Texas Tech Quantum Computing Seminar Series

April 23, 2021, 02:00 - 2:50 p.m. CST

https://zoom.us/j/92939545211

Simulating the evolution of Markovian open quantum systems on quantum computers

Abstract

Simulating the evolution of quantum systems becomes one of the most appealing tasks researchers hope to perform when small quantum computers are emerging. The simulation of Hamiltonian evolution has been well studied in previous results: the best-known gate complexity is O(t polylog(t/\epsilon)), where t is the evolution time and \epsilon is the precision. In this talk, we consider simulating the evolution of a class of more generalized systems: the Markovian open quantum systems (a.k.a Lindblad evolution). We first present an efficient quantum algorithm for simulating such evolution with gate complexity O(t polylog(t/\epsilon)). If time permits, we argue that it is impossible to achieve this linear dependency in t by simply reducing Lindblad evolution to Hamiltonian evolution in "the Church of larger Hilbert space".

Biography

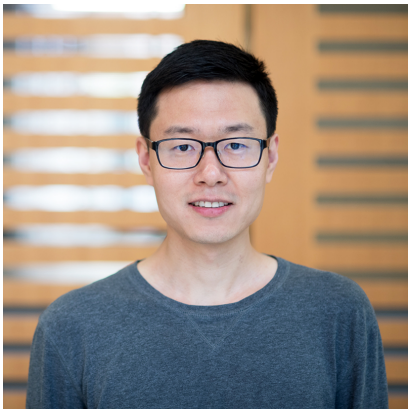
Chunhao Wang is an assistant professor in the Department of Computer Science and Engineering at the Pennsylvania State University. Before this, he was a postdoctoral research at the University of Texas at Austin. He received his Ph.D. in computer science from the University of Waterloo in 2018, where he was advised by Richard Cleve. His research aims to investigate the connections between quantum and classical algorithms and to find better quantum algorithmic tools related to physical systems.

Paper:

Efficient Quantum Algorithms for Simulating Lindblad Evolution by Richard Cleve and Chunhao Wang

In Proceedings of the 44th International Colloquium on Automata, Languages, and Programming (ICALP 2017), pages 17:1–17:14, 2017

https://arxiv.org/abs/1612.09512



Chunhao Wang