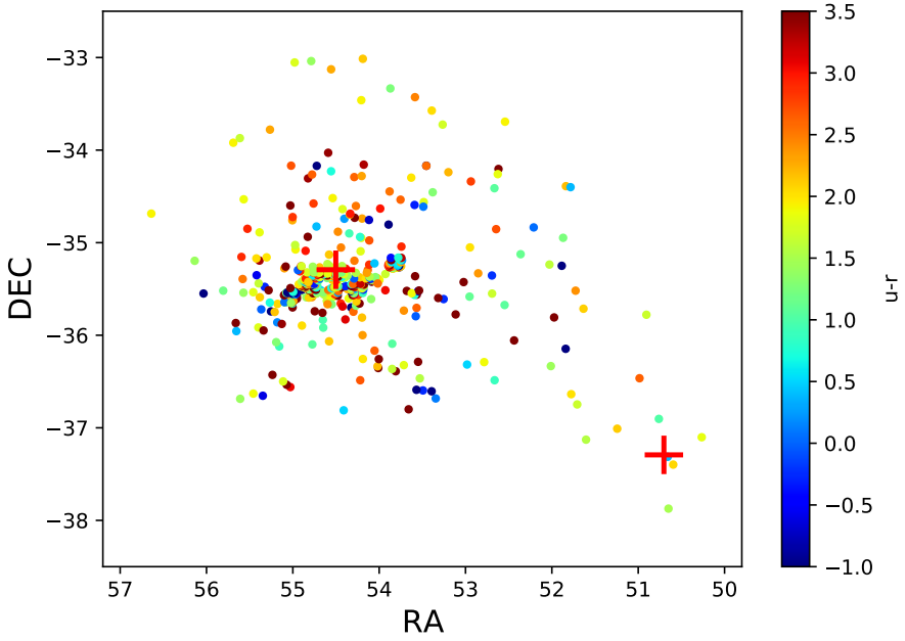


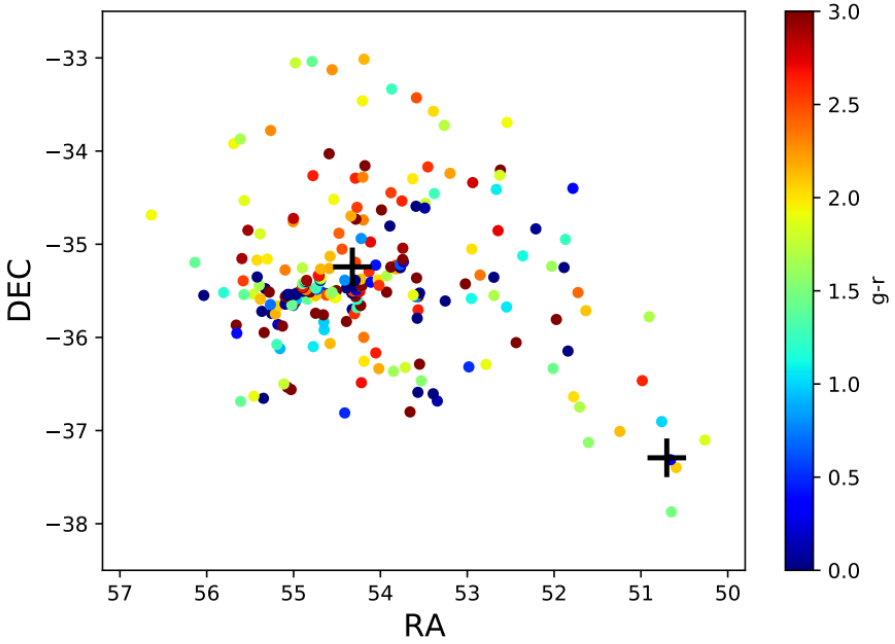


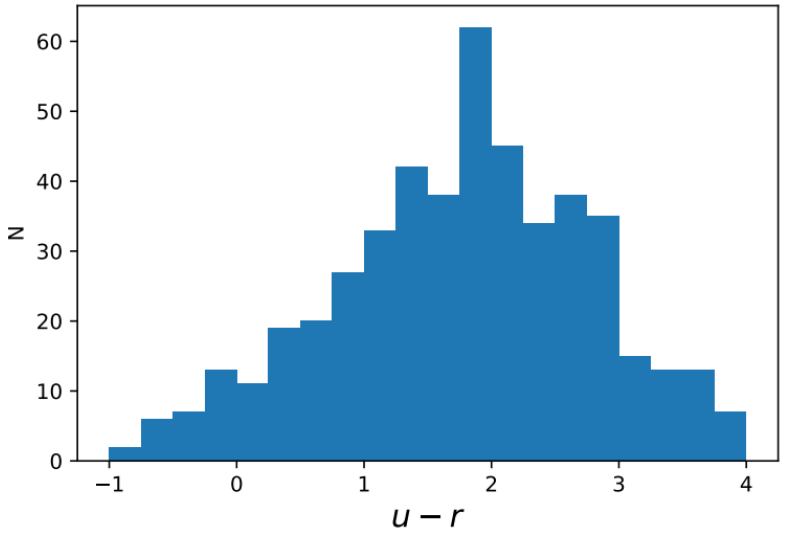


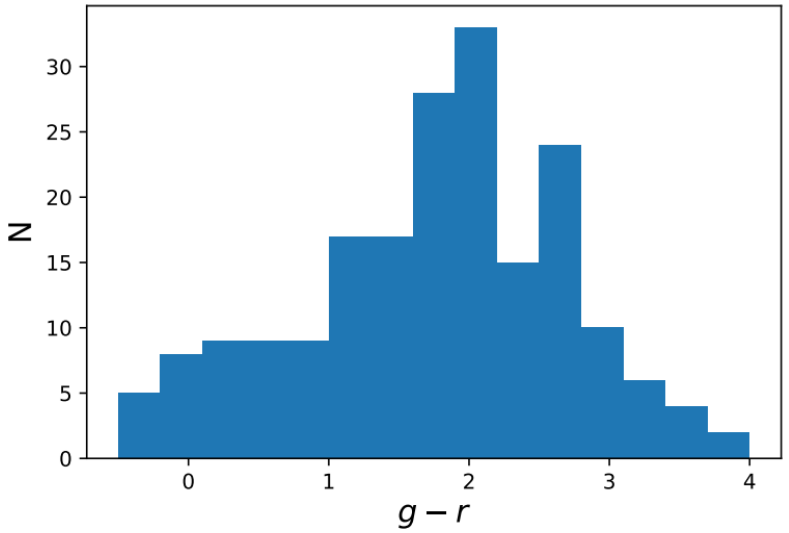
Different distribution of galaxies points toward different morphological evolution of galaxies in clusters

