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Mapping out Dark Matter in the Milky Way

Tuesday 25 March 2025 11:15 (15 minutes)

In this talk, I will explore the interfacing of simulations, observations, and machine learning techniques to construct a detailed map of Dark Matter in the Milky Way, focusing on the Galactic Center/Halo and dwarf galaxies. For the Galactic Halo, I will present a recent work that reveals a decline in the stellar circular velocity, inducing tensions with established estimates of the Milky Way's mass and Dark Matter content. I will discuss how the underestimated systematic errors in such a common methodology necessitates a revised approach that combines theory, observations, and machine learning. In dwarf galaxies, I will present a novel Graph Neural Network methodology that facilitates the accurate extraction of Dark Matter density profiles, validated against realistic simulations. I will conclude with a discussion on the future trajectory of astroparticle physics, emphasizing the need for the integration of astrophysical probes with experimental Dark Matter research, potentially leading to a better understanding of the nature of Dark Matter.

Author: NECIB, Lina (MIT)

Presenter: NECIB, Lina (MIT)

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