

Astrophysics seminar

4 March 2025

AUTHOR: dr. Mariana Jaber (CFT-PAN, Warsaw)

TITLE: Physical Cosmology: From Cosmic Expansion to Galaxy Pairwise Dynamics

ABSTRACT: The standard CDM model, despite its remarkable success, remains incomplete, especially regarding the nature of cosmic acceleration. During the first part of the talk, I will discuss my work testing alternatives to the Cosmological Constant, including quintessence models and modifications to General Relativity using galaxy redshift surveys. The resulting catalogues contain a wealth of untapped information, particularly regarding galaxy motions and pairwise velocities. A key challenge in utilising this wealth of new data is understanding galaxy bias, which is essential for making accurate cosmological inferences. This motivates the second part of my talk, where I discuss my research on developing analytical models of galaxy pairwise dynamics, based on the kinetic BBGKY theory describing the evolution of a system of particles interacting via gravity. This approach could lead to new methods to constrain cosmological parameters such as matter density, the Hubble parameter, and the growth rate. Combining these analytical models with the information about the large-scale environment and observational data we could refine constraints on CDM and extend our galaxy bias modelling to non-linear scales.