Color distribution

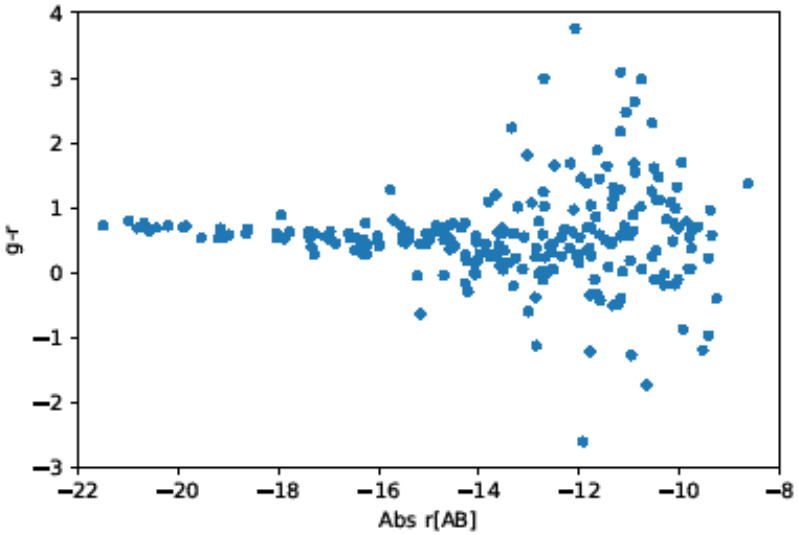


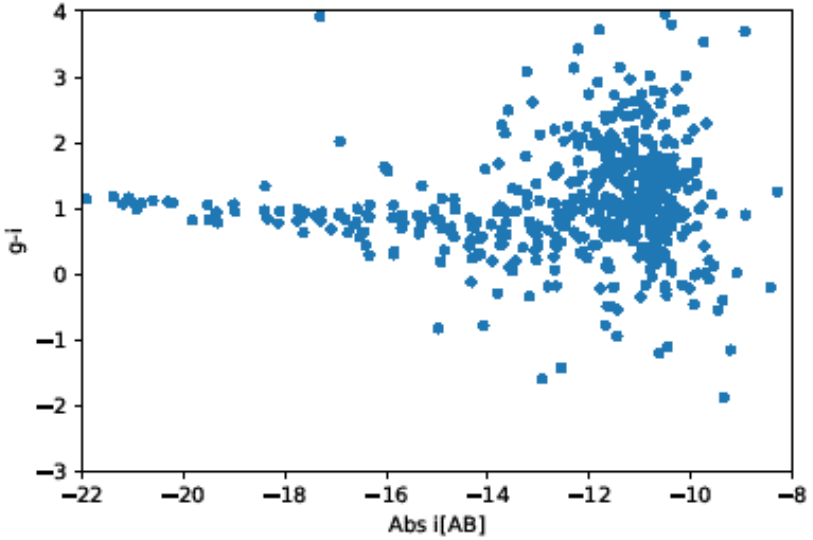


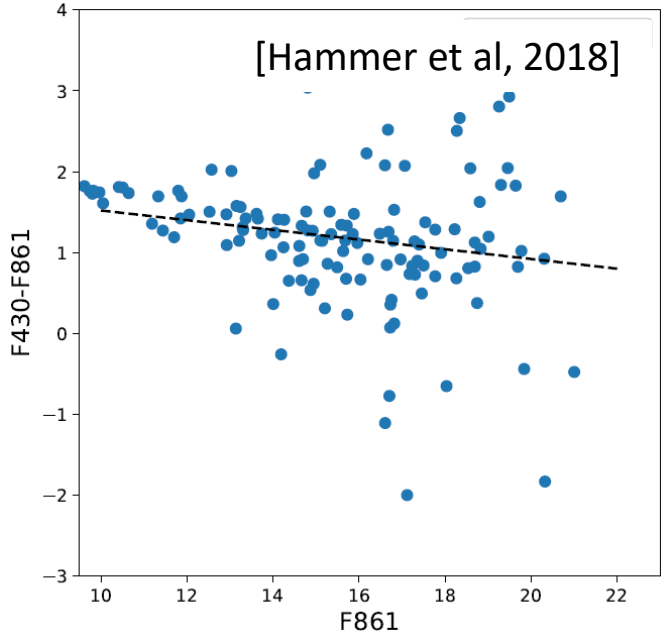


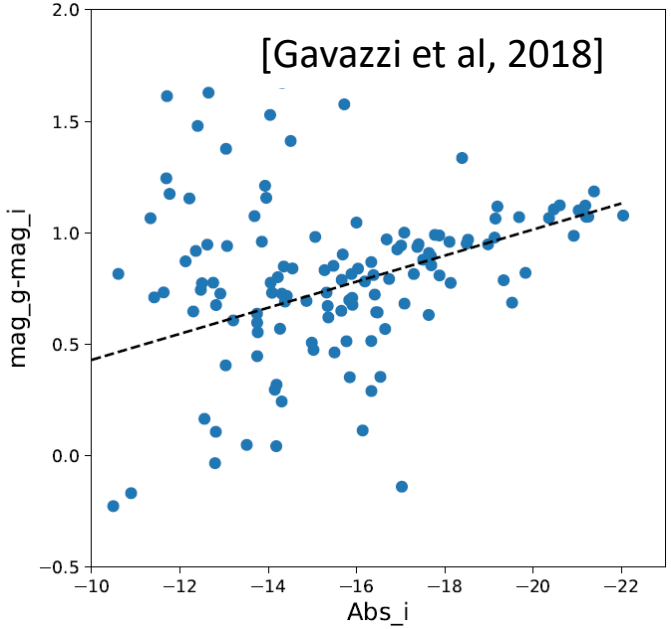


