Blueberry and Green Pea galaxies live in low-density environments

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Little is known about the environments of Green Pea (GP) and Blueberry (BB) galaxies, low-mass, compact starbursts that are local analogs to high-redshift galaxies. We analyze the clustering of 339 GPs ($0.1<z\leq0.33$) and 56 BBs ($z\leq0.1$), comparing them to control samples binned by stellar mass and sSFR from SDSS and to galaxies from the TNG300 simulation. Using neighbor counts within 5 Mpc, we find clustering strongly depends on star-formation activity: passive galaxies are more clustered than star-forming ones with GPs and BBs at the extreme end, exhibiting the lowest environmental densities. BBs also have lower-mass nearest neighbors. Their low metallicities and weak clustering support scenarios in which recent starbursts are driven by internal processes or pristine gas accretion, reinforcing their role as nearby analogs of young, low-mass galaxies in the early Universe.

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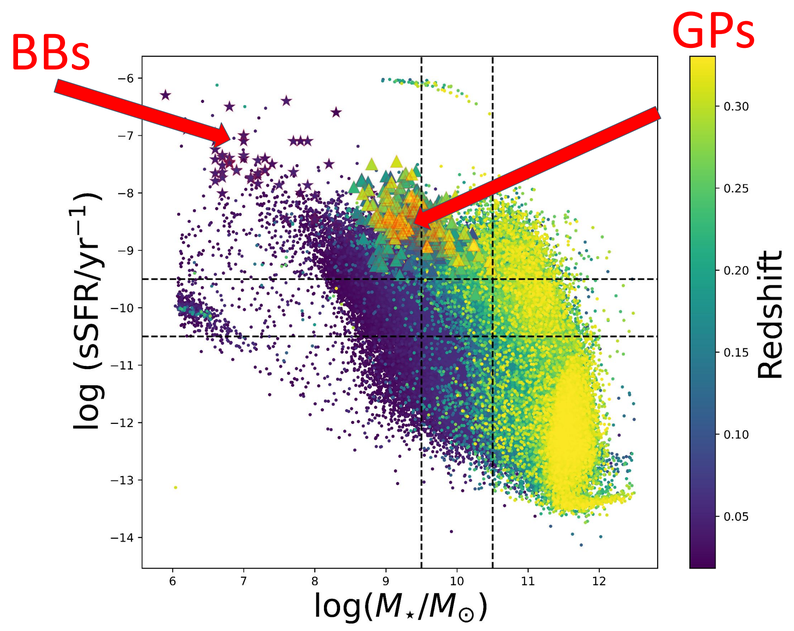
Methodology

- Clustering properties of GPs & BBs vs SDSS MPA-JHU DR8 catalogue

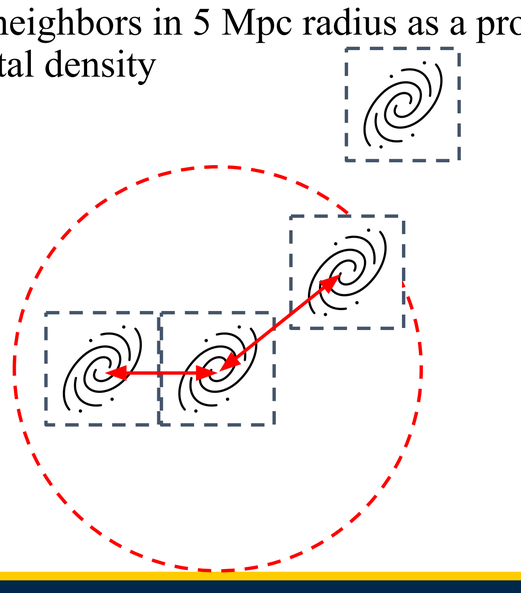
- 1068446 objects in 2 redshift ranges:
  $0 < z \leq 0.1$
  $0.1 < z \leq 0.33$

