Near Extremal Black Holes and Holography

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The near horizon region of near extremal black holes includes an AdS_2 geometry, raising the possibility of a holographic description of the black hole dynamics in terms of near conformal quantum mechanics. The appropriate quantum mechanics models, however, are very little understood, even though significant progress has been made recently due to the advances in the study of the Sachdev-Ye-Kitaev class of models. A fruitful playground where there is much more control on the miscroscopic dynamics of near extremal black holes and their dual quantum mechanics description is provided by supersymmetric (BPS) black holes that are also aymptotically AdS. Such black holes can be understood holographically as renormalization group flows in a higher dimensional quantum field theory, which is under better control. I will describe how to identify several properties of the near conformal quantum mechanics dual to generic near extremal black holes through a systematic holographic analysis, and I will discuss some of the key consequences of supersymmetry and of a higher dimensional holographic dual description. The talk will be based on Refs. [1] and [2], as well as on ongoing work.

References:

[1] Alejandra Castro, Finn Larsen, Ioannis Papadimitriou, 5D Rotating Black Holes and the nAdS2/nCFT1 Correspondence, arXiv:1807.06988, JHEP10 (2018) 042.

[2] M. Cvetič, I. Papadimitriou, AdS_2 Holographic Dictionary, arXiv:1608.07018, JHEP12 (2016) 008.