JOINT TUFTS/MIT COSMOLOGY SEMINAR

Full-kinematics cosmological collider at higher mass and higher loop

Qianshu Lu
IAS and NYU

The inflation era presents a unique opportunity to probe microphysics at energy much higher than what is attainable in terrestrial experiments. Extracting the microphysics from n-point correlation function of the inflaton requires understanding of the correlation functions in the full kinematic domain probed by observables such as the CMB, accounting for the complete model contribution including the feature-rich "signal" and featureless "background" components that originate from the same microphysics. However, progress has been hindered by the steep technical complexity of such computations in the curved de Sitter spacetime. In the first part of this talk, I will present the first full kinematics, full model computation of the inflationary bispectrum from super-Hubble massive particles with tree-level interaction with the inflaton. Searching for these models in the CMB data using the CMBBEST pipeline yielded a suggestive 2.5 sigma local significance for an oscillatory bispectrum, however a consistent interpretation of the fNL requires extrapolation beyond the range of model parameters considered. In the second part I will discuss an ongoing work where we develop the first general purpose numerical algorithm for computing 3-point inflaton correlation function in de Sitter up to one loop level for arbitrary kinematics. The algorithm translates the tropical Monte Carlo technologies developed for flat space scattering amplitudes to de Sitter correlation functions. I will present the core principle of the algorithm and some preliminary cross checks with existing bispectrum results in the literature.

Tuesday, March 3, 2026, 2:30 pm
574 Boston Ave, Room 310
Tufts University
Refreshments at 2:00 outside room 304