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BHH 2018

Synopsis and Organizers

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Black Holes and Holography

String theory is a consistent mathematical framework for quantum gravity, a deep question in both fundamental physics and mathematics. One of the main achievements during the past two decades is the discovery of holographic duality that found many applications of holography to various problems in black hole physics, nuclear physics, and condensed matter physics. Recently, it was found that the near horizon geometry of black holes are related to chaotic behavior. Moreover, using holography, a simple solvable quantum mechanic theory proposed by Sachdev, Ye, and Kitaev can be used to analyze universal behaviours of quantum gravity near black holes. On the condensed matter side, the SYK model is a solvable many-body interacting system without quasi-particle descriptions, therefore attracts enormous attentions. It also presents a useful testing ground for the ideas trying to connect quantum chaos, thermalization and transports. SYK model belongs to the class of models called quantum spin glass models. The classical spin glass models were important models in applied mathematics, closely related to random matrix theories. Although many results were already worked out for classical spin glass models, not many can be said for the quantum version. It is certainly an uncharted land in mathematics, and holography might shed some light on the study of quantum spin glass.
This workshop will bring three communities together, mathematicians, high energy physicists and condensed matter physicists. The following topics will be covered: holography for extremal black holes, AdS2 and SYK models, Quantum chaos, entanglement and geometry.

Organizers

Name	University
Herman Verlinde	Princeton University, USA
Yingfei Gu	Harvard University, USA
Shing-Tung Yau	Harvard University, USA
Hong Yao	Tsinghua University, China
Si Li	Tsinghua University, China
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