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