

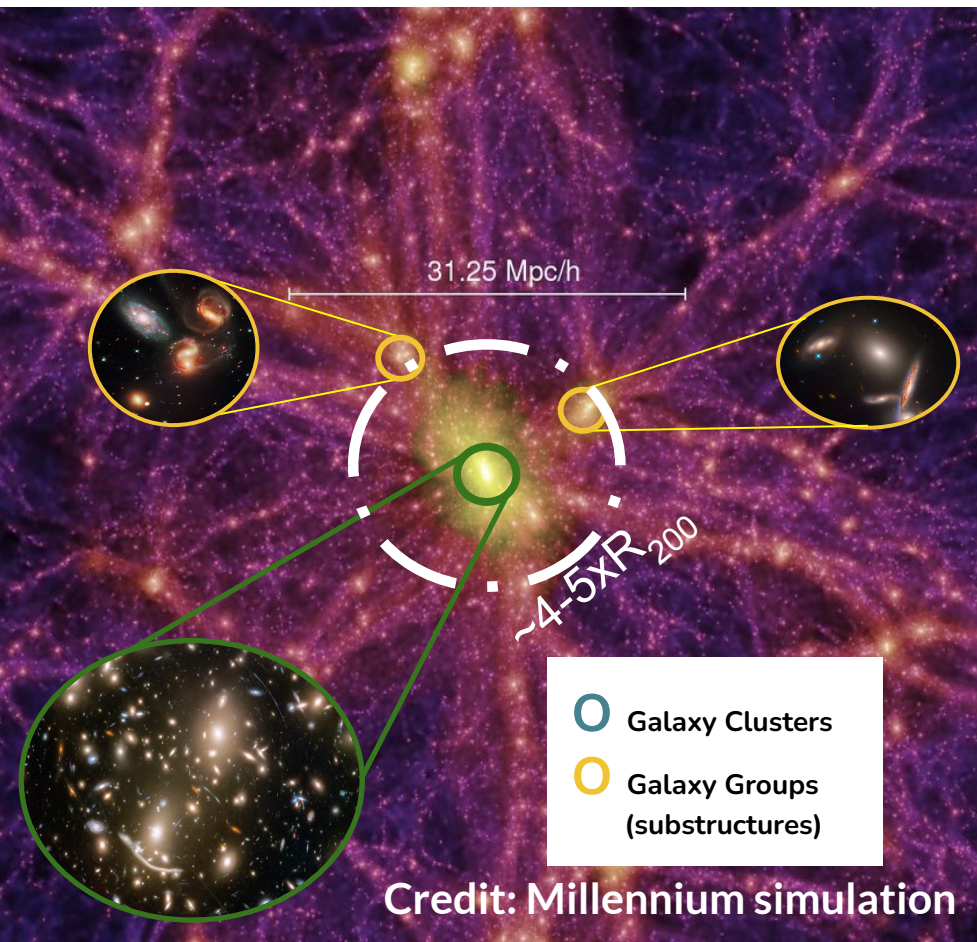
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Characterization of the environment of the CHANCES Low-z subsurvey using Machine Learning Techniques

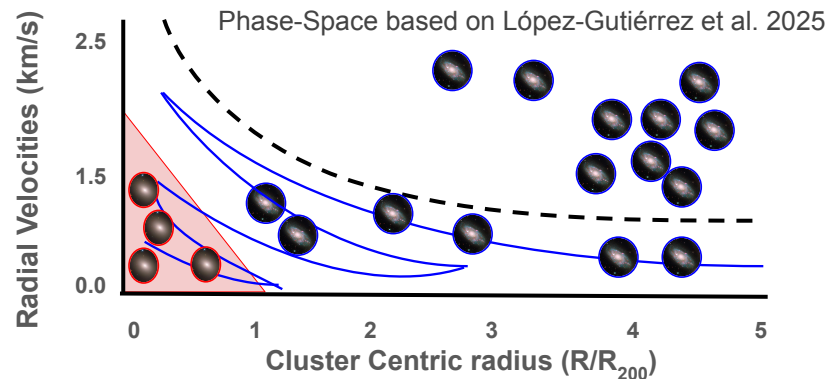
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Yara Jaffé (UTFSM, Chile), Daniela Olave-Rojas (UTALCA, Chile), Gerardo
Rodríguez, Pía Amigo (UTFSM), Martín Gaytán, G. Sepúlveda (UTALCA),
CHANCES Team et al.



