Structural properties and nuclear activity in compact groups and field galaxies in the Stripe 82 region

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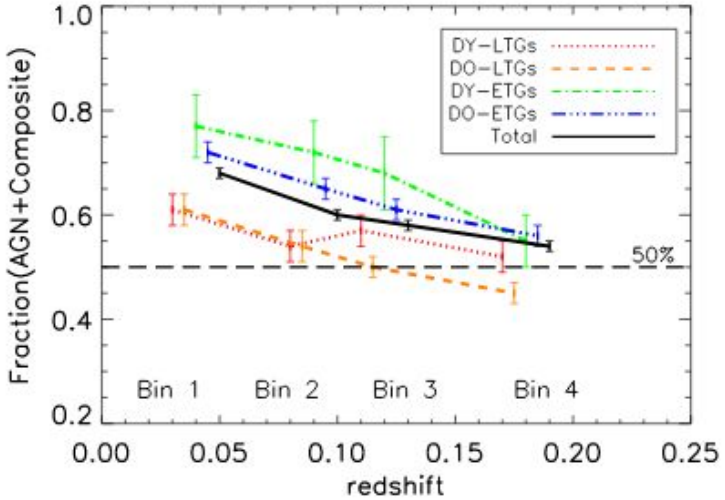
Introduction

- Hickson et al. in 1992 showed that compact groups (CGs) of galaxies are one of the ideal systems to study the effects of galaxy interactions, due to their high galaxy density and low-velocity dispersion.

- Large number of cluster members have been pre-processed in groups and low-mass clusters (Eckert et al. 2014; Pallero et al. 2019, 2020)

- Martinez et al. (2010) showed that the fraction of AGN in CGs is about 42%, also showed that the majority of AGN in CGs have low luminosities and they attributed this to their high gas deficiencies

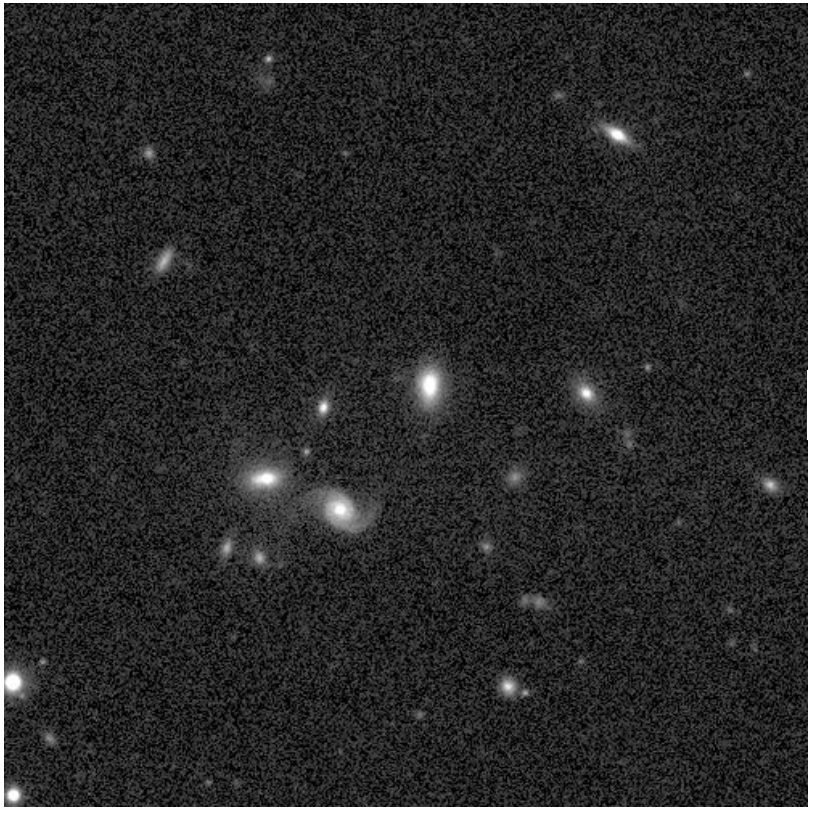
- Bitsakis et al. 2015 propose that the observed increase of LINER and Seyfert 2 nuclei in the early-type galaxies of the dynamically young groups, is due to the morphological transformation of lenticular into elliptical galaxies.



