北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

Time: 4: 00 pm, Sept. 25, 2019 (Wednesday)

2019 9 25 4:00

Venue: Room W563, Physics building, Peking University

563

Abstract

Today, we face major scientific challenges because the large-scale data acquired by our automated scientific instrumentation and algorithm and the vast degrees of freedom of our target subjects are constantly defying human analysis. Here we sketch concepts, strengths as well as shortcomings of machine learning techniques, and how they may serve as useful tools in overcoming data largeness and noises as well as bridging fields such as between computation and theory, experiment and theory, and even inter-discipline. We report developments in machine learning approaches in recognizing different types of topological phases from quantum many-body states and validating hypothesized order hidden through complex, experimentally-derived electronic quantum matter images at the atomic scale. In particular, we bridge quantum states and classical machine learning techniques coherently with an ensemble of chosen operators we dub as quantum loop topography. We also repeatedly discover a very specific, lattice-commensurate, unidirectional, and translational-symmetry-breaking state favoring particle-like strong-coupling theories of electronic liquid crystals from a large, experimentally-derived electronic quantum matter image archive spanning a wide range of electron densities and energies in carrier-doped cuprates. As a pedagogical example, we outline our progress in using machine learning for efficient and generic quantum computation realizations of quantum adiabatic algorithm and topological quasiparticle braiding.

About the speaker

Dr. Zhang, Yi is a