SCHOOL OF DATA SCIENCE

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SEMINAR SERIES

Quantum Simplicity:
A Quantum Perspective on Complexity at the Macroscopic Scale

Date: 11 January 2019 (Friday)
Time: 11:00am to 12:00noon
Venue: P4703 (Lift 1), 4/F, Yeung Kin Man Academic Building (YEUNG), City University of Hong Kong

Dr. Gu, Mile
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NRF Fellow, School of Physical & Mathematical Sciences
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Guest Speaker's profile

Mile Gu is a National Research Foundation Fellow, and holds dual positions the Complexity Institute at Nanyang Technological University and the Centre for Quantum Technologies. He heads the quantum and complexity science initiative - which seeks to explore how quantum technologies can help us understand the science of complex systems (www.quantumcomplexity.org). Gu past research span the areas of quantum information, complexity theory and optical quantum computation, and has been featured in Science and Natural suite Journals on five separate occasions. Prior to his current appointment, Gu obtained his Ph.D. at the University of Queensland, and spent three years as faculty at the Institute for Interdisciplinary Information Sciences Tsinghua University.

Abstract

Complexity and quantum science appear at first to be two fields that bear little relation. One deals with the science of macroscopic reality — seeking the understand and predict the behavior of large complex systems in the everyday world. Quantum theory, on the other hand, deals with particles at the microscopic level, and is usually considered limited to the domain of individual photons and atoms. Yet, different as they appear, there is growing evidence that the science of very small may help us better understand that of the very large.

Here, I begin with a pedagogical introduction of quantum information science, which seeks to understand the remarkable counter-intuitive properties of data at the quantum scale. I outline how these properties can be harnessed to perform operational tasks that would otherwise be considered either impractical or impossible.

I then outline recent advances showing that such quantum effect can also fundamentally change what we consider in nature of be complex. I demonstrate how predicting the future behavior of certain phenomena may require tracking immense amounts of observation statistical classically, and yet remarkable little when quantum technologies are involved. Thus, existing notions of structure, complexity, may change drastically in the advent of quantum technology.

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All are welcome