Bitsakis et al. 2015

Sample

- We made a match between the Sohn et al. (2016) and Zheng and Shen (2020) catalogs of compact groups (CGs) in the Stripe 82 regions with the S-PLUS catalog, and obtained a sample of 369 CGs with 1109 galaxies
- And we have 943 S-PLUS field galaxies in the same region of Stripe 82 from the catalog by Baldry et al. (2006)

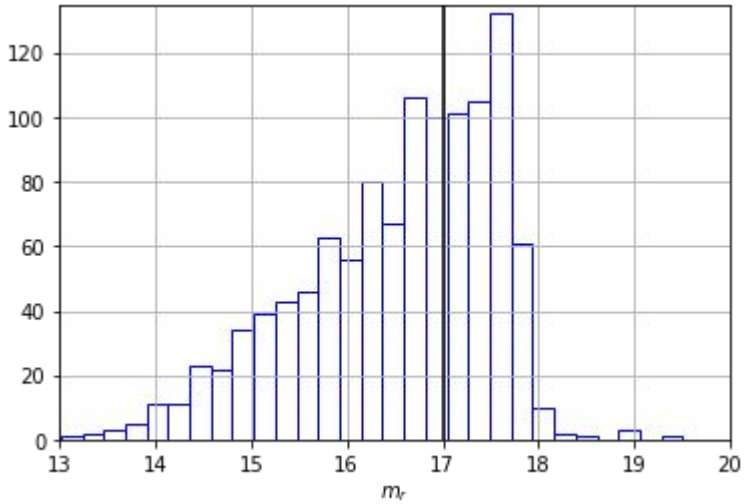


Example: cCGs-4001 in the r-band

Morfometryka (MFMTK) and Spectral index with SDSS

We used data from Morphometryka (MFMTK) which is an algorithm to automatically classify galaxies from astronomical images, which gives us different parameters. Since MFMK results are reliable for r-band magnitudes smaller than 17, in the figure a histogram of mr is shown with the cut at 17. We have a subsample of 713 galaxies in a CGs with reliable MFMK outputs, that represents 64.3% of our original sample.

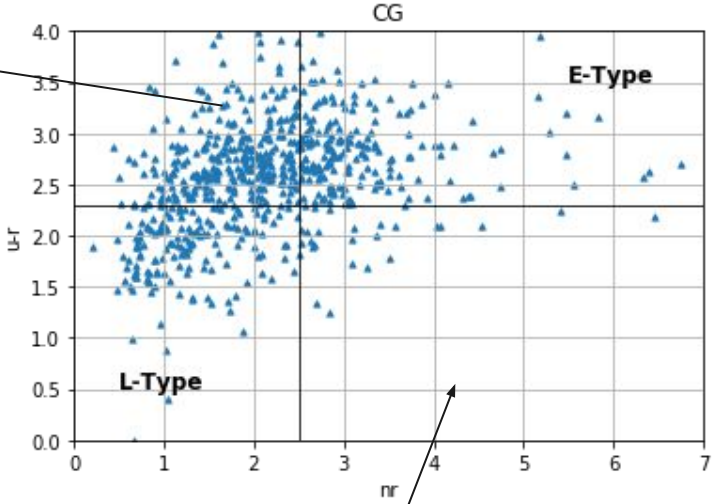
We also used emission line data from the Thomas D. et al (2013) catalog where they used BOSS data from the Sloan Digital Sky Survey (SDSS), available for 88% of our original sample.

