The 5th Korea Meeting

Marat Freytsis
IAS/Tel Aviv/Weizmann

Seeing the dark matter halo through Gaia's eyes with machine learning

Understanding the properties of our dark matter halo is relevant to both astrophysics, as it informs the formation history of our galaxy, and particle physics in that it impacts the interpretation of dark matter detection experiments. I will review the assumptions made underlying typical halo models and discuss how such assumptions can lead us astray, making clear data-driven halo modeling would be highly desirable. Recent work has shown low-metallicity stars can act as tracers for a substantial fraction of local dark matter, allowing data from the Gaia satellite to potentially be interpreted as a measurement of the halo. However, despite Gaia having observed well over a billon stars, metallicity measurements require cross-correlation with other much smaller (~200,000 star) surveys. With the aid of modern machine learning methods, we seek to find if the tracer stars can be identified only by the kinematic and spectral information available to Gaia. I will discuss a method tested and verified in FIRE galactic simulations indicating that we can "learn the dark matter halo" with much finer resolution than currently known, as well as preliminary results using the Gaia GR2 catalog revealing novel features of the local nonvirialized DM distribution.

1:30pm, Friday, May 3, 2019

Korea University

아산이학관 432호