The Department of Electrical and Computer Engineering Presents

A DISTINGUISHED SEMINAR

YI-ZHUANG YOU

MACHINE LEARNING PHYSICS: FROM QUANTUM MECHANICS TO HOLOGRAPHIC GEOMETRY

ABSTRACT

Inspired by the "third wave" of artificial intelligence (AI), machine learning has found rapid applications in various topics of physics research. Perhaps one of the most ambitious goals of machine learning physics is to develop novel approaches that ultimately allows AI to discover new concepts and governing equations of physics from experimental observations. In this talk, I will present our progress in applying machine learning technique to reveal the quantum wave function of Bose-Einstein condensate (BEC) and the holographic geometry of conformal field theories. In the first part, we apply machine translation to learn the mapping between potential and density profiles of BEC and show how the concept of quantum wave function can emerge in the latent space of the translator and how the Schrodinger equation is formulated as a recurrent neural network. In the second part, we design a generative model to learn the field theory configuration of the XY model and show how the machine can identify the holographic bulk degrees of freedom and use them to probe the emergent holographic geometry.

BIOGRAPHY

Yi-Zhuang You received his PhD from Tsinghua University in 2013. Then he was a post doctoral researcher at UC Santa Barbara and later at Harvard. He joined UC San Diego as an assistant professor in 2018. He works in various topics in condensed matter physics, including strongly correlated quantum many-body system, topological phases and phase transitions, quantum many-body entanglement and quantum chaos, machine learning in application to quantum physics.

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