Color-magnitude diagrams

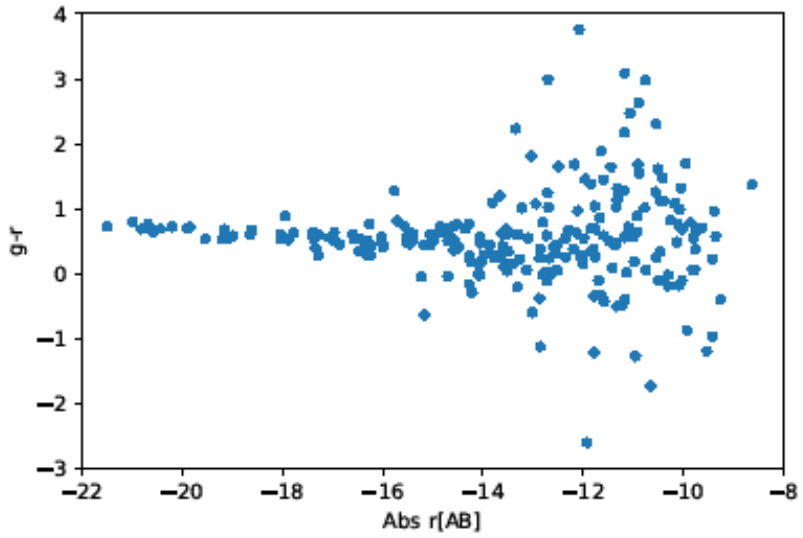


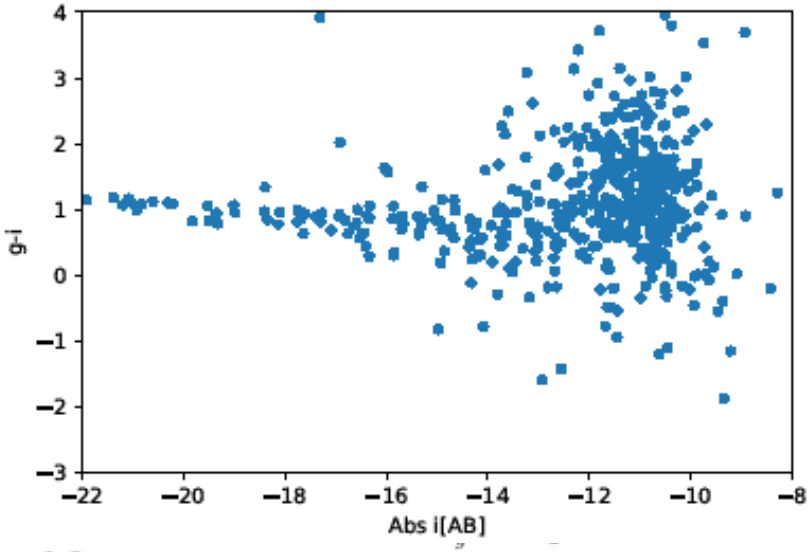


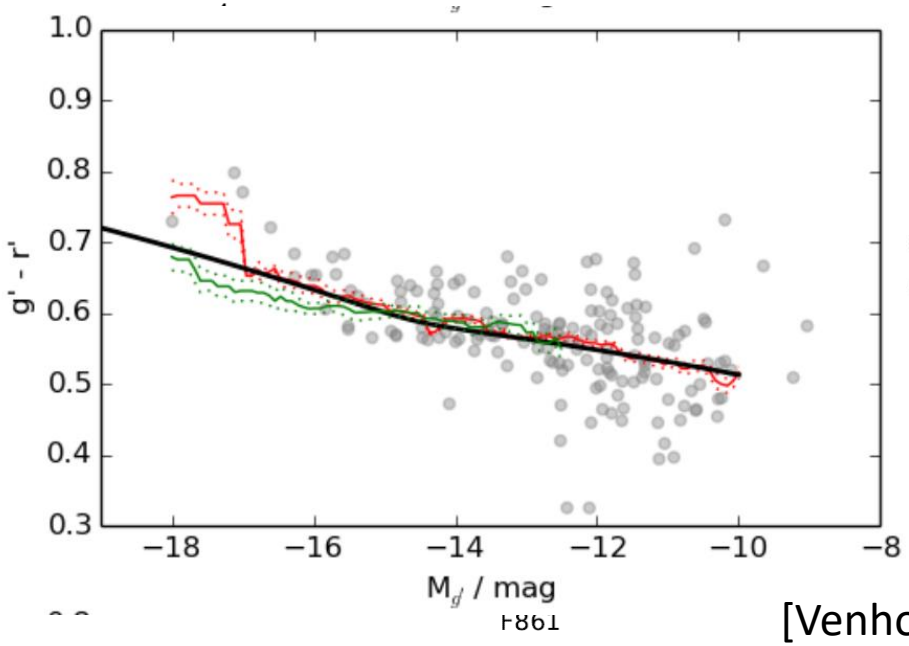


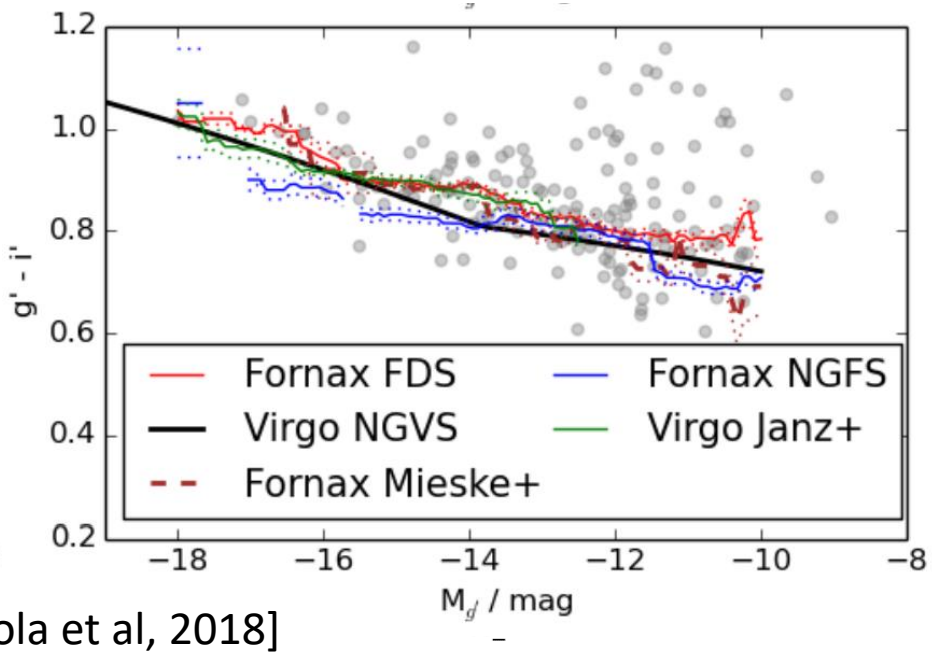


Color-magnitude diagrams