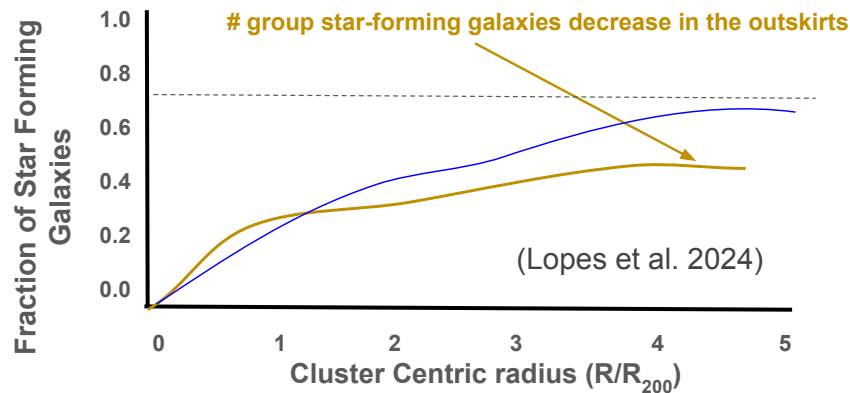
The **complex effect** of evolving environments



Spectroscopic Cluster Members Selection

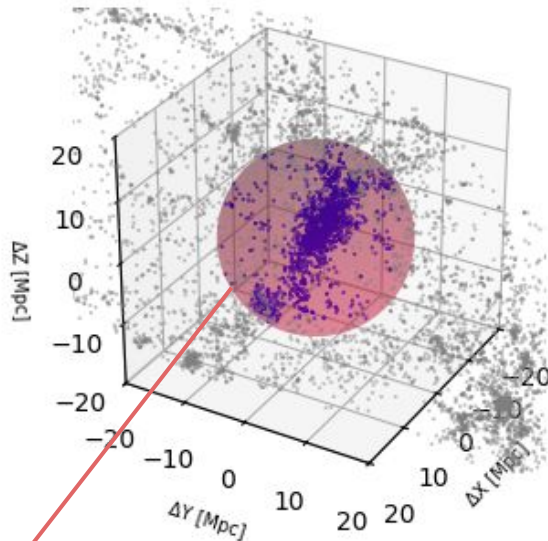
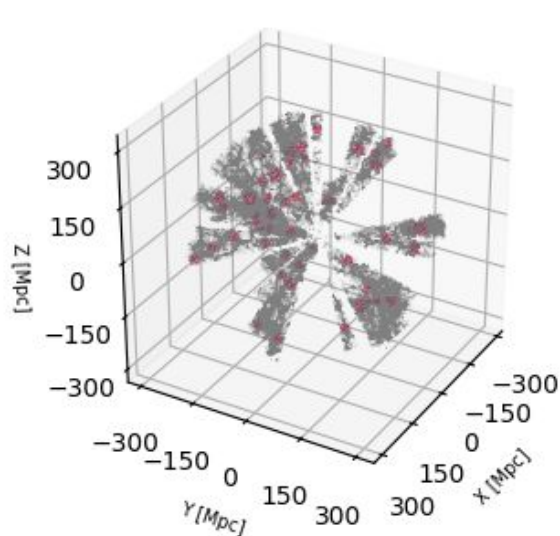


Pre-Processing in the outskirts of GCs

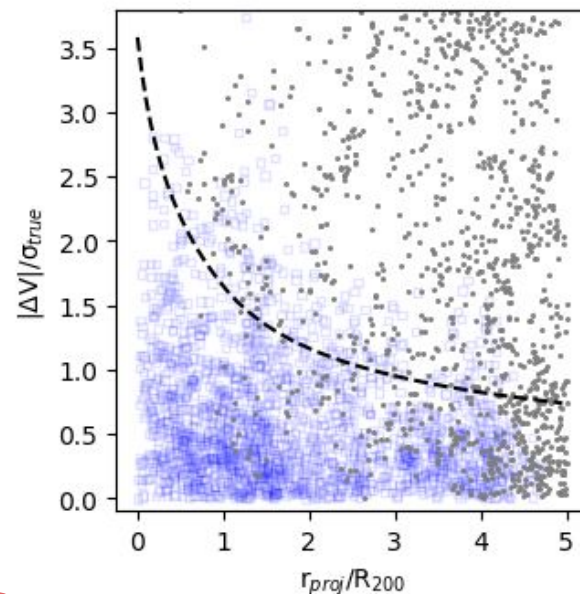


Mocks provide a well-defined ground truth

We use replicas of the **4MOST CHANCES Low-z sub-survey** (Sifón et al. 2025), targeting galaxies brighter than $m_r = 20.4$ out to $5 \times R_{200}$ in 50 clusters at $z < 0.07$.



