

# JOINT TUFTS/MIT COSMOLOGY SEMINAR

---

## *The Effective Field Theory of Large Scale Structures*

Leonardo Senatore  
Stanford University

After reviewing our knowledge of Inflation after Planck, I will focus on Large Scale Structures surveys, as they promise to be the next leading probe of cosmological information. It is therefore crucial to reliably predict their observables. The Effective Field Theory of Large Scale Structures (EFTofLSS) provides a manifestly convergent perturbation theory for the weakly non-linear regime of dark matter, where correlation functions are computed in an expansion of the wavenumber  $k$  of a mode over the wavenumber associated with the non-linear scale  $k_n l$ . Since most of the information is contained at high wavenumbers, it is necessary to compute higher order corrections to correlation functions. I will present the predictions of the EFTofLSS up to 2-loops. We find that it matches to percent accuracy the non-linear matter power spectrum up to  $k \sim 0.6$  h/Mpc, requiring just one unknown coupling constant that needs to be fit to observations. Given that Standard Perturbation Theory stops converging at  $k \sim 0.1$  h/Mpc, our results demonstrate the possibility of accessing a factor of order 200 more dark matter quasi-linear modes than naively expected. If the remaining observational challenges to accessing these modes can be addressed with similar success, our results show that there is tremendous potential for large scale structure surveys to explore the primordial universe.

Tuesday, April 1, 2014, 2:30 pm  
Cosman Seminar Room  
Center for Theoretical Physics  
Building 6C, Room 6C-442  
Massachusetts Institute of Technology  
Refreshments at 2:00 in the same room