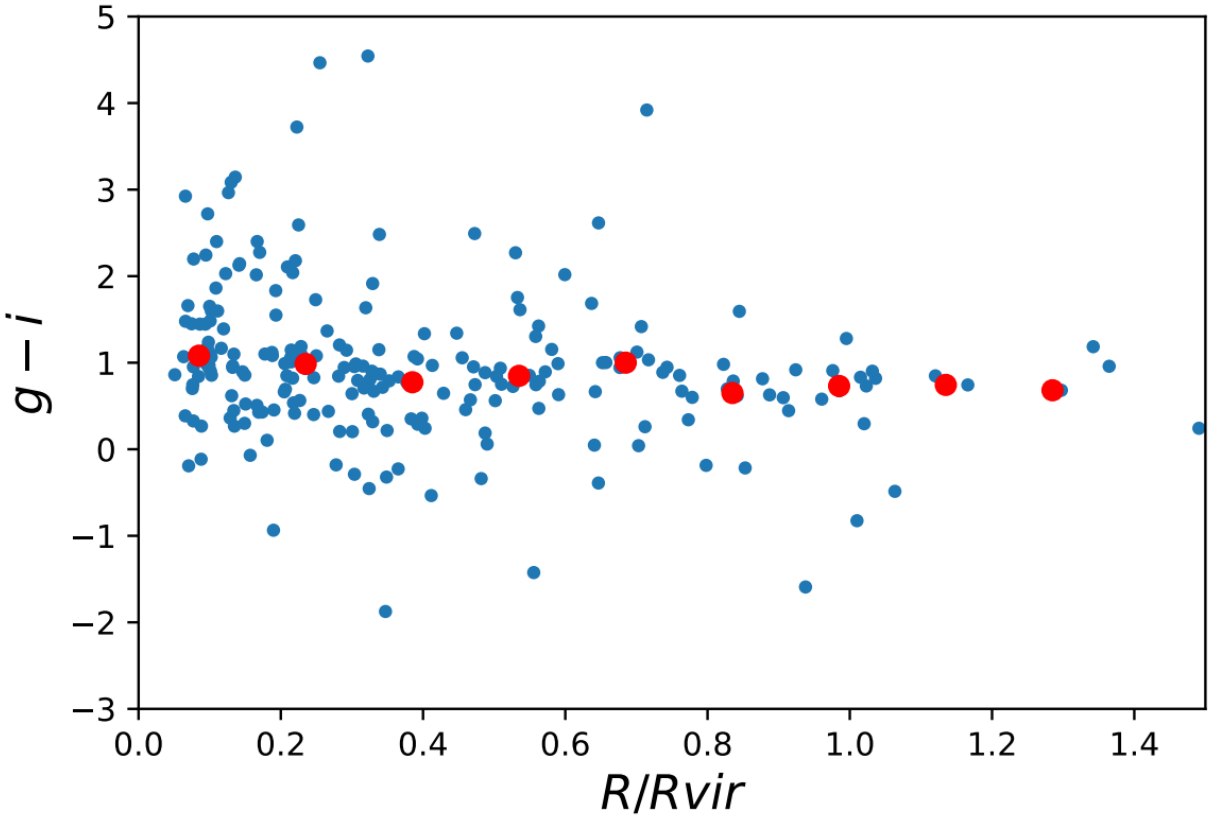




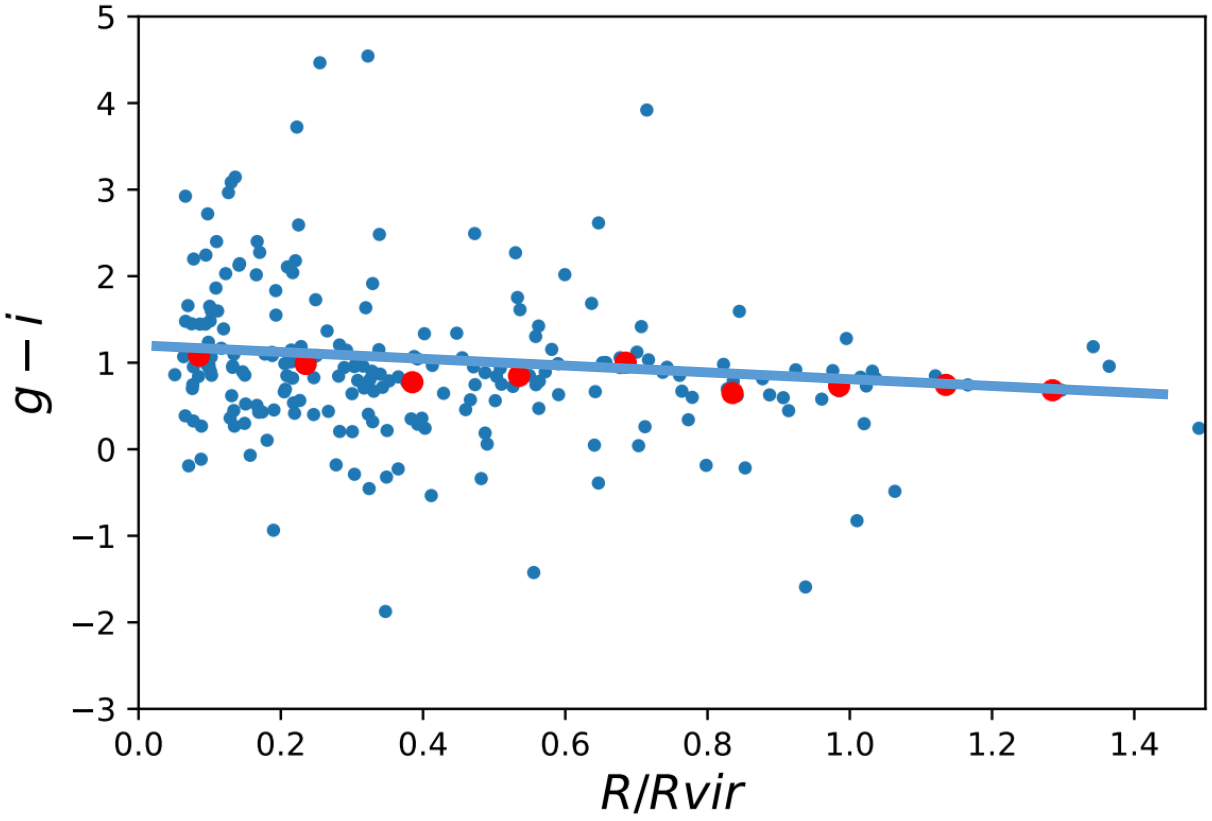


[Venhola et al, 2018]

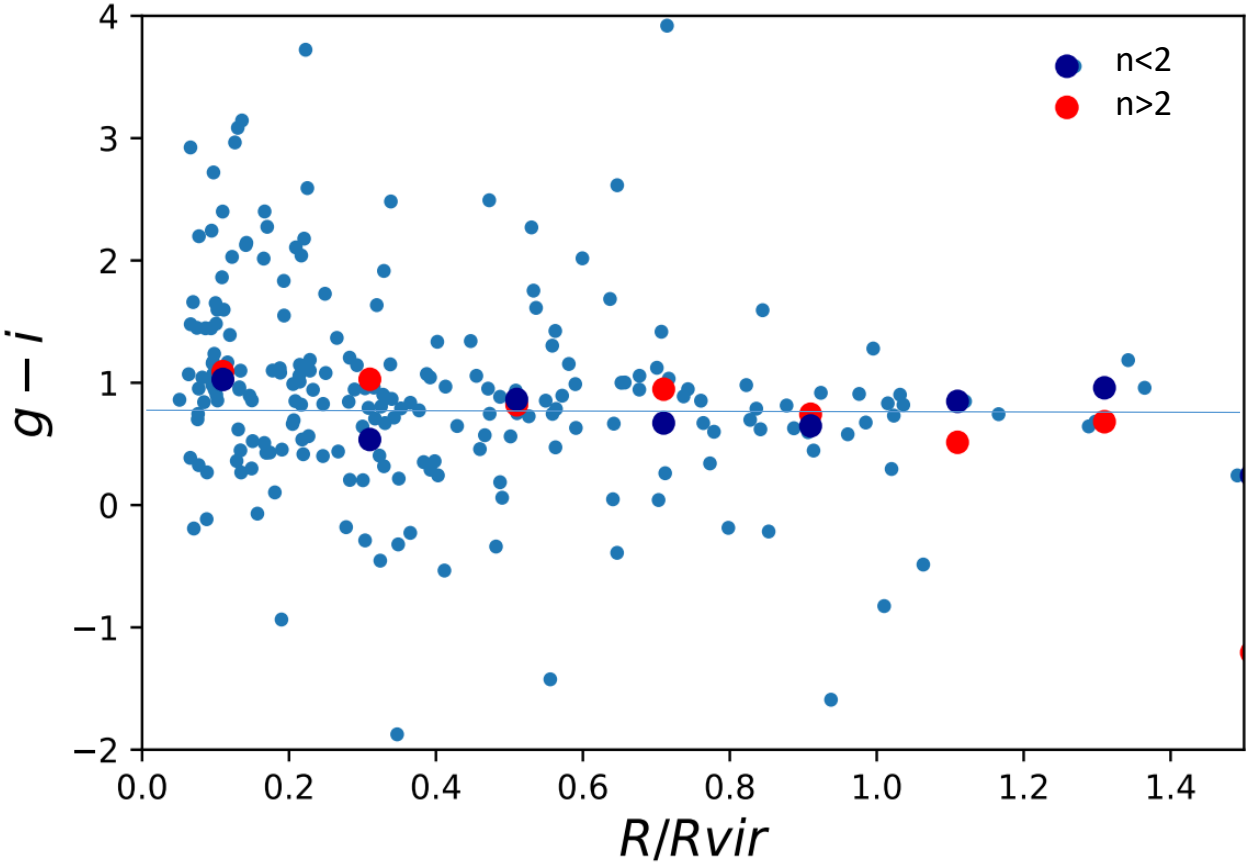
Radial distribution – colors - morphology



