

Workshop IV: Topology, Quantum Error Correction and Quantum Gravity

Monday November 27, 2023

- 8:00–8:55 *Check-in/Breakfast (hosted by IPAM)*
- 8:55–9:00 *Welcome and Opening Remarks*
- 9:00 *SESSION CHAIR: Zhenghan Wang (Microsoft Research)*
- 9:00–9:50 **Matthew Hastings** (Microsoft Research)
Pumping Chirality in Three Dimensions
- 10:00–10:15 *Break*
- 10:15–11:05 **Marius Junge** (University of Illinois at Urbana-Champaign)
Let's talk about noise
- 11:15–11:30 *Break*
- 11:30–12:20 **Dave Aasen** (Microsoft Station Q)
Quantum computation from dynamic automorphism codes
- 12:30–2:00 *Lunch (on your own)*
- 2:00 *SESSION CHAIR: Dave Aasen (Microsoft Station Q)*
- 2:00–2:50 **Colleen Delaney** (University of California, Berkeley (UC Berkeley))
Rooting out the classical in the topological quantum
- 3:00–3:20 *Lightning Poster Session*
- 3:30–4:30 *Poster Session*
- 5:00–6:00 **Peter Shor** (Massachusetts Institute of Technology)
"Green Family Lecture: Quantum Computing"
- 6:00–7:00 *Reception (Location: IPAM Lobby)*

Tuesday November 28, 2023

- 8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*
- 9:00 *SESSION CHAIR: Anurag Anshu (Harvard University)*
- 9:00–9:50 **Roman Lutchyn** (Microsoft Research)
Topological Quantum Computation with Majorana zero-energy modes
- 10:00–10:15 *Break*

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- 10:15–11:05 **John Wright** (University of California, Berkeley (UC Berkeley))
Virtual -TBD
- 11:15–11:30 *Break*
- 11:30–12:20 **Thomas Faulkner** (University of Illinois at Urbana-Champaign)
Quantum Error Correcting for Gravity in the large-N limit
- 12:30–2:00 *Lunch (on your own)*
- 2:00 *SESSION CHAIR: Roman Lutchyn (Microsoft Research)*
- 2:00–2:50 **Zhenghan Wang** (Microsoft Research)
Topology of moduli spaces of topological theories and applications to codes
- 3:00–3:15 *Break*
- 3:15–4:05 **Anurag Anshu** (Harvard University)
Circuit-to-Hamiltonian from tensor networks and fault tolerance
- 5:00–6:00 **Peter Shor** (Massachusetts Institute of Technology)
“Green Family Lecture: The Development of Quantum Error Correction”

Wednesday November 29, 2023

- 8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*
- 9:00 *SESSION CHAIR: Colleen Delaney (University of California, Berkeley)*
- 9:00–9:50 **Michael Freedman** (Microsoft Research)
Entanglement of Sections
- 10:00–10:15 *Break*
- 10:15–11:05 **Jeongwan Haah** (Microsoft Station Q)
Global unitaries and local measurements
- 11:15–11:30 *Break*
- 11:30–12:20 **Sakura Schafer-Nameki** (University of Oxford)
Virtual Talk: Categorical Landau Paradigm and the SymTFT
- 12:30–12:45 *Group Photo*
- 12:45–2:30 *Lunch (on your own)*
- 2:30 *SESSION CHAIR: Wednesday PM TBD*
- 2:30–3:20 **Xie Chen** (California Institute of Technology)
Topological defects in toric code and Sequential quantum circuit
- 3:30–4:00 *Break*

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4:00–4:50 **Bela Bauer** (Microsoft Research)
Fault Tolerant Quantum Computation using Majorana-Based Topological Qubits

Thursday November 30, 2023

8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*

9:00 *SESSION CHAIR: Marius Junge (University of Illinois)*

9:00–9:50 **Pavel Panteleev** (Moscow State University)
High-dimensional Sipser-Spielman codes

10:00–10:15 *Break*

10:15–11:05 **Hengyun Zhou** (Harvard University)
Quantum Computation with Quantum LDPC Codes in Reconfigurable Atom Arrays

11:15–11:30 *Break*

11:30–12:20 **Dominic Williamson** (University of Sydney)
Layer Codes

12:30–2:30 *Lunch (on your own)*

2:30 *SESSION CHAIR: Toby Cubitt (University College London)*

2:30–3:20 **Nicolas Delfosse** (Microsoft - Redmond, WA)
Fast erasure decoder for a class of quantum LDPC codes

3:30–4:00 *Break*

4:00–4:50 **Chinmay Nirkhe** (IBM Watson Research Center)
Making the leap to Quantum PCPs

Friday December 1, 2023

8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*

9:00 *SESSION CHAIR: Chinmay Nirkhe (IBM Watson Research Center)*

9:00–9:50 **Madelyn Cain** (Harvard University)
Logical processors and decoders for early fault-tolerant quantum computation

10:00–10:15 *Break*

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- 10:15–11:05 **Toby Cubitt** (University College London)
Hamiltonian simulation meets holographic duality
- 11:15–11:30 *Break*
- 11:30–12:20 **Tamara Kohler** (Stanford University)
Supersymmetry in quantum complexity: clique homology is QMA₁-hard
- 12:30–2:30 *Lunch (on your own)*
- 2:30 *SESSION CHAIR: Tamara Kohler (Stanford University)*
- 2:30–3:20 **Lukasz Fidkowski** (University of Washington)
A no-go result for implementing chiral symmetries by locality-preserving unitaries in a 3-dimensional Hamiltonian lattice model of fermions
- 3:30–4:00 *Break*
- 4:00–4:50 **Peter Shor** (Massachusetts Institute of Technology)
“Green Family Lecture: tbd”

