Department of Physics

UNIVERSITY OF OXFORD

Machine Learning and Physics Seminar Series

Thursday, 03 December 2020 at 3.00pm
To receive the Zoom room link, send an empty email to
request.zoom.ox.ml.and.physics [AT] gmail [DOT] com

Reconstructing quantum states with generative models

Prof Roger Melko
University of Waterloo

Generative models are a powerful tool in unsupervised learning, where the goal is to learn the unknown probability distribution that underlies a data set. Recently, it has been demonstrated that modern generative models adopted from industry are capable of reconstructing quantum states, given projective measurement data on individual qubits. These virtual reconstructions can then be studied with probes unavailable to the original experiment. In this talk I will outline the strategy for quantum state reconstruction using generative models, and show examples on real experimental data from a Rydberg atom quantum simulator. I will discuss the continuing theoretical development of the field, including the exploration of powerful autoregressive models for the reconstruction of sign-problematic and mixed quantum states.

Roger Melko got his PhD from the University of California, Santa Barbara, in 2005. After spending two years as a Wigner Fellow at Oak Ridge National Laboratory, he joined the faculty of the University of Waterloo and the Perimeter Institute for Theoretical Physics. Melko is a condensed matter theorist who develops new computational methods and algorithms to study strongly correlated many-body systems. Among his honours, he has received the Herzberg Medal from the Canadian Association of Physicists, the Young Scientist Prize in Computational Physics from the International Union of Pure and Applied Physics, and a Canada Research Chair in Computational Quantum Many-Body Physics.