Radial distribution – colors - morphology

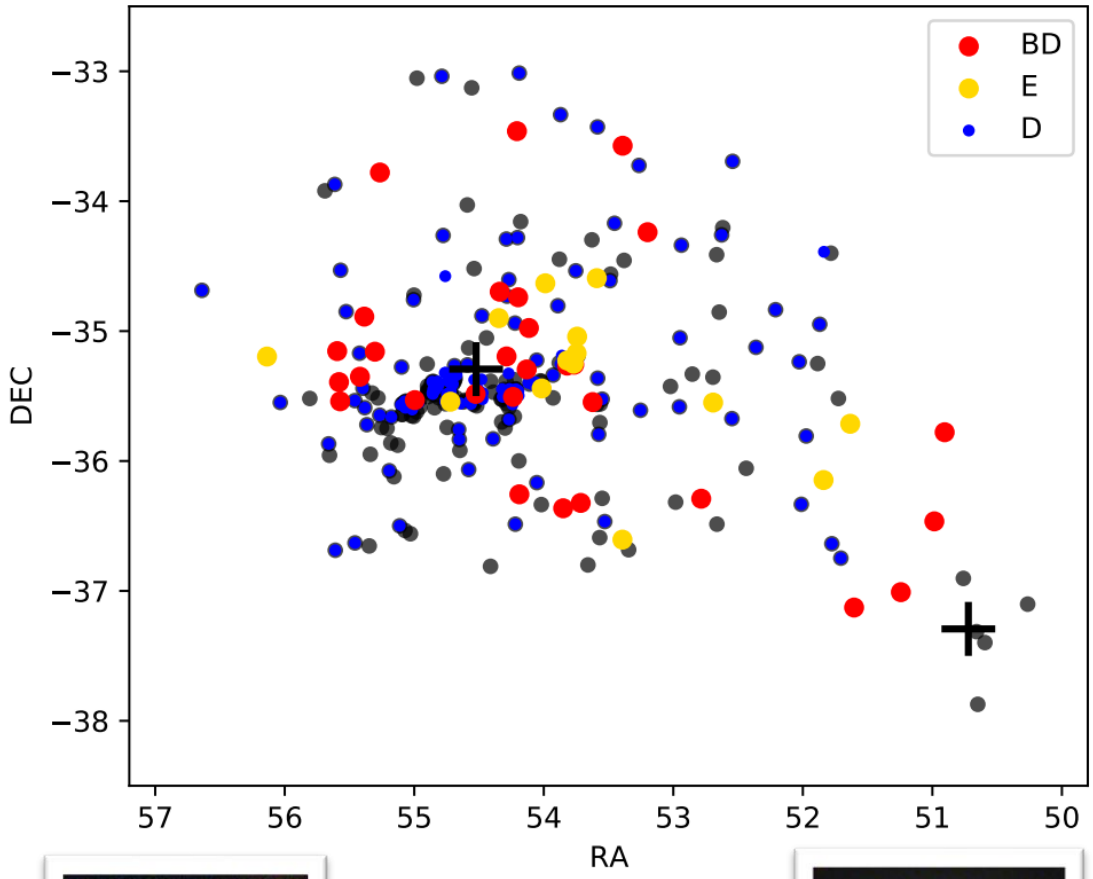


Radial distribution – colors - morphology



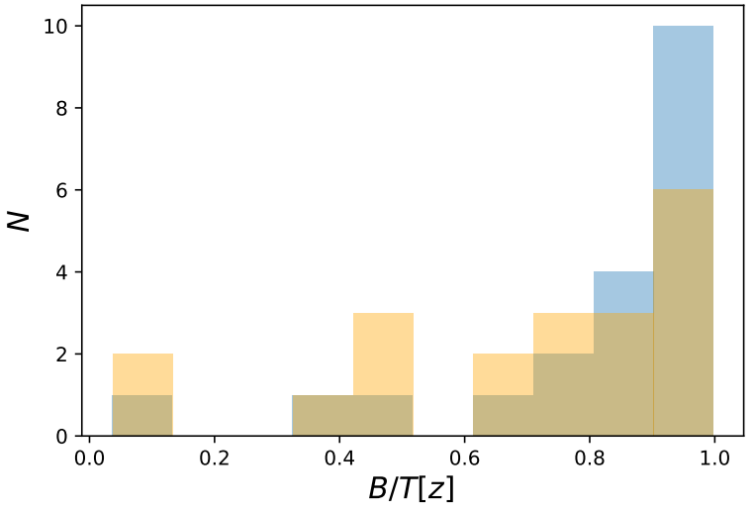
Morphology – where are bulges and disks?

