

NASSP 2019 Honours and MSc Project Proposal

Mapping Dark Matter with CMB Lensing

Supervisor: Kavilan Moodley, University of KwaZulu-Natal (South Africa)
072 447 5499, kavilan.moodley@gmail.com

Level: Honours and MSc

Project Description:

Gravitational lensing is the phenomenon whereby light is deflected when it passes a massive object, due to the curvature of space-time around the object. The phenomenon of lensing has now been observed in a variety of astronomical objects. This project will study gravitational lensing of the cosmic microwave background, which has now been detected with high significance. Techniques to infer the projected mass distribution in the universe and its cross-correlation with other tracers of the large-scale structure will be investigated. Specifically a compact angular-space estimator for the lensing convergence field will be developed and contrasted with the standard harmonic-space estimators. For the MSc project these estimators will be implemented and tested on simulations and then applied to recent cosmic microwave background datasets from the Planck, ACT and SPT experiments. Gravitational lensing surveys are important as they constrain cosmological models by mapping the distribution of dark matter, and can measure the bias of various tracers in cross-correlation with those surveys.