

Quantum Numerical Linear Algebra

Monday January 24, 2022

- 8:55 *Session Chair: Lin Lin (UC Berkeley)*
- 8:55–9:00 *Welcome & Opening Remarks: Dean Miguel García-Garibay (Dean of Physical Sciences, UCLA) and Dima Shlyakhtenko (Director, IPAM)*
- 9:00–9:35 **Andrew Childs** (University of Maryland)
Virtual Talk: Efficient quantum algorithm for dissipative nonlinear differential equations
- 9:45–10:00 *Break*
- 10:00–10:35 **Di Fang** (University of California, Berkeley (UC Berkeley))
Virtual Talk: Time-dependent Hamiltonian Simulation of Highly Oscillatory Dynamics
- 10:45–11:00 *Break*
- 11:00–11:35 **Andras Gilyen** (Renyi Institute of Mathematics)
Virtual Talk: Quantum Algorithms for Quantum Information Processing Tasks
- 11:45–1:30 *Lunch (on your own)*
- 1:30 *Session Chair: Nathan Wiebe (University of Toronto)*
- 1:30–2:05 **Dan Stamper-Kurn** (University of California, Berkeley (UC Berkeley))
Virtual Talk: Approaches to quantum information processing with cold atoms
- 2:15–2:30 *Break*
- 2:30–3:05 **Yulong Dong** (University of California, Berkeley (UC Berkeley))
Virtual Talk: Fast algorithms for quantum signal processing
- 3:15–3:30 *Break*
- 3:30–4:05 **Rolando Somma** (Los Alamos National Laboratory)
Virtual Talk: The Quantum Linear Systems Problem
- 4:15–4:30 *Lightning Poster Presentations - Presenters: Mehsein Jabel Atteya (Al-Mustansiriyah Univ.), Daan Camps (LBNL), Priyanga Ganesan (Texas A&M) and Ehsan Gholami (RWTH Aachen)*
- 4:30 *Poster Session (please visit the Poster Session tab)*



Tuesday January 25, 2022

- 9:00 *Session Chair: Aram Harrow (MIT)*
- 9:00–9:35 **Iordanis Kerenidis** (Université Paris Diderot)
Virtual Talk: New results in quantum linear algebra
- 9:45–10:00 *Break*
- 10:00–10:35 **Jarrod McClean** (Google)
Virtual Talk: Dequantization and quantum advantage in learning from experiments
- 10:45–11:00 *Break*
- 11:00–11:35 **Ewin Tang** (University of Washington)
Virtual Talk: On quantum linear algebra for machine learning
- 11:45–12:45 *Lunch (on your own)*
- 12:45 *Session Chair: Di Fang (UC Berkeley)*
- 12:45–1:15 *Panel Discussion, "The Hope of Practical Exponential Speedups" - Panelists: Jarrod McClean (Google), Ewin Tang (Univ. Washington) and Nathan Wiebe (Univ. Toronto) - Moderator: Aram Harrow (MIT)*
- 1:15–1:30 *Break*
- 1:30–2:05 **Seth Lloyd** (Massachusetts Institute of Technology)
Virtual Talk: Quantum polar decomposition
- 2:15–2:30 *Break*
- 2:30–3:05 **Dong An** (University of Maryland)
Virtual Talk: Improved complexity estimation for Hamiltonian simulation with Trotter formula
- 3:15–3:30 *Break*
- 3:30–4:05 **Dominic Berry** (Macquarie University)
Virtual Talk: Optimal scaling quantum linear systems solver via discrete adiabatic theorem

Wednesday January 26, 2022

- 9:00 *Session Chair: Ewin Tang (Univ. Washington)*
- 9:00–9:35 **Birgitta Whaley** (University of California, Berkeley (UC Berkeley))
Virtual Talk: Quantum non-orthogonal methods for calculation of electronic energies
- 9:45–10:00 *Break*
- 10:00–10:35 **Garnet Chan** (California Institute of Technology)
Virtual Talk: Arithmetic tensor networks and integration
- 10:45–11:00 *Break*

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- 11:00–11:35 **Anirban Chowdhury** (University of Waterloo)
Virtual Talk: Classical and quantum algorithms for estimating traces and partition functions
- 11:45–12:45 *Lunch (on your own)*
- 12:45 *Session Chair: Anirban Chowdhury (Univ. Waterloo)*
- 12:45–1:15 *Junior Participant Introductions: Daan Camps (LBNL); Cody Fan (UCLA); Priyanga Ganesan (Texas A&M); Ehsan Gholami (RWTH Aachen); Jianqiang Li (Penn State); Diyi Liu (Minnesota); and Anastasiia Minenkova (UConn)*
- 1:15–1:30 *Break*
- 1:30–2:05 **Sophia Economou** (Virginia Tech)
Virtual Talk: Problem-tailored variational quantum algorithms
- 2:15–2:30 *Break*
- 2:30–3:05 **Yu Tong** (University of California, Berkeley (UC Berkeley))
Virtual Talk: Heisenberg-limited ground state energy estimation for early fault-tolerant quantum computers
- 3:15–3:30 *Break*
- 3:30–4:05 **Kirsten Eisentraeger** (Pennsylvania State University)
Virtual Talk: Classical and quantum algorithms for isogeny problems

Thursday January 27, 2022

- 9:00 *Session Chair: Yulong Dong (UC Berkeley)*
- 9:00–9:35 **Jin-Peng Liu** (University of Maryland)
Virtual Talk: Efficient quantum algorithms for nonlinear ODEs and PDEs
- 9:45–10:00 *Break*
- 10:00–10:35 **Carlos Bravo-Prieto** (University of Barcelona)
Virtual Talk: Variational quantum architectures for linear algebra applications
- 10:45–11:00 *Break*
- 11:00–11:35 **Alexandra Kolla** (University of California, Santa Cruz)
Virtual Talk: Quantum Approximate Optimization Algorithm (QAOA) and Local Max-Cut
- 11:45–12:45 *Lunch (on your own)*
- 12:45 *Session Chair: Jin-Peng Liu (Univ. Maryland)*
- 12:45–1:15 *Open Problem Session - Moderator: Lin Lin (UC Berkeley) Notes:*
<http://www.ipam.ucla.edu/wp-content/uploads/2022/01/IPAM-QL2022-Open-Problem-Session-Notes.pdf>
- 1:15–1:30 *Break*

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- 1:30–2:05 **Chao Yang** (Lawrence Berkeley National Laboratory)
Virtual Talk: Practical Quantum Circuits for Block Encodings of Sparse Matrices
- 2:15–2:30 *Break*
- 2:30–3:05 **Maria Kieferova** (University of Technology Sydney)
Virtual Talk: Training quantum neural networks with an unbounded loss function
- 3:15 *Conclusion*