- 339 Green Peas
- 56 Blueberries

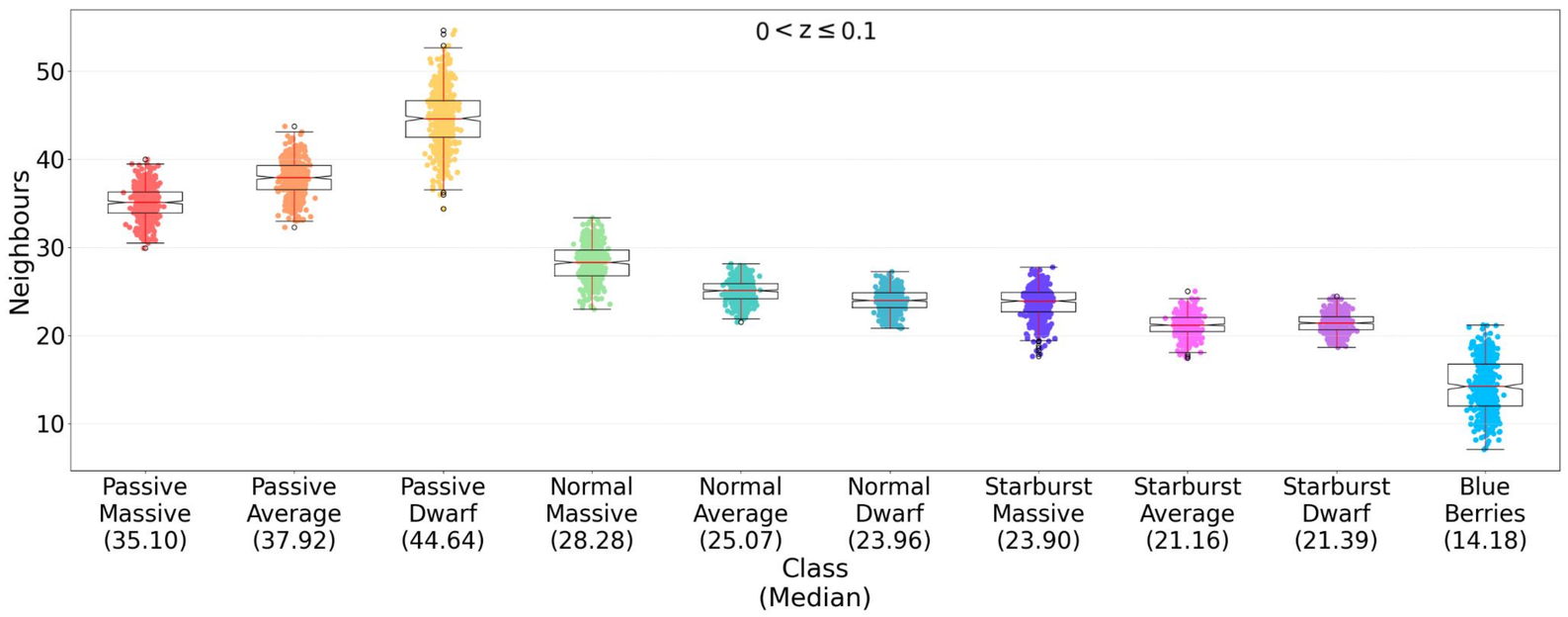


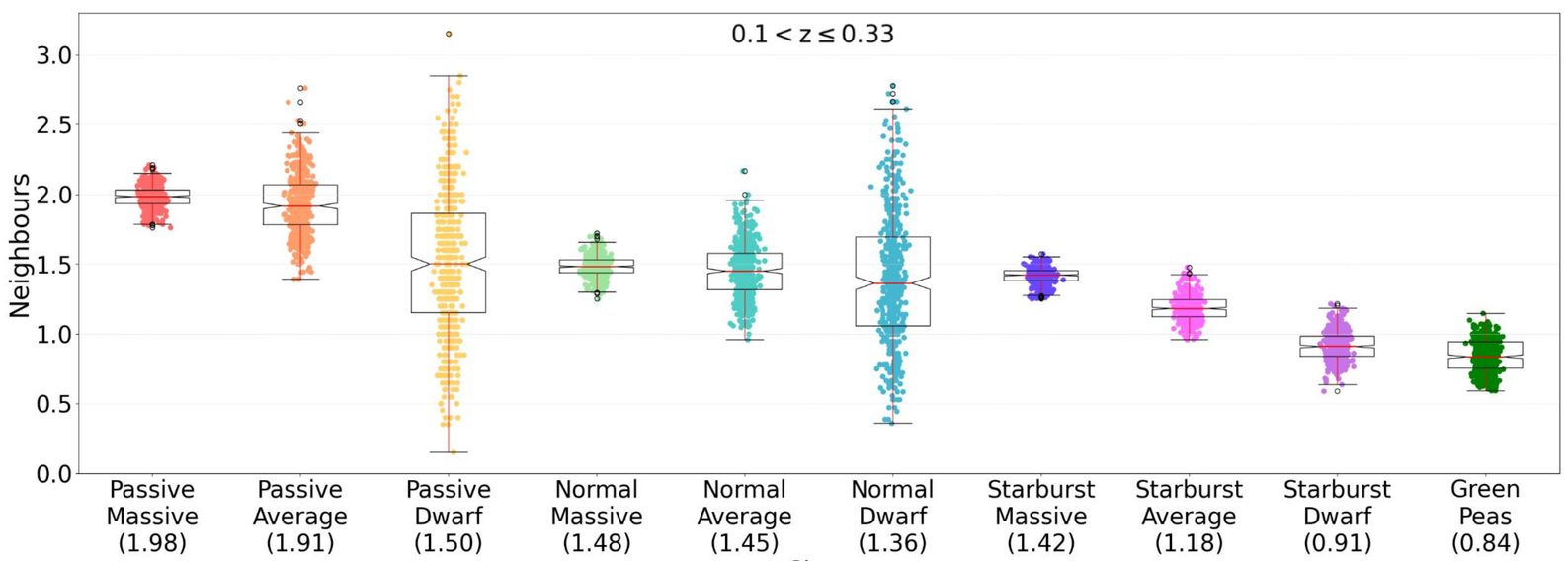
Log(sSFR/yr) / Log($M_\star/M_\odot$)	Passive ≤ -10.5	Normal -10.5 < log(sSFR/yr) < -9.5	Starburst ≥-9.5
Dwarf ≤ 9.5	16672	37637	22066
Average (9.5 < log($M_\star/M_\odot$) < 10.5)	62245	109638	10053
Massive ≥ 10.5	325560	74045	4320