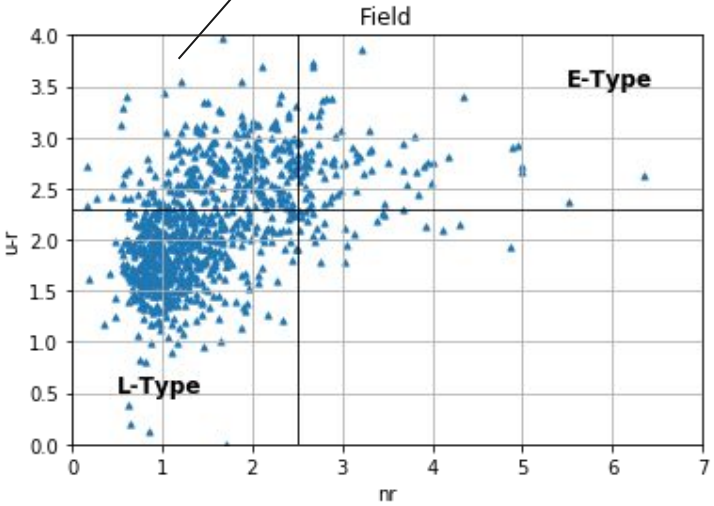


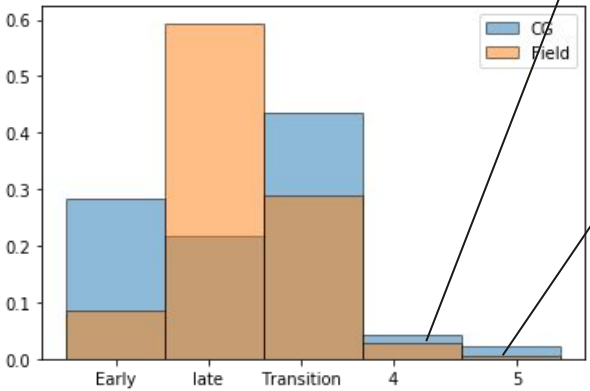
ETG and LTG classification

Using the classification of Vika et al. (2015) to separate the population

Transition region



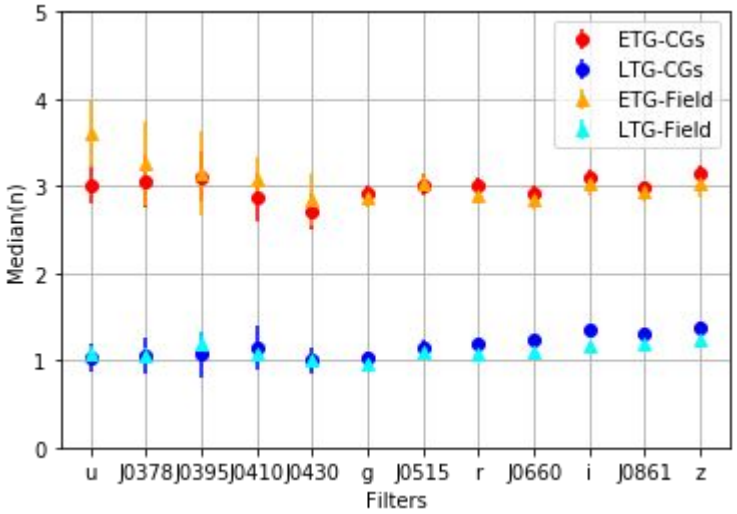




Outliers in MFMTK

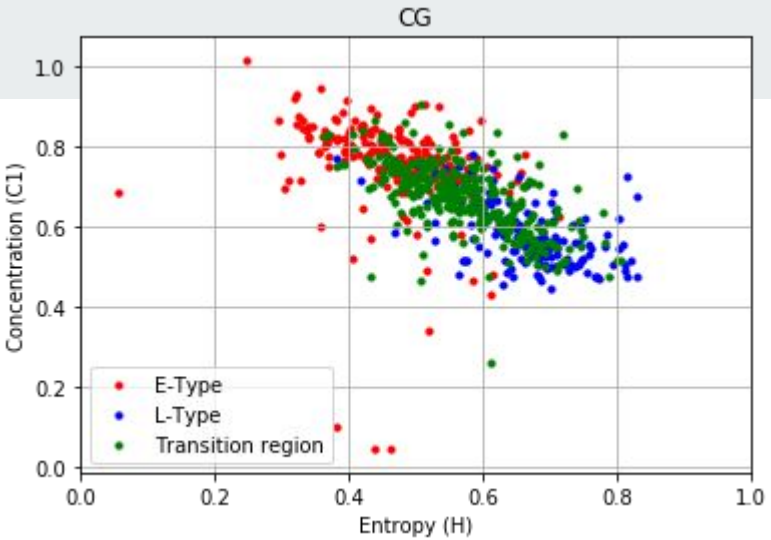
Sersic index according to the 12-filters