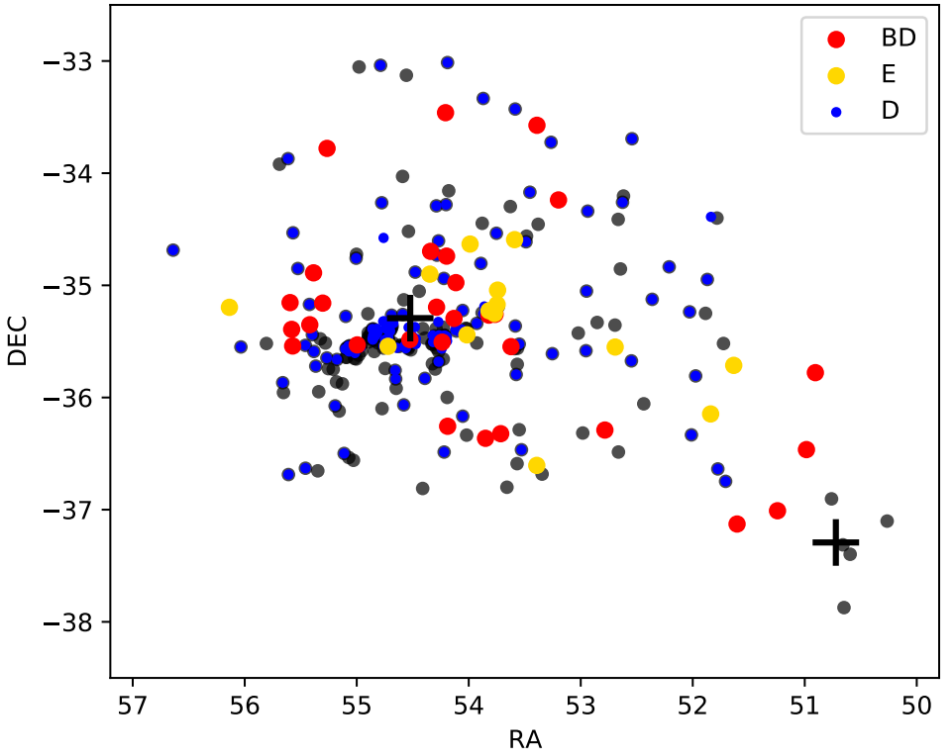
Preliminary results



Radial distribution – morphology

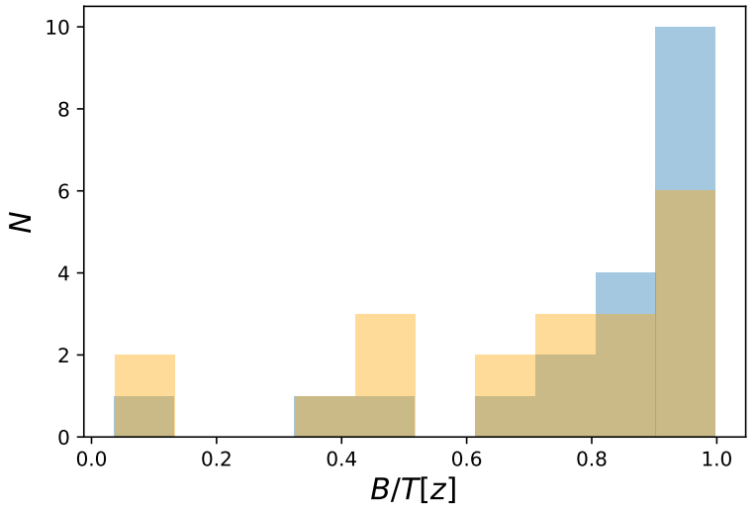
Preliminary results

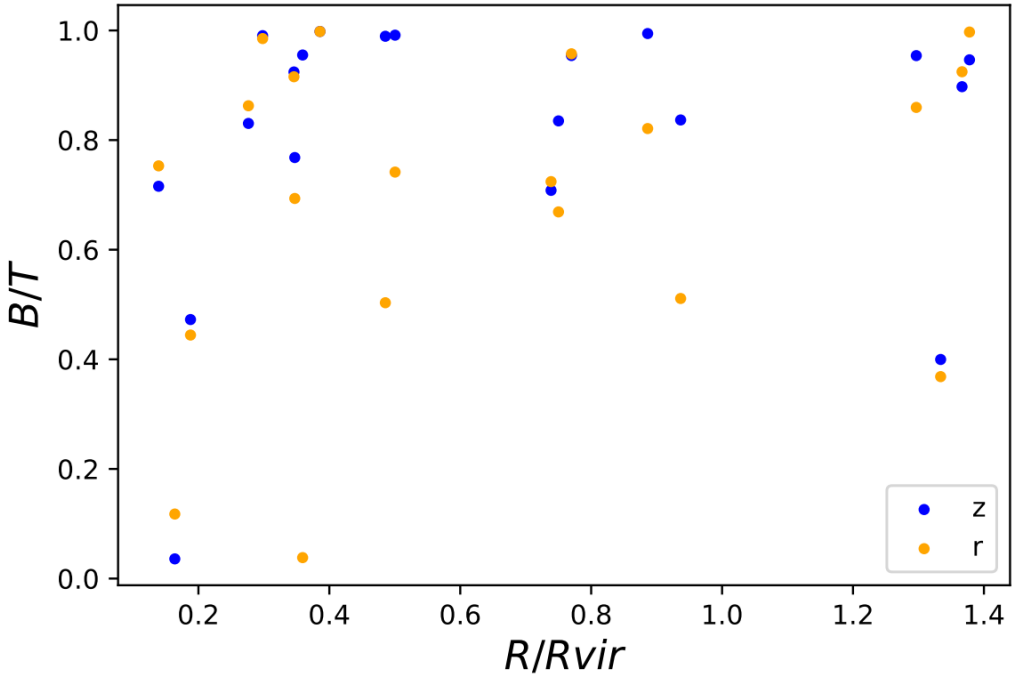




Radial distribution – morphology

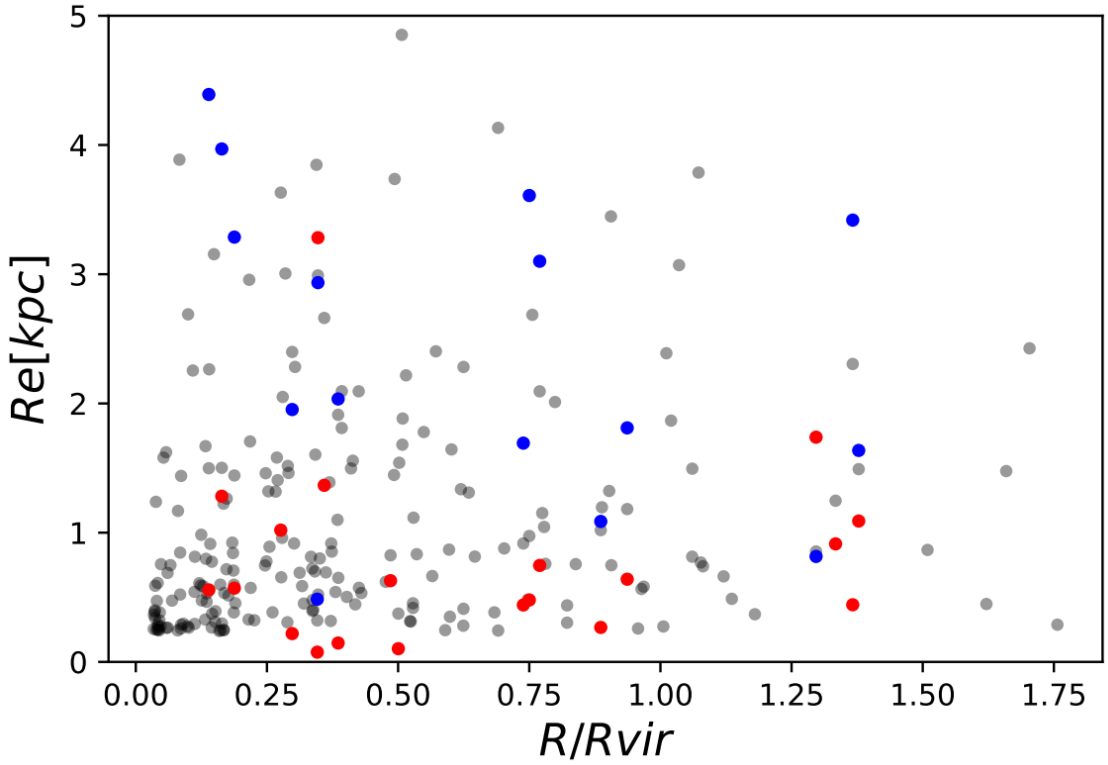
