MECHANICAL ENGINEERING SEMINAR

Monday, 18th January 2026 at 14:30, Dan Kahn Building, Auditorium 1

Error Suppression in Adiabatic Quantum Computation with Neutral Atoms

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Hosted by: Associate Professor Gal Shmuel

Adiabatic quantum computing algorithms use continuous pulse control to prepare quantum systems in states that represent solutions to computational problems. Traditional quantum error correction methods — which involve mid-circuit readout and correction — are not directly applicable to adiabatic algorithms, as these are inherently continuous. In the early days of adiabatic quantum computing, an alternative error-suppression paradigm was proposed that uses continuous energy penalties to suppress thermal errors [1]. However, feasible implementations of this proposal using existing technological platforms are lacking. Recent advances in neutral-atom quantum computing platforms open up new possibilities and call for revisiting these early proposals.

In this talk, I will present a proposal for quantum error suppression in adiabatic quantum computation with neutral atoms. First, I will introduce an adiabatic algorithm for solving the Maximum Independent Set problem using Rydberg atom arrays [2] and recent proposals for accelerating its performance [3,4]. Then, I will present a logical encoding scheme that uses feasible two-body interactions to protect information against thermal errors. Finally, I will present protocols for implementing the required Hamiltonian interactions with rubidium qubits.

[1] Jordan, S. P., Farhi, E., & Shor, P. W. (2006). Error-correcting codes for adiabatic quantum computation. *Physical Review A*, *74*(5), 052322

[2] M., Ebadi, S., Keesling, A., et al. (2022). Quantum optimization of MIS using Rydberg atom arrays. *Science*, *376*(6598), 1209–1215

[3] Karni, G., Cohen N, and Pick, A (2026). Efficient Hamiltonian engineering for adiabatic MIS algorithms. *arXiv preprint arXiv:2605.16944*.

[4] Turyansky, D., Zolti, Y., Cohen, Y., & Pick, A. (2026). Gradient-free pulse optimization for adiabatic control in open few-body quantum systems. *Physical Review Research*, *8*(1), 013206.

Seminars Coordinator: Prof. Sefi Givli

Short Bio

Adi Pick is an Associate Professor in the Department of Applied Physics at the Hebrew University of Jerusalem since 2022. Her research group explores the foundations of open quantum systems and their applications to quantum computation and sensing. Dr. Pick received her Ph.D. in Physics from Harvard University in 2017 under the supervision of Prof. Steven G. Johnson. She subsequently held a postdoctoral position at the Technion under the supervision of Prof. Nimrod Moiseyev, and later joined the Weizmann Institute of Science as a postdoctoral researcher with Prof. Barak Dayan. Her research contributions include developing applications of exceptional points in photonic and atomic systems and optimization of adiabatic quantum algorithms. She has received support from the Einstein Foundation, the Israel Science Foundation, and the German Israel Foundation (GIF). She is a member of the Israeli Quantum Computing Theory Center and a core group member of the European Cooperation in Science and Technology (COST).