UNIVERSIDAD TECNICA FEDERICO SANTA MARIA | DEPARTAMENTO DE FÍSICA

Defensa Proyecto Investigación para optar al grado de Licenciado en Astrofísica.

Tema: ***Member selection in galaxy clusters out to five virial radii: evaluation of the caustic method using CHANCES mocks.***

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Abstract:

We evaluate member selection in galaxy clusters out to five virial radii using only projected positions and line of sight velocities, motivated by wide field spectroscopic surveys such as CHANCES. Using mock observations built from the Uchuu simulation populated with UniverseMachine, we define an intrinsic three dimensional membership truth based on the halo centric radius out to five times R200. We then apply the caustic technique, implemented with CausticPy, to identify a boundary in projected phase space and classify galaxies as members or interlopers.

We quantify the performance using confusion matrices and derive purity and completeness as functions of projected radius, using both a distributional summary across clusters and a pooled micro summary that combines raw counts. For a sample of 51 clusters, completeness remains high at all radii, with a micro averaged value of 0.9715, indicating that the caustic boundary retains most true members even in the cluster outskirts. Purity declines strongly with radius as projection effects become more important, decreasing from near unity in the inner region to approximately 0.03 in the outermost radial bin.

These results show that the caustic method provides an effective cleaning step for studies of cluster outskirts when high completeness is required, while also highlighting the need for additional information or parameter tuning to better control contamination at large radii.

Comisión:

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Martes 6 de enero 2026 a las 10:00 hrs. - Sala Conferencias Dr. Luciano Laroze, E300