



Contribution ID : 39

Type : **Contributed talk**

Inferring Spatial Distributions of Dark Matter in Dwarf Galaxies with ML

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The spatial distribution of dark matter can help us understand the formation and evolution of the structures in our universe. However, dark matter is invisible, so we need to infer its distribution from the motions of visible stars. Previous techniques struggle to handle incomplete and biased datasets, such as missing velocity information, and have difficulty incorporating measurement uncertainties. To mitigate these limitations, we develop Neural Likelihood Estimator (NLE), a machine learning framework which models the probability of seeing a given set of visible stars given a set of dark matter parameters. By applying Bayes' theorem, we can recover the dark matter distribution of the galaxy from visible stars. Our model not only performs well on synthetic galaxies, but it has proven to outperform traditional methods and modern techniques at recovering the distributions of dark matter from real observational data of the dwarf galaxy Draco. The method is also highly effective at handling uncertainty and incomplete and biased data.

Did you give a contributed talk at CASCA 2026?

No

If you are selected for a poster, would you be interested in giving a short flash talk on your work?

Yes

What is your career level?

Undergraduate

Which keyword describes the area of focus of this talk?

Astrostatistics

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