Preliminary results





Radial distribution - size

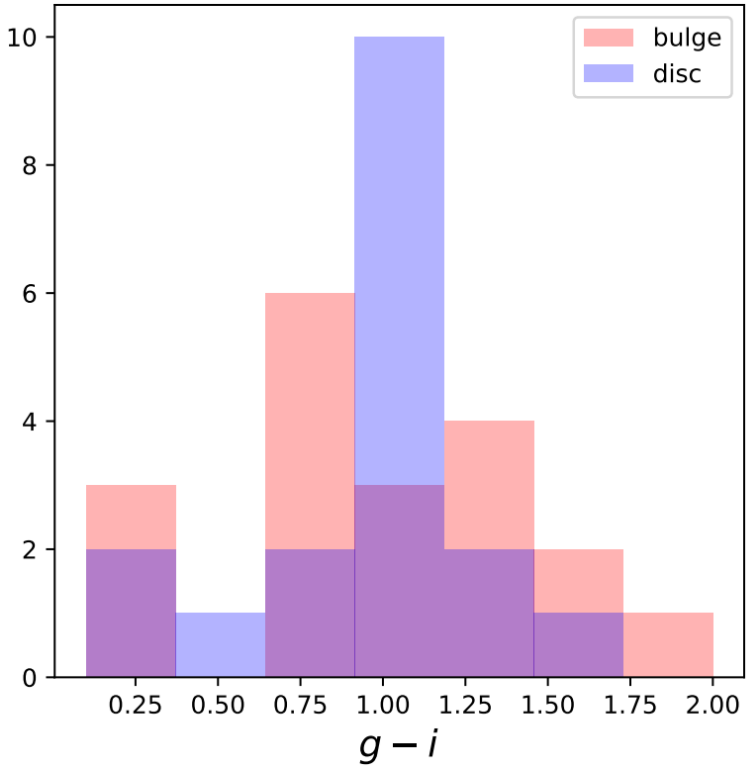
Preliminary results



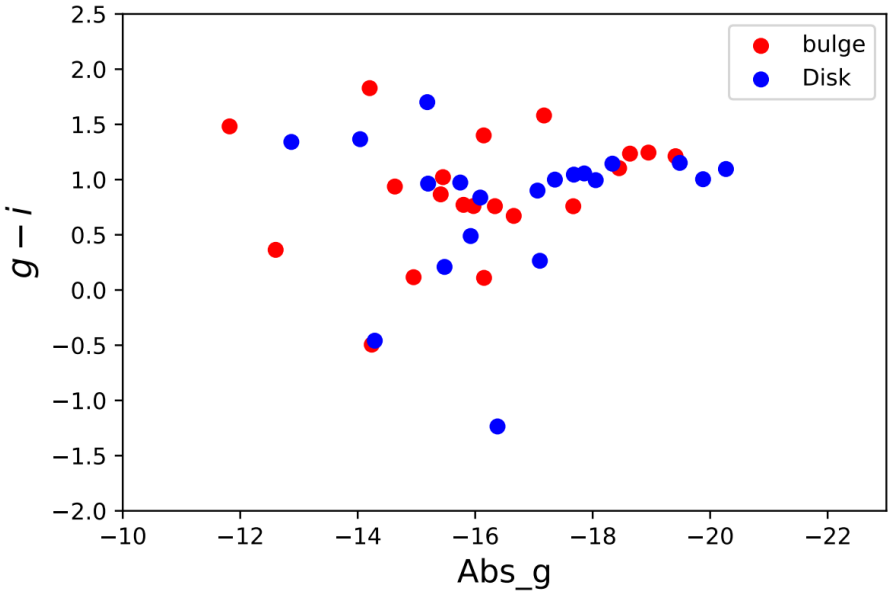
Weak dependences of sizes with the environment

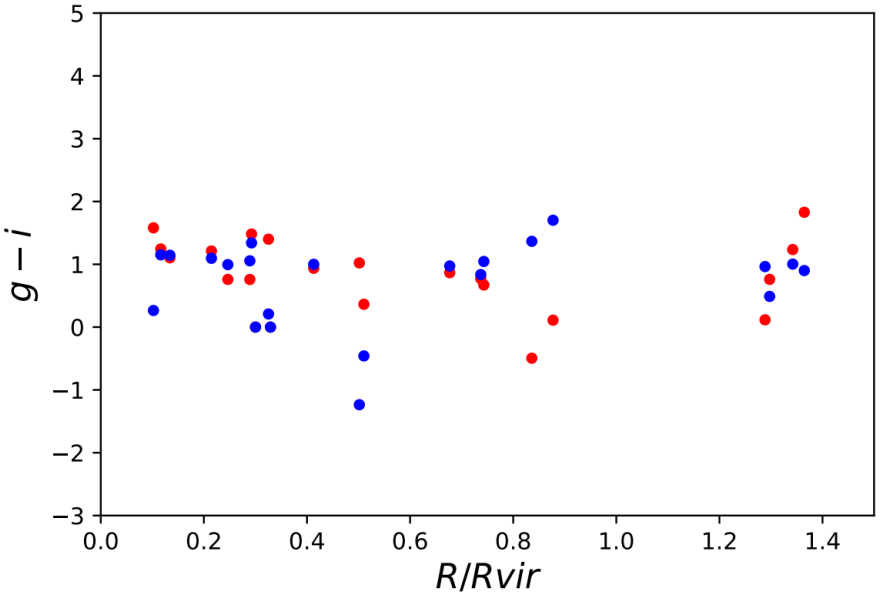
Radial distribution – colors - morphology

