Department of Computer Science, The University of Hong Kong

Quantum Information Seminar

Noncommuting conserved quantities in quantum many-body thermalization

Dr. Nicole Yunger Halpern
Harvard University

Date:
Sept 11, 2020
Friday
10:00pm
HK Time (GMT+8)

Join Zoom Meeting
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Meeting ID: 955 1251 0759
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Abstract:

In statistical mechanics, a small system exchanges conserved quantities— heat, particles, electric charge, etc.—with a bath. The small system may thermalize to the canonical ensemble, the grand canonical ensemble, etc. The conserved quantities are represented by operators usually assumed to commute with each other. But noncommutation distinguishes quantum physics from classical. What if the operators fail to commute? I will argue, using quantum-information-theoretic thermodynamics, that the small system thermalizes to near a “non-Abelian thermal state.” I will present a protocol for realizing this state experimentally, supported with numerical simulations of a spin chain. The protocol is suited to ultracold atoms, trapped ions, quantum dots, and more. This work introduces a nonclassical phenomenon—noncommutation of conserved quantities—into a decades-old thermodynamics problem.

About the Speaker:

Dr. Nicole Yunger Halpern currently is an ITAMP Postdoctoral Fellow at Harvard. She completed her Ph.D. in 2018, under John Preskill's supervision at Caltech. Her dissertation won the Ilya Prigogine Prize for a thermodynamics Ph.D. thesis. She earned her Master's degree from the Perimeter Scholars International (PSI) program of the Perimeter Institute for Theoretical Physics, working with Rob Spekkens and Markus P. Müller. Before that, she was at Dartmouth College from where she earned her Bachelor's degree and graduated as a co-valedictorian of her class.

All are welcome!
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