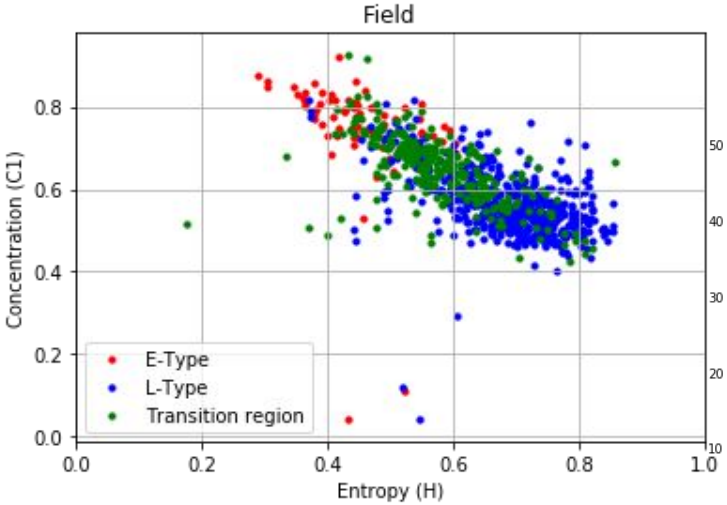
Suggest that by fixing the population according to the LTG and ETG, the Sersic index of each population doesn't appear to change with the environment as a function of the filters.

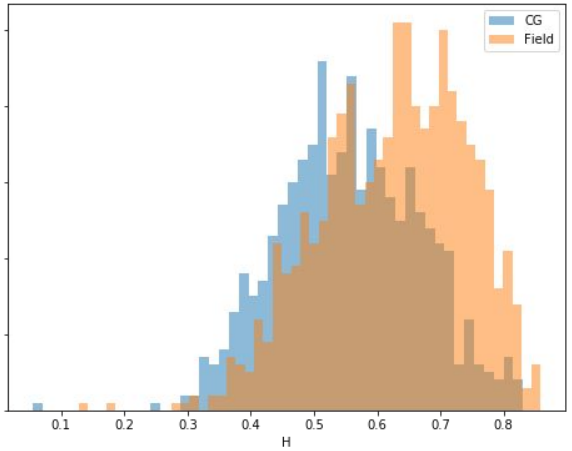


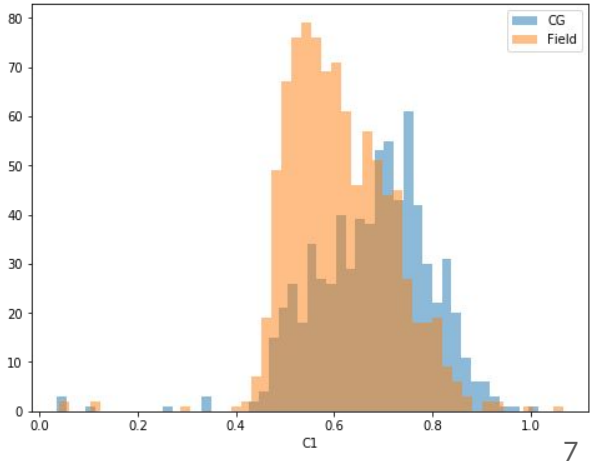
In general concentration parameter in field galaxies is lower than galaxies in compact groups, while with entropy it is the opposite