5 R₂₀₀ ~ radius of the gravitational sphere of influence of galaxy clusters, which separates the galaxies that are falling into the cluster from those that are moving away from the cluster following the Hubble expansion (e.g. Voit 2025)

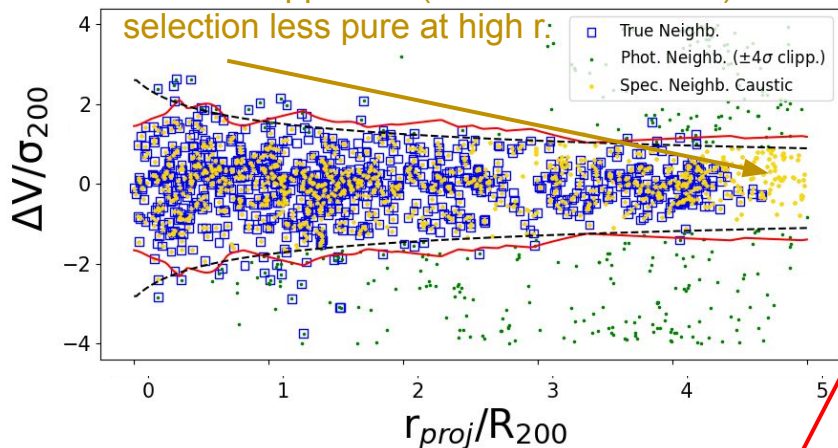


Piraino-Cerda et al. in prep.

Random Forest provides a slightly pure spectroscopic cluster member selection

Caustics approach (Diaferio et al. 1999)

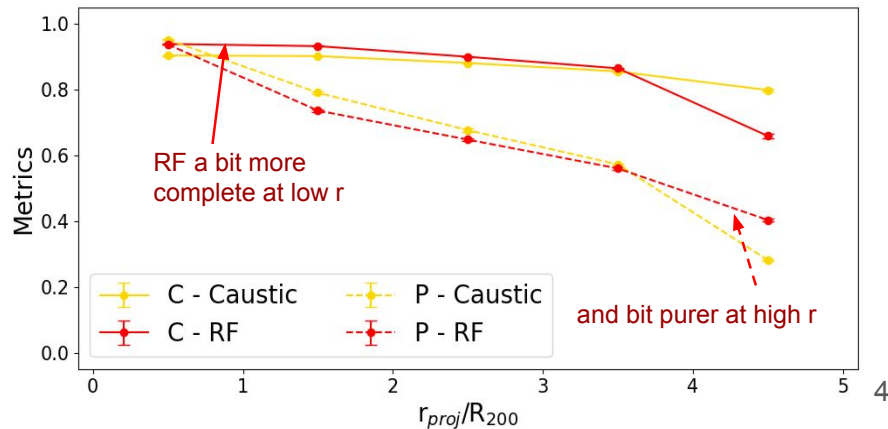
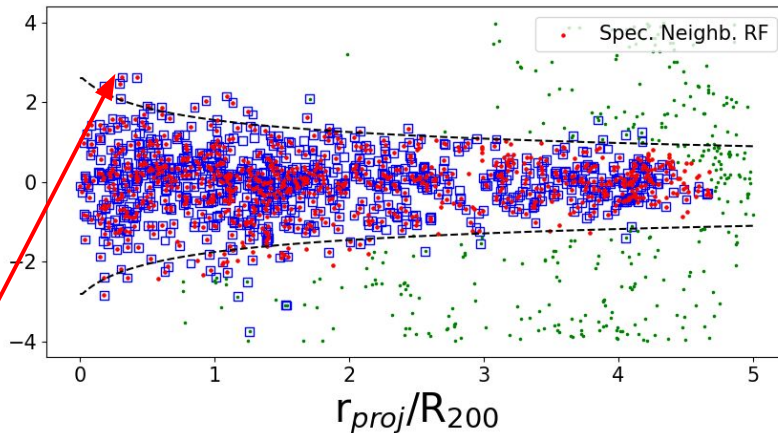
selection less pure at high r



RF selects more TRUE envelope galaxies
(e.g. jellyfish galaxies, Jaffé et al 2018)

- t_p : selected galaxies that are true 3D neighbours.
- f_p : selected galaxies that are not true 3D neighbours.
- f_n : true 3D neighbours that are not selected.
- t_n : galaxies that are neither true neighbours nor selected.

Piraino-Cerda et al. in prep.