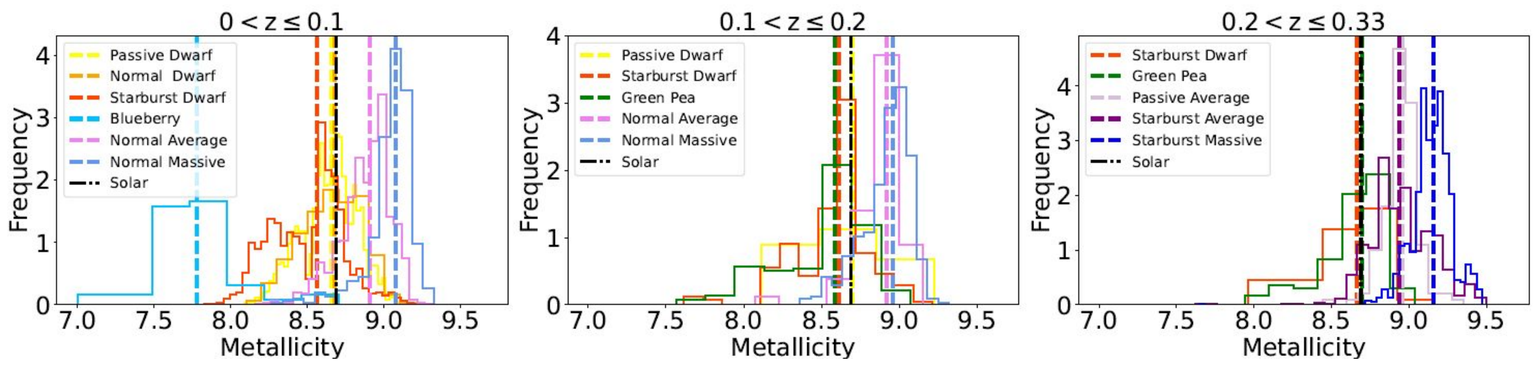
Number of neighbors in 5 Mpc radius as a proxy for environmental density



Results







- Galaxy clustering correlates with star formation rate,
  - Passive galaxies more clustered than Starburst.
  - GPs and BBs lying at the extreme end of this relation - lowest neighbour counts.
- BBs have lower-mass nearest neighbours than other classes of dwarf galaxies.
- The comparison with simulation (IllustrisTNG) shows broad agreement with observational trends.
- The lower metallicities of GP and BBs indicate absence of substantially long star formation cycles of moderate intensity in the past which would have otherwise increased their metallicities.

Low density → Mergers unlikely
Low metallicity → Absence of long star formation cycles

Conclusions

- ❖ GPs and BBs predominantly reside in isolated, low-density environments, suggesting that their intense starbursts are unlikely to be triggered by common environmental processes such as mergers or starburst cycles.
- ❖ Their low metallicities and weak clustering instead support scenarios in which recent starbursts are driven by internal processes or pristine gas accretion, reinforcing their role as nearby analogs of young, low-mass galaxies in the early Universe.

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