MFMTK parameters

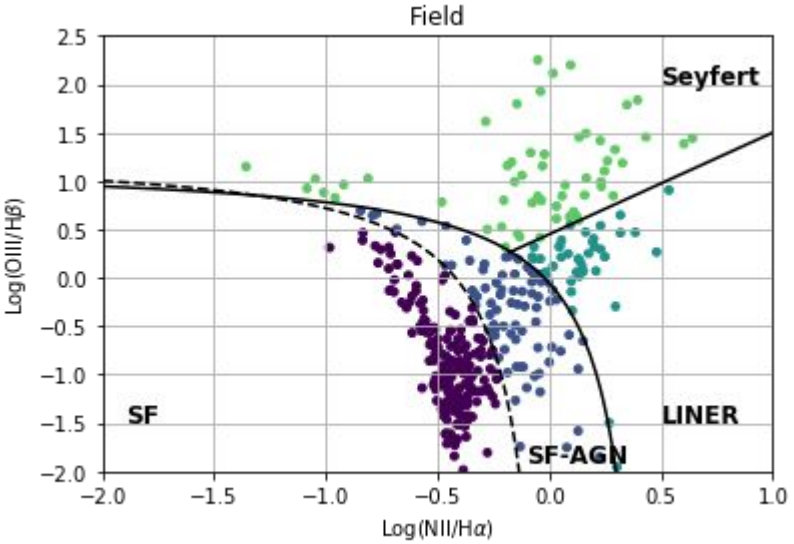


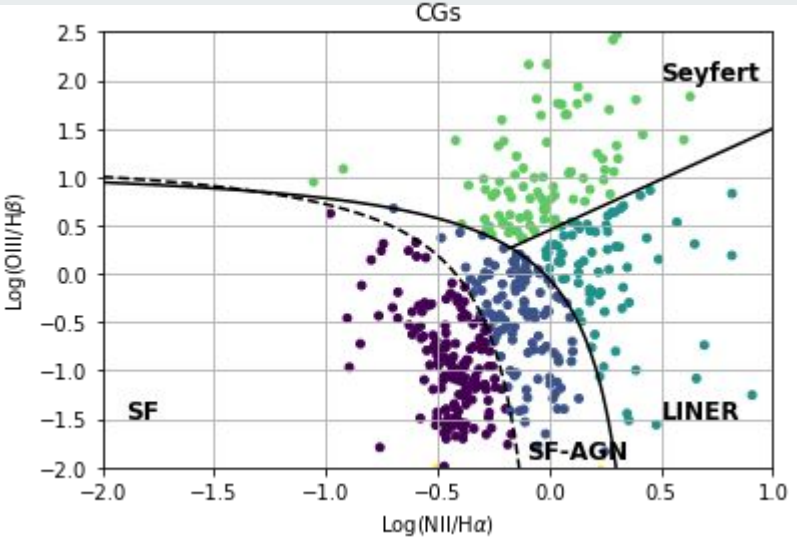


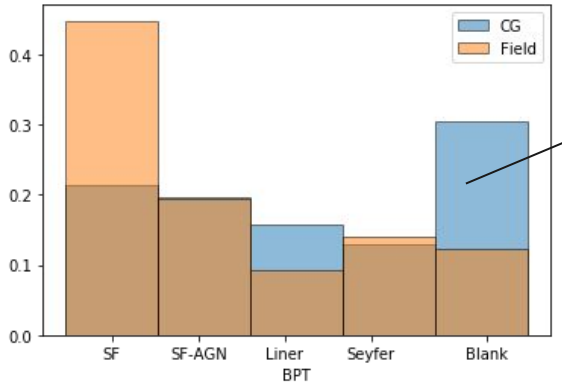




