

## ICTS Seminar

Title : Gravity from Quantum Entanglement in the AdS/CFT correspondence

Speaker : Onkar Parrikar, Stanford University

Date : Thursday, February 20, 2020

Time : 4:00 pm

Venue : Emmy Noether Seminar Room, ICTS Campus, Bangalore

Abstract : The Anti de Sitter /Conformal Field Theory correspondence (AdS/CFT) has given us a window into the nature of quantum gravity. In particular, the Ryu-Takayanagi (RT) formula, relating the entanglement entropies in the CFT with areas of minimal-area surfaces in AdS, suggests that spacetime geometry on the AdS side emerges as a representation of the entanglement structure in the CFT. We will argue that any asymptotically AdS spacetime which computes the entanglement entropies of a CFT state with the RT formula must necessarily satisfy the fully non-linear Einstein equation, thus showing that gravitational dynamics also emerges from the structure of entanglement in the dual CFT. At a technical level, our strategy involves studying the shape-dependence of entanglement entropy for arbitrary states and (simple connected) subregions in holographic conformal field theories. It is typically hard to work with general states/subregions without relying on symmetries, but we will combine field-theory and gravitational techniques to make progress. Our analysis also leads to a new quasi-Lorentzian proof (without using the replica trick) of the RT formula and suggests that RT is a natural consequence of matching between a certain bulk and boundary "algebraic" symmetry called modular flow.