CQSE Special Seminar

「Dec. 18, 2020 (Friday)」

- Time : 10:30~11:30
- Place : Rm716, New Physics Building
- Speaker: Hsin-Yuan Huang (Robert)
  California Institute of Technology, USA
- Title : Predicting many properties of a quantum system from very few measurements

▲The seminar is also open to non-NTU members; hence all participants must wear a mask. (Following Fall and Winter Precautionary Measures)

**Sponsored by Center for Quantum Science and Engineering (CQSE) 量子科學與工程研究中心
and Center for Advanced Study in Theoretical Sciences (CASTS) 理論科學高等研究中心, NTU

Joint CQSE and CASTS Seminar

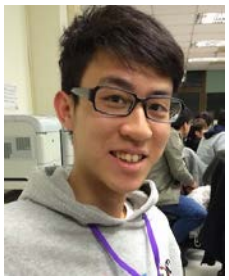
Special Seminar
December 18, Friday

TIME Dec. 18, 2020, 10:30~11:30
TITLE Predicting many properties of a quantum system from very few measurements
SPEAKER Hsin-Yuan (Robert) Huang
California Institute of Technology, USA
PLACE Rm716, CCMS & New Physics Building, NTU

Abstract:

Predicting properties of complex, large-scale quantum systems is essential for developing quantum technologies. I will begin the talk with our work (Huang, Kueng, Preskill, Nature Physics 2020). In this work, we present an efficient method for constructing an approximate classical description of a quantum state using very few measurements of the state. This description, called a classical shadow, can predict many different properties: order log(M) measurements suffice to accurately predict M properties of the state with high success probability. The properties could be expectation values of incompatible observables that cannot be simultaneously measured. Examples include quantum fidelities, entanglement entropies, two-point correlation functions, expectation values of local observables, and the energy variance of many-body local Hamiltonians. The proposed method builds on machine learning theory and quantum information scrambling. In the second half of the talk, I will discuss recent progress extending upon this work, including experimental demonstrations in a collaboration with Peter Zoller's group and a rigorous foundation for training classical machine learning models to solve quantum many-body problems.

About the Speaker:



I am Hsin-Yuan Huang (黃信元), a Ph.D. student at the California Institute of Technology (Caltech) advised by John Preskill and Thomas Vidick. My research focuses on the interplay between physics and computer science (complexity theory, information theory, machine learning). Some of my recent works include rigorous results for training classical machine learning models to characterize quantum devices and solve quantum-mechanical problems. I have also worked at Google AI Quantum to study the potential for quantum advantage in machine learning tasks. I studied computer science and physics during my undergraduate, with previous research experiences in deep learning (at Allen Institute of AI and Microsoft Research AI), optimization, and statistical machine learning (with Prof. Chih-Jen Lin).

- N O T I C E -
▲Please swipe NTU card / ID card when entering CCMS-Phys. Building. ▲The seminar is also open to non-NTU members; hence all participants must wear a mask. ▲We provide alcohol sanitizer to keep your hands clean.

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