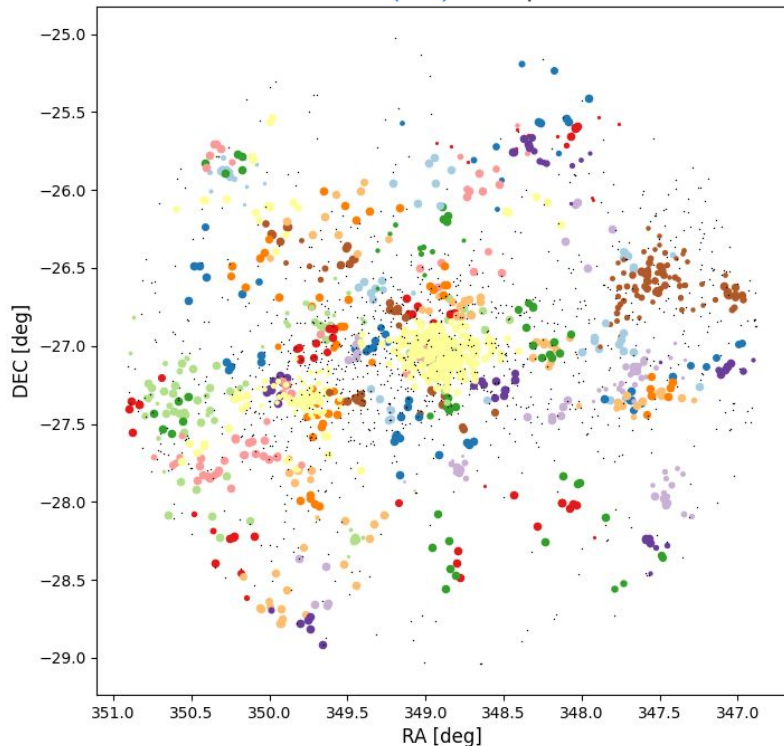


Clustering algorithms, such as **HDBSCAN**, provide reliable detections of the galaxy cluster **substructures**

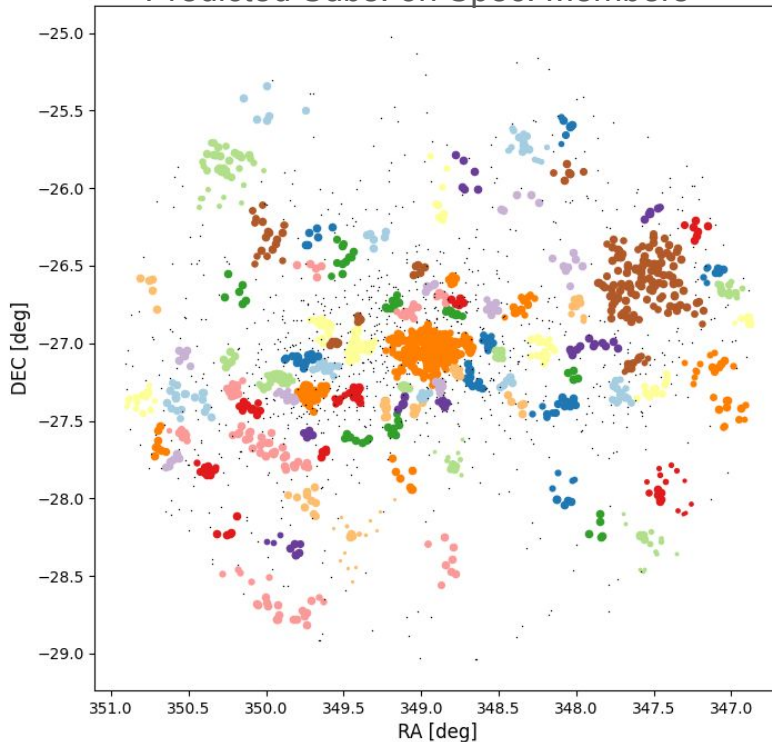
(Olive-Rojas et al. 2023, Piraino-Cerda et al. 2024, Tuomainen et al. 2026)



True Substructures (3D) on Spec. Members



Predicted Subs. on Spec. Members



Piraino-Cerda et al. in prep.

CONCLUSIONS

- **Random Forest** classifier is found to recover a phase-space boundary closely analogous to the cluster escape-velocity profile traced by caustics.
- This **approach** achieve **high completeness** over the full radial range, while **contamination from interlopers increases** toward large clustercentric distances, reflecting the mixed dynamical state of the infall region.
- We are testing **RF** to identify **cluster members** in order to **characterize the environment** (e.g **substructures** using **HDBSCAN**) within the infall regions of the **CHANCES Low-z clusters** using the validated mocks presented here.

MANY THANKS!!!!

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