

Workshop I: Quantum Algorithms for Scientific Computation

Monday October 2, 2023

- 8:00–8:55 *Check-In/Breakfast (Hosted by IPAM)*
- 8:55–9:00 *Welcome and Opening Remarks*
- 9:00 *Session Chair: Lin Lin (UC Berkeley)*
- 9:00–9:50 **Rolando Somma** (Google)
Quantum algorithm for simulating coupled classical oscillators
- 10:00–10:15 *Break*
- 10:15–11:05 **Mario Berta** (RWTH Aachen University)
Quantum state preparation without coherent arithmetic
- 11:15–11:30 *Break*
- 11:30–12:20 **Yuan Su** (Microsoft - Redmond, WA)
On the complexity of implementing Trotter steps
- 12:30–2:00 *Lunch (on your own)*
- 2:00 *Session Chair: Rolando Somma (Google)*
- 2:00–2:50 **Robin Kothari** (Google)
Mean estimation when you have the source code; or, quantum Monte Carlo methods
- 3:00–3:15 *Break*
- 3:15–4:05 **Yu Tong** (California Institute of Technology)
Recent progress in Hamiltonian learning
- 4:20–4:50 *Lightning Poster Presentations*
- 4:50–6:30 *Poster Session & Reception (Hosted by IPAM)*

Tuesday October 3, 2023

- 8:00–9:00 *Check-In/Breakfast (Hosted by IPAM)*
- 9:00 *Session Chair: Di Fang (Duke University)*
- 9:00–9:50 **Lexing Ying** (Stanford University)
Q-PDO and Robust QPE
- 10:00–10:15 *Break*

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- 10:15–11:05 **Peter Johnson** (Zapata Computing)
In pursuit of the first useful quantum computations for chemistry
- 11:15–11:30 *Break*
- 11:30–12:20 **Zhiyan Ding** (University of California, Berkeley (UC Berkeley))
Optimized signal fitting for Quantum phase estimation on an early fault-tolerant quantum computer
- 12:30–2:00 *Lunch (on your own)*
- 2:00 *Session Chair: Peter Johnson (Zapata Computing)*
- 2:00–2:50 **Kianna Wan** (Stanford University)
Fast multipole method on a quantum computer
- 3:00–3:15 *Break*
- 3:15–4:05 **Christian Mendl** (Technical University of Munich)
Trotter error with commutator scaling for the Fermi-Hubbard model, and improvements of Trotter methods by Riemannian quantum circuit optimization
- 4:15–4:30 *Break*
- 4:30–5:20 **Zane Rossi** (Massachusetts Institute of Technology)
Modular quantum signal processing in many variables

Wednesday October 4, 2023

- 8:00–9:00 *Check-In/Breakfast (Hosted by IPAM)*
- 9:00 *Session Chair: Konstantina Trivisa (University of Maryland)*
- 9:00–9:50 **Andras Gilyen** (Renyi Institute of Mathematics)
Quantum algorithmic tools for simulating open quantum systems
- 10:00–10:15 *Break*
- 10:15–11:05 **Chi-Fang Chen** (California Institute of Technology)
“Quantum” Markov Chain Monte Carlo algorithm
- 11:15–11:30 *Break*

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- 11:30–12:20 **Jianfeng Lu** (Duke University)
Lindblad Equations: Variational Analysis and Numerical Methods
- 12:30–2:00 *Lunch (on your own)*
- 2:00 *Session Chair: Andras Gilyen (Reyni Institute of Mathematics)*
- 2:00–2:50 **Xiantao Li** (Pennsylvania State University)
Open quantum systems in quantum computing
- 3:00–3:15 *Break*
- 3:15–4:05 **Lin Lin** (University of California, Berkeley (UC Berkeley))
Single-ancilla ground state preparation via Lindbladians
- 4:15–4:30 *Break*
- 4:30 *Panel Session Chair: Lin Lin (UC Berkeley)*
- 4:30–5:20 *Panel Discussion*

Thursday October 5, 2023

- 8:00–9:00 *Check-In/Breakfast (Hosted by IPAM)*
- 9:00 *Session Chair: Christian Mendl (Technical University of Munich)*
- 9:00–9:50 **Dong An** (University of Maryland)
Linear combination of Hamiltonian simulation for non-unitary dynamics with optimal state preparation cost
- 10:00–10:15 *Break*
- 10:15–11:05 **Chao Yang** (Lawrence Berkeley National Laboratory)
An Efficient Block Encoding Quantum Circuit for a Pairing Hamiltonian
- 11:15–11:30 *Break*
- 11:30–12:20 **Alexander Kemper** (North Carolina State University)
Quantum algorithms for dynamics and dynamical observables
- 12:30–2:00 *Lunch (on your own)*
- 2:00 *Session Chair: Alexander Kemper (North Carolina State University)*
- 2:00–2:50 **Di Fang** (Duke University)
Time-marching strategy can work quantumly for differential equations
- 3:00–3:15 *Break*

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- 3:15–4:05 **Andrew Baczewski** (Sandia National Laboratories)
Quantum computation of stopping power for inertial fusion target design
- 4:15–4:30 *Break*
- 4:30–5:20 **Jingbo Wang** (University of Western Australia)
Quantum walk, efficient implementation, and potential application

Friday October 6, 2023

- 8:00–9:00 *Check-In/Breakfast (Hosted by IPAM)*
- 9:00 *Session Chair: Yuan Su (Microsoft)*
- 9:00–9:50 **Konstantina Trivisa** (University of Maryland)
On Efficient Quantum algorithms for some classes of linear and non-linear differential equations
- 10:00–10:15 *Break*
- 10:15–11:05 **Jin-Peng Liu** (University of California, Berkeley (UC Berkeley))
Towards Provably Efficient Quantum Algorithms for Nonlinear Dynamics and Large-scale Machine Learning Models
- 11:15–11:30 *Break*
- 11:30–12:20 **Ruizhe Zhang** (Simons Institute for the Theory of Computing)
Quantum Speedups of Continuous Sampling and Optimization Problems

