Workshop III: Many-body Quantum Systems via Classical and Quantum Computation

Monday November 6, 2023

8:00–8:55 *Check-In/Breakfast (Hosted by IPAM)*

8:55–9:00 *Welcome & Opening Remarks*

9:00 *SESSION CHAIR: Richard Ross (University of California, Los Angeles)*

9:00–9:50 **Sophia Economou** (Virginia Tech)
Adaptive quantum simulation algorithms

10:00–10:15 *Break*

10:15–11:05 **Abhinav Kandala** (IBM Thomas J. Watson Research Center)
Evidence for the utility of quantum computing before fault tolerance.

11:15–11:30 *Break*

11:30–12:20 **Ojas Parekh** (Sandia National Laboratories)
Suffering from a hard local Hamiltonian? Quantum approximation algorithms may help.

12:30–2:30 *Lunch (on your own)*

2:30 *SESSION CHAIR: Paul Cazeaux (Virginia Polytechnic Institute and State University)*

2:30–3:20 **Norbert Schuch** (University of Vienna)
Lower bounding ground state energies through renormalization and tensor networks

3:30–4:00 *Break*

4:00–4:50 **Shankar Balasubramanian** (Massachusetts Institute of Technology)
Ultraslow dynamics, fragile fragmentation, exotic entanglement, and geometric group theory

5:00–5:15 *Lightning Poster Session*

5:15–6:30 *Poster Session & Reception (Hosted by IPAM)*

Tuesday November 7, 2023

8:00–9:00 *Check-In/Breakfast (Hosted by IPAM)*

9:00 *SESSION CHAIR: Sophia Economou (Virginia Tech)*

9:00–9:50 **Itay Hen** (University of Southern California (USC))
QMC of everything: A universal algorithm for simulating arbitrary quantum many-body systems

10:00–10:15 *Break*

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10:15–11:05 **Paul Cazeaux** (Virginia Polytechnic Institute and State University)
Randomized Algorithms for Rounding and Rank Compression in the Tensor Train Format

11:15–11:30 *Break*

11:30–12:20 **Prineha Narang** (University of California, Los Angeles (UCLA))
From nonequilibrium quantum systems to open quantum systems

12:30–2:30 *Lunch (on your own)*

2:30 *SESSION CHAIR: Mitchell Luskin (University of Minnesota)*

2:30–3:20 **Nick Mayhall** (Virginia Polytechnic Institute and State University)
Electronic structure theory via Classical and Quantum Computation

3:30–4:00 *Break*

4:00–4:50 **Joonho Lee** (Harvard University)
Auxiliary-Field Quantum Monte Carlo Beyond Hartree-Fock Trial Wavefunctions

Wednesday November 8, 2023

8:00–9:00 *Check-In/Breakfast (Hosted by IPAM)*

9:00 *SESSION CHAIR: Richard Ross (University of California, Los Angeles)*

9:00–9:50 **Daniel Mark** (Massachusetts Institute of Technology)
Universal fluctuations in ergodic quantum dynamics, and their use for benchmarking highly entangled states

10:00–10:15 *Break*

10:15–11:05 **Gary Mooney** (University of Melbourne)
Large-scale Entanglement on Physical Quantum Computers

11:15–11:30 *Break*

11:30–12:20 **Thomas Schuster** (California Institute of Technology)
Noise, complexity, and information dynamics in quantum circuits

12:30–12:45 *Group Photo*

12:45–2:30 *Lunch (on your own)*

2:30 *SESSION CHAIR: Marius Junge (University of Illinois)*

2:30–3:20 **Jacob Miller** (Zapata Computing)
Synergy Between Quantum Circuits and Tensor Networks

3:30–4:15 *Break*

4:15–5:00 *Panel Discussion*

Thursday November 9, 2023

8:00–9:00	*Check-In/Breakfast (Hosted by IPAM)*
9:00	*SESSION CHAIR: Norbert Schuch (University of Vienna)*
9:00–9:50	**Bill Fefferman** (University of Chicago) *Have we seen a demonstration of experimental quantum advantage?*
10:00–10:15	*Break*
10:15–11:05	**Ewout Van den Berg** (IBM Research) *Quantum error mitigation for observable expectation values and shot counts*
11:15–11:30	*Break*
11:30–12:20	**Leo Zhou** (California Institute of Technology) *Quantum Advantages in Energy Minimization*
12:30–2:30	*Lunch (on your own)*
2:30	*SESSION CHAIR: Katerina Gratsea (ICFO)*
2:30–3:20	**Ryan Babbush** (Google) *Searching for valuable applications of fault-tolerant quantum computers in chemistry*
3:30–4:00	*Break*
4:00–4:50	**Vedika Khemani** (Stanford University) *Quantum information phases in space-time: measurement-induced entanglement and teleportation on a noisy quantum processor*