
Bayes vs. machine learning in large-scale survey demographics with eROSITA

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Abstract

Demographic studies in astronomy are a complex, multi-step process, involving characterizing the biased detection process, association to multi-wavelength counterparts for the assembly of the spectral energy distribution, removal of non-target objects, estimation of redshifts and characterisation of the physics underlying the emission process, and finally, the synthesis of the population across parameters of interest (e.g., luminosity or mass functions). In each of these steps, machine learning is part of modern analyses. From analysis of millions of X-ray photons in the deepest X-ray observations with Chandra, most recently our team applied novel methods to the avalanche of sources discovered by the new X-ray surveyor eROSITA on board SRG towards obtaining a unbiased and complete picture of the impact of supermassive black hole accretion onto galaxy evolution. In this talk, I will review how population demographics from biased samples is possible in a principled Bayesian framework, by combining machine learning techniques with selection-bias-aware hierarchical Bayesian models. The framework is applicable to any selection wavelength and object class of interest.

Slides: in PDF

Video: <https://youtu.be/ReRpjl6SHXM>

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