BPT diagram



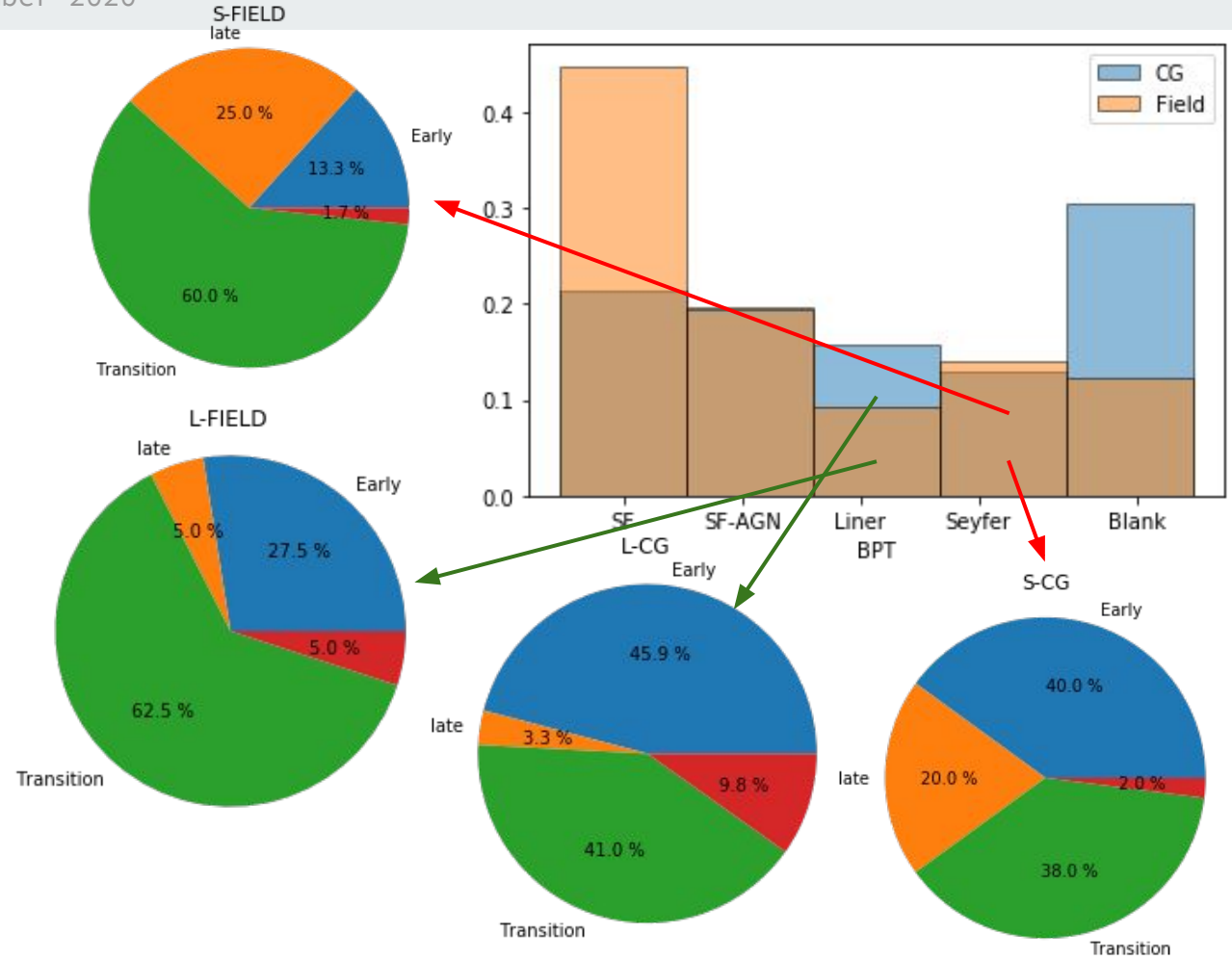




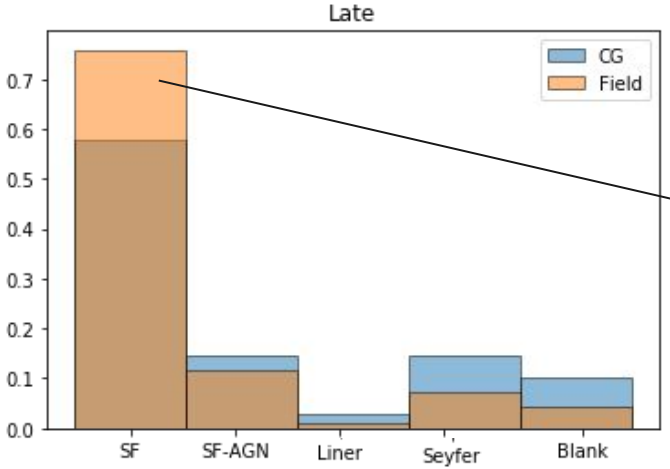
Galaxies without prominent emission lines

