

Workshop II: Mathematical Aspects of Quantum Learning

Monday October 16, 2023

- 8:00–8:50 *Check-In/Breakfast (Hosted by IPAM)*
- 8:55–9:00 *Welcome & Opening Remarks*
- 9:00 *SESSSION CHAIR: Jens Eisert*
- 9:00–9:50 **Nathan Wiebe** (University of Toronto)
TBA
- 10:00–10:15 *Break*
- 10:15–11:05 **Maria Schuld** (Xanadu Quantum Technologies)
How to rethink quantum machine learning
- 11:15–11:30 *Break*
- 11:30–12:20 **Juan Carrasquilla** (Vector Institute)
Training Binary Neural Networks in Quantum Superposition
- 12:30–2:30 *Lunch (on your own)*
- 2:30 *SESSSION CHAIR: Nathan Wiebe*
- 2:30–3:20 **Yihui Quek** (Harvard University)
The signal and the noise: learning with random quantum circuits and other agents of chaos
- 3:30–4:00 *Break*
- 4:00–4:50 **Patrick Rebentrost** (National University of Singapore)
Learning of neural networks with quantum computers and learning of quantum states with graphical models.
- 5:00–5:15 *Lightning Poster Session*
- 5:15–6:30 *Poster Session & Reception (Hosted by IPAM)*

Tuesday October 17, 2023

- 8:00–9:00 *Check-In/Breakfast (Hosted by IPAM)*
- 9:00 *SESSSION CHAIR: Maria Kieferova*
- 9:00–9:50 **Jens Eisert** (Freie Universität Berlin)
Do quantum computers have applications in machine learning and combinatorial optimization?
- 10:00–10:15 *Break*

(Tuesday schedule continued on next page)



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- 10:15–11:05 **Matthias Caro** (Freie Universität Berlin)
Classical Verification of Quantum Learning
- 11:15–11:30 *Break*
- 11:30–12:20 **Ryan Sweke** (IBM Research - Almaden)
Should we use parameterized quantum circuits for machine learning?
- 12:30–2:30 *Lunch (on your own)*
- 2:30 *SESSION CHAIR: Maria Schuld*
- 2:30–3:20 **Marco Cerezo** (Los Alamos National Laboratory)
A Unified Theory of Barren Plateaus for Deep Parametrized Quantum Circuits
- 3:30–4:00 *Break*
- 4:00–4:50 **Zoe Holmes** (EPFL (Ecole Polytechnique Fédérale de Lausanne))
Exponential Concentration in Quantum Generative Modeling and Quantum Kernel Methods

Wednesday October 18, 2023

- 8:00–9:00 *Check-In/Breakfast (Hosted by IPAM)*
- 9:00 *SESSION CHAIR: Matthias Caro*
- 9:00–9:50 **Srinivasan Arunachalam** (IBM Research - Almaden)
Overview of learning structured quantum states
- 10:00–10:15 *Break*
- 10:15–11:05 **Daniel Liang** (Rice University)
Learning Beyond Stabilizer States
- 11:15–11:30 *Break*
- 11:30–12:20 **Hsin-Yuan (Robert) Huang** (California Institute of Technology)
(Remote Speaker) Learning to predict arbitrary quantum processes
- 12:30 *Group Photo*
- 12:30–2:30 *Lunch (on your own)*
- 2:30 *SESSION CHAIR: Ryan Sweke*
- 2:30–3:20 **Marika (Maria) Kieferova** (University of Technology, Sydney)
Generating Approximate Ground States of Molecules Using Quantum Machine Learning
- 3:30–4:00 *Break*
- 4:00–4:50 **Tongyang Li** (Peking University)
(Remote Speaker) On Quantum Speedups for Nonconvex Optimization via Quantum Tunneling Walks

Thursday October 19, 2023

- 8:00–9:00 *Check-In/Breakfast (Hosted by IPAM)*
- 9:00 *SESSION CHAIR: Srinivasan Anurachalam*
- 9:00–9:50 **Vojtěch Havlíček** (IBM Thomas J. Watson Research Center)
Quantum Statistical Query Learning I.
- 10:00–10:15 *Break*
- 10:15–11:05 **Louis Schatzki** (University of Illinois at Urbana-Champaign)
Quantum Statistical Query Learning II.
- 11:15–11:30 *Break*
- 11:30–12:20 **Vedran Dunjko** (Leiden University)
On provable separations between classical and quantum learners
- 12:30–2:30 *Lunch (on your own)*
- 2:30 *SESSION CHAIR: Srinivasan Anurachalam*
- 2:30–3:20 **Carlos Bravo Prieto** (Freie Universität Berlin)
Understanding quantum machine learning also requires rethinking generalization
- 3:30–4:00 *Break*
- 4:00–4:50 *Panel Discussion (Moderator: Jens Eisert)*

Friday October 20, 2023

- 8:00–9:00 *Check-In/Breakfast (Hosted by IPAM)*
- 9:00 *SESSION CHAIR: Zoe Holmes*
- 9:00–9:50 **Roger Melko** (University of Waterloo)
Language Models for Quantum Simulation
- 10:00–10:15 *Break*
- 10:15–11:05 **Amira Abbas** (University of Amsterdam)
On quantum backpropagation and information reuse
- 11:15–11:30 *Break*
- 11:30–12:20 **Jarrod McClean** (Google)
(Remote Speaker) The role of data, precomputation, and communication in a quantum learning landscape

