Department of Theoretical Physics

THE QUANTUM SPACETIME SEMINAR SERIES

Euclidean wormholes, ensemble averages and coarse-grained states

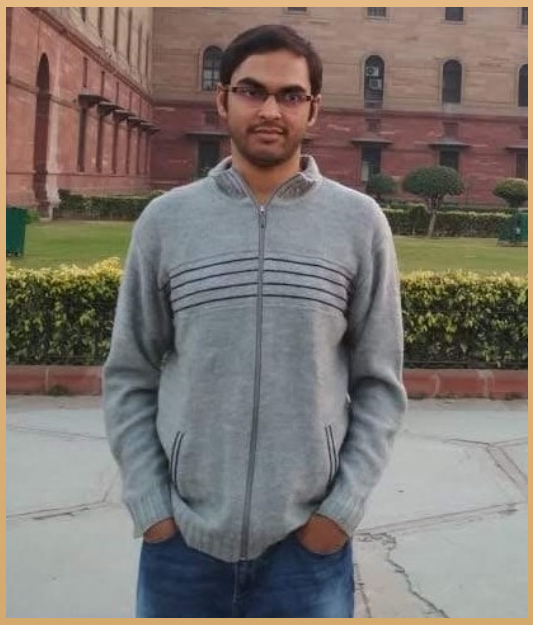
Jeevan Chandra

(Cornell University)

Date: August 29, 2022

Time: 9 AM IST

Zoom link shall be shared separately



I shall describe new Euclidean wormhole solutions in AdS_{d+1} and interpret them in terms of the overlap between GHZ-like entangled states in individual holographic CFTs. This interpretation provides a natural framework to coarse grain pure states in CFTs. I shall illustrate this idea by coarse graining the microstates dual to black hole geometries formed by backreaction of end-of-the-world branes and collapsing thin shells. In the process, I shall match the entropy of the coarse grained state with the area of the time-symmetric apparent horizon in the corresponding black hole geometry. I shall then describe how the addition of probe matter on these black hole backgrounds helps realise an isometric holographic code which can be interpreted as a random tensor network for CFTs obeying ETH. In the second part of my talk, I shall describe more general Euclidean wormhole solutions in AdS_3 and interpret them in terms of an average over an ensemble of large-c CFT data which I shall construct using universal results from conformal bootstrap. Interestingly, but quite non-trivially, the gravitational action for a large class of these wormhole geometries matches with the expectation from the CFT ensemble. This motivates the proposal that semiclassical 3D gravity is an average of large-c CFTs. In the end, I shall briefly mention how some of these more general wormhole solutions can be interpreted in individual CFTs thereby providing a richer framework to coarse grain pure states in 2D CFTs.