TEP Seminar

UCLA

Tuesday, November 14th @ 2pm
Schwinger Lounge

"Near extremal black holes through the lens of Lightcone modular boostrap "

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1   Title and Abstract

Title: Near extremal black holes through the lens of Lightcone modular bootstrap

Abstract: The physics of near extremal black holes in AdS_3 is captured by the Schwarzian theory, implying existence of a Schwarzian *sector* in holographic CFTs with large central charge c, specifically in the large spin states with twist accumulating to $\frac{c-1}{12}$. We expound on this by performing a rigorous CFT analysis using Tauberian technique, a widely used tool in the analytical number theory. We show that for a unitary modular invariant 2D CFT with fixed central charge $c > 1$, having a nonzero twist gap in the spectrum of Virasoro primaries, for sufficiently large spin J, there always exist spin J operators with twist falling in the interval $\left(\frac{c-1}{12} - \varepsilon, \frac{c-1}{12} + \varepsilon\right)$ with $\varepsilon = O(J^{-1/2} \log J)$. We establish that the number of Virasoro primary operators in such a window has a Cardy-like i.e., $\exp\left[2\pi \sqrt{\frac{(c-1)J}{6}}\right]$ growth. A similar result is then proven for a family of holographic CFTs with the twist gap growing linearly in c and a uniform boundedness condition, in the regime $J \gg c^3 \gg 1$. Our result sheds light on the validity regime of Schwarzian approximation in describing the near-extremal rotating BTZ black holes (without electric charge). We make further conjectures on potential extension of the above results to CFTs with conserved currents. The talk will be based on `arXiv:2307.02587` [hep-th] with Jiaxin Qiao and an earlier work `arXiv:2212.04893` [hep-th] with Jiaxin Qiao and Slava Rychkov.