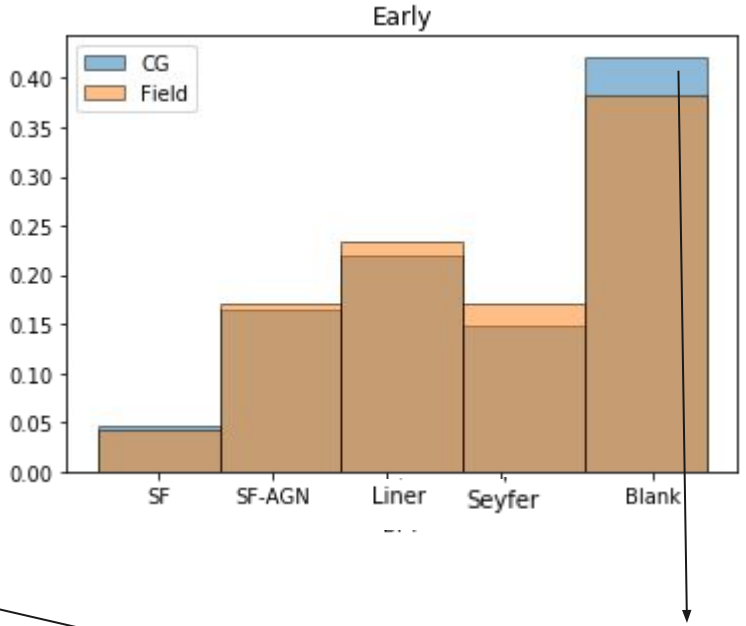
AGN activity

Differences in the relative contribution of CG and field galaxy populations, with more Liner galaxies in the CGs than in the field and more star-forming galaxies in the field than in the CG. Also, the proportion of AGN galaxies changes in these two environments according to the classification of ETG and LTG populations.



ETG and LTG on the BPT diagram

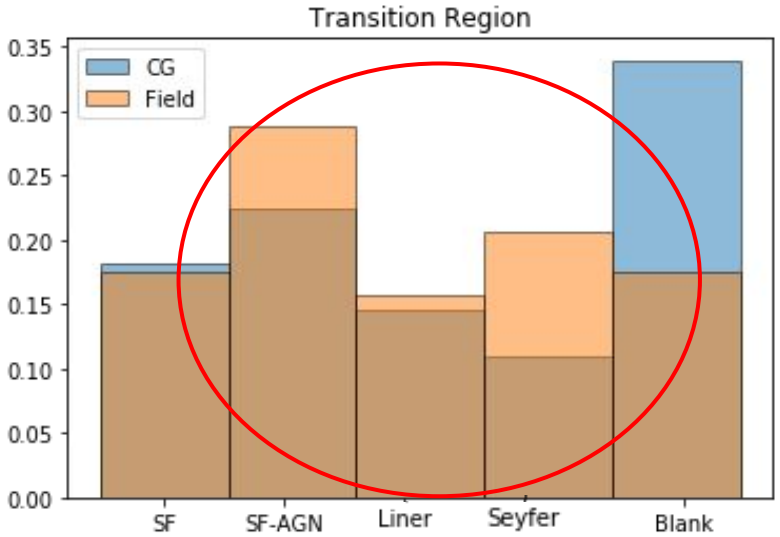




As expected there is a higher proportion of galaxies in the SF zone for the field compared to CGs for LTGs, while for ETGs there is a higher proportion of galaxies without prominent emission lines in CGs

Transition region:

The transition region for field galaxies is dominated by nuclear activity, while for CGs it is dominated by galaxies with low emission lines.



Summary

01 | By fixing the population according to LTG and ETG, the Sersic index of each population doesn't appear to change with the environment as a function of the filters.

02 | Concentration parameter in field galaxies is lower than in galaxies in compact groups, while with entropy parameter we find the opposite trend

03 | Differences in the relative contribution of CG and field galaxy populations, with more Liner galaxies in the CGs than in the field and more star-forming galaxies in the field than in the CG

04 | The proportion of AGN galaxies changes in these two environments according to the classification of ETG and LTG populations, in the case of field galaxies there is a higher proportion in the transition region between LTG and ETG, whereas for CGs it is higher in ETG

05 | The transition region for field galaxies is dominated by nuclear activity, while for CGs it is dominated by galaxies with low emission lines.

Future work

- SED fitting
- SFRs determination
- Mass estimation
- Comparing with other methods to study galaxy morphology

Thanks!