
Galaxy Cluster Mass Estimation Using Deep Learning

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Abstract

The next generation of galaxy cluster surveys will generate a wealth of highly detailed observations across a wide range of wavelengths. To turn this data into constraints on cosmology, modern measurement techniques will need to be highly precise and robust, with strong emphases on efficiency and automation. In this talk, I will discuss how we can leverage the use of deep learning models to infer dynamical masses of galaxy clusters from spectroscopic samples with high precision and computational efficiency. I will describe how our deep learning models allow us to not only produce cluster mass estimates with remarkably low bias and scatter, but also how we can reconstruct high fidelity posterior uncertainties of these predictions using Approximate Bayesian Neural Networks. I will describe our efforts in verifying our methods across multiple simulations and on real observational systems, such as the Coma cluster and CLASH systems. Lastly, I will mention our ongoing efforts to use deep learning to combine information on cluster observables from multiple wavelengths.

Poster: PDF

Video: <https://youtu.be/ShKMbEgk0LY>

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