Preliminary results



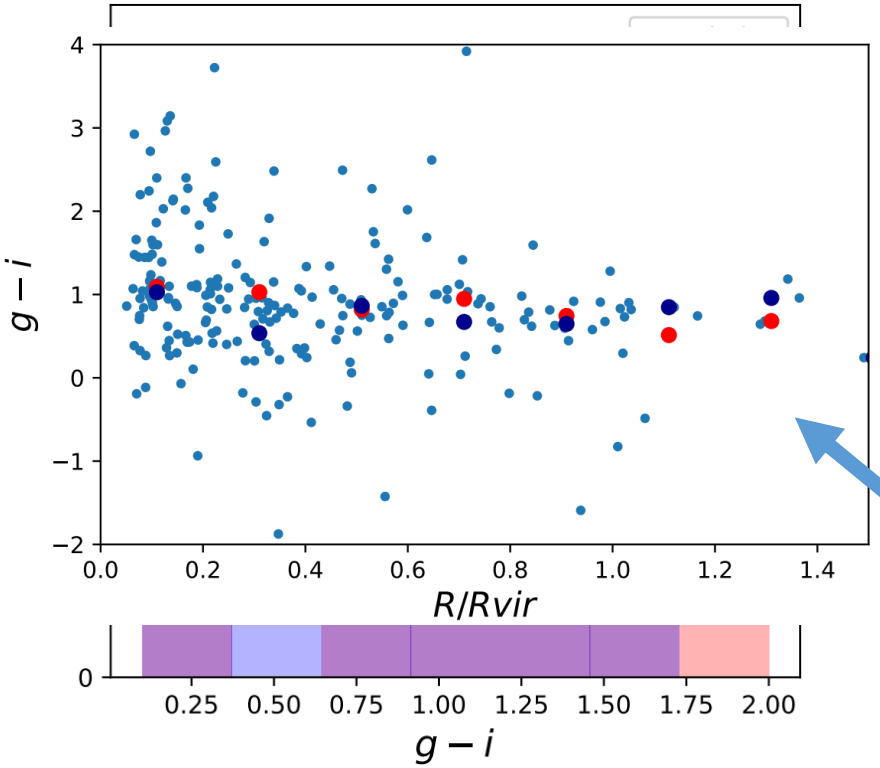
Bulges are redder then disks

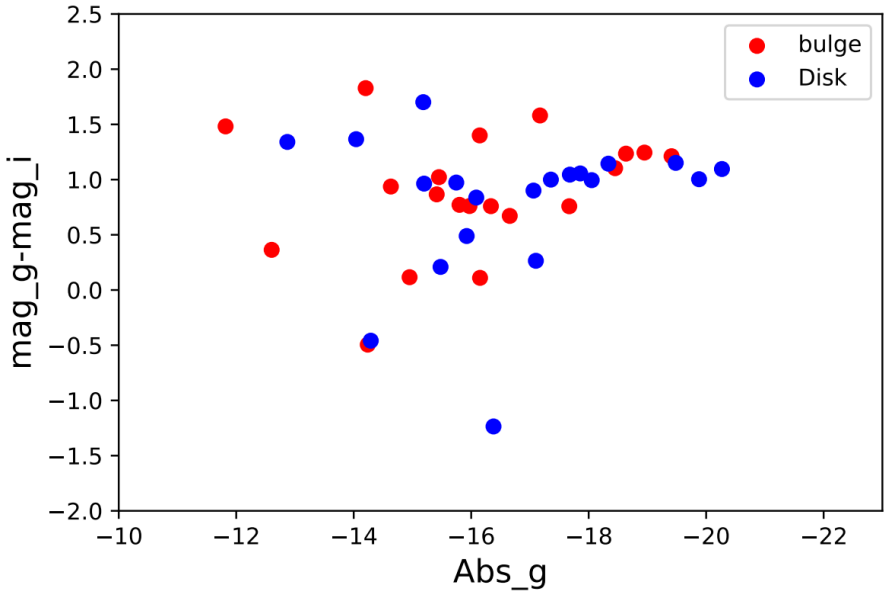


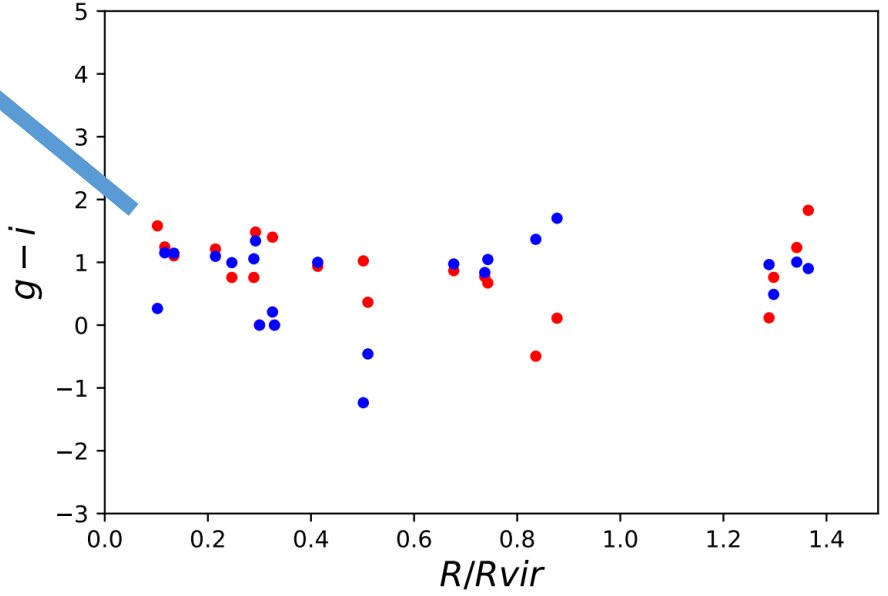


Radial distribution – colors - morphology

Preliminary results

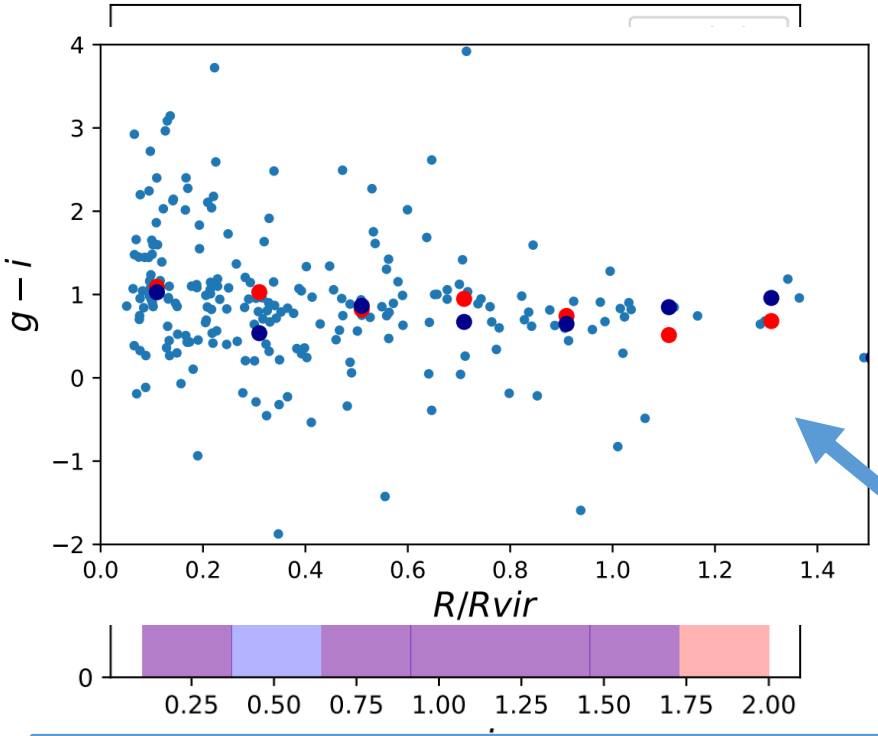


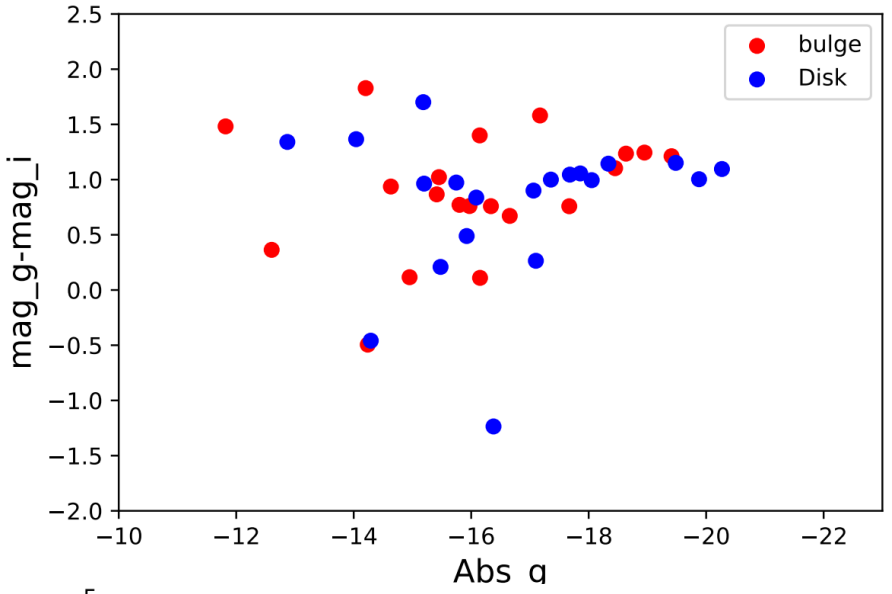


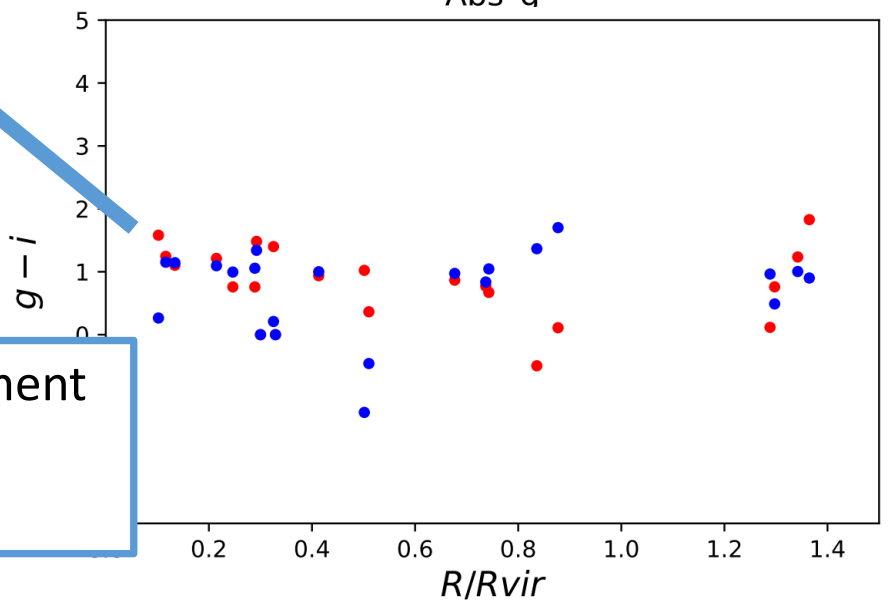


Radial distribution – colors - morphology

Preliminary results







Lack of color gradient with the environment

Morphological quenching?

Lackner & Gunn (2013)

Next steps …

- Better Morphological classification to be compared with the visual one - non parametric classification

- Retrieve stellar populations properties of cluster members and bulges and discs

- Compare with Fornax like clusters from simulations (Fornax simulation group from M. De Rossi et all)

- Compare field-cluster galaxy properties to investigate quenching and morphological transformation

- Additional ideas are welcome!


Thank you!