

ITAY HEN CURRICULUM VITAE

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Personal Details

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Education

- Ph.D. Physics, Tel-Aviv University (04/2009).
Advisor: Prof. Marek Karliner.
- M.Sc. Physics, Tel-Aviv University, joined the direct Ph.D. program (2003). Advisor: Prof. Marek Karliner.
- B.Sc. Physics, Tel-Aviv University, magna cum laude (2002).
- B.A. Psychology, Tel-Aviv University (2002).

Academic and Research Positions

- **Adjunct Associate Professor (Research)** – Department of Physics and Astronomy, University of Southern California, Los Angeles, CA (07/2020 –).
- **Research Lead/Computer Scientist** – Information Sciences Institute, University of Southern California, Los Angeles, CA (10/2013 –).
- **Adjunct Assistant Professor (Research)** – Department of Physics and Astronomy, University of Southern California, Los Angeles, CA (07/2016 –06/2020).
- **Senior Research Scientist** – NASA Ames Research Center, Moffett Field, CA (08/2012 – 09/13).
Research Associate – Physics Department, UC Santa Cruz, CA (08/2012 – 09/13).
- **Postdoctoral Fellow** – Theoretical Condensed Matter/Quantum Computing, UC Santa Cruz, CA (06/2010 – 07/2012). Advisor: Prof. Peter Young.
- **Postdoctoral Fellow** – Theoretical Condensed Matter, Georgetown University, Washington, DC (10/2008 – 05/2010). Advisor: Prof. Marcos Rigol.

Fields of interest

- Quantum computing and algorithms, Adiabatic quantum computing and quantum annealing.
- Foundations of Quantum Mechanics.
- Quantum phase transitions, Bose-Hubbard models, ultra-cold atoms in optical lattices.
- Quantum and classical Monte Carlo simulations.
- Numerical and computational physics: Optimization techniques, many-body simulations, molecular dynamics, partial differential equations, multi-dimensional minimization algorithms.
- Topological solitons, spontaneous breaking of rotational symmetry in quantum field theories (thesis title).

Journal Refereeing/Editing

- Associate Editor: ACM Transactions on Quantum Computing
- Editorial Board Member: Scientific Reports
- Academic Editor: PLOS ONE
- Editorial Board Member: Entropy
- Review editor, Guest associate editor: Frontiers in ICT

- Nature, Nature Physics, Nature Communications, Nature Nanotechnology
- PNAS
- Physical Review A, B, E, X, X Quantum, Letters, Applied, Research
- npj Quantum Information
- IEEE Access, IEEE Transactions on Systems, Man and Cybernetics: Systems
- Quantum Science and Technology
- Quantum
- New Journal of Physics
- Quantum Information Processing
- Journal of Physics A: Mathematical and Theoretical, Journal of Physics B: Atomic, Molecular and Optical Physics
- Europhysics Letters
- Journal of Computer Science and Technology
- Physics Letters A
- Annalen der Physik
- Entropy, Applied Sciences.
- Canadian Journal of Physics
- JSTAT: Journal of Statistical Mechanics: theory and experiment
- Frontiers in Physics
- European Physical Journal D
- Theory and Practice of Logic Programming
- Open Systems and Information Dynamics
- Advanced Quantum Technologies
- Journal of Mathematical Analysis and Applications
- Computers and Electrical Engineering
- Reports on Mathematical Physics
- Quantum Machine Intelligence
- Journal of Computational Science
- Communications Physics

List of publications

- (1) G. Quiroz, P. Titum, P. Lotshaw, P. Lougovski, K. Schultz, E. Dumitrescu and I. Hen, “Quantifying the Impact of Precision Errors on Quantum Approximate Optimization Algorithms”. arXiv:2109.04482 (2021).
- (2) J. L. C. da C. Filho, Z. G. Izquierdo, A. Saguia, T. Albash, I. Hen, and M. S. Sarandy, “Observation of many-body localization in an experimental quantum annealer”. arXiv:2108.06762 (2021).
- (3) M. Kowalsky, T. Albash, I. Hen and D. A. Lidar, “3-Regular 3-XORSAT Planted Solutions Benchmark of Classical and Quantum Heuristic Optimizers”, submitted for publication. arXiv:2103.08464 (2021).
- (4) T. Halverson, L. Gupta, M. Goldstein and I. Hen, “Efficient simulation of so-called non-stoquastic superconducting flux circuits”, submitted for publication. arXiv:2011.03831 (2020).

- (5) L. Barash, S. Güttel and I. Hen, “Calculating elements of matrix functions using divided differences”, accepted for publication in *Computer Physics Communications*. arXiv:2107.14124 (2021).
- (6) Y.-H. Chen, A. Kalev, and I. Hen, “A quantum algorithm for time-dependent Hamiltonian simulation by permutation expansion”, *PRX Quantum* 2, 030342 (2021). arXiv:2103.15334 (2021).
- (7) A. Kalev, and I. Hen, “An integral-free representation of the Dyson series using divided differences”, *New J. Phys.* 23, 103035 (2021). arXiv:2010.09888.
- (8) Z. Gonzalez Izquierdo, T. Albash and I. Hen, “Testing a quantum annealer as a quantum thermal sampler”, *ACM Transactions on Quantum Computing* 2/7, 1-20. arXiv:2003.00361 (2020).
- (9) I. Hen, “Determining quantum Monte Carlo simulability with geometric phases”, *Physical Review Research* 3, 023080 (2021). arXiv:2012.02022 (2020).
- (10) A. Kalev, and I. Hen, “Quantum Algorithm for Simulating Hamiltonian Dynamics with an Off-diagonal Series Expansion”, *Quantum* 5, 426 (2021). arXiv:2006.02539 (2020).
- (11) E. Crosson, T. Albash, I. Hen, and A. P. Young, “De-Signing Hamiltonians for Quantum Adiabatic Optimization”, *Quantum* 4, 334 (2020). arXiv:2004.07681.
- (12) Z. Gonzalez Izquierdo, R. Zhou, K. Markström and I. Hen, “Discriminating Non-Isomorphic Graphs with an Experimental Quantum Annealer”, *Phys. Rev. A* 102, 032622. arXiv:2003.00361 (2020).
- (13) L. Gupta, T. Albash and I. Hen, “Permutation Matrix Representation Quantum Monte Carlo”, *J. Stat. Mech.* 073105 (2020). arXiv:1908.03740.
- (14) J. Klassen, M. Marvian, S. Piddock, M. Ioannou, I. Hen and B. Terhal, “Hardness and Ease of Curing the Sign Problem for Two-Local Qubit Hamiltonians”, *SIAM J. Comput.*, 49(6), 13321362 (2020). arXiv:1906.08800.
- (15) L. Gupta, L. Barash and I. Hen, “Calculating the divided differences of the exponential function by addition and removal of inputs”, *Computer Physics Communications* 254, 107385 (2020). arXiv:1912.12157 (2019).
- (16) L. Gupta and I. Hen, “Elucidating the interplay between non-stoquasticity and the sign problem”, *Advanced Quantum Technologies*. arXiv:1910.13867 (2019).
- (17) A. Pearson, A. Mishra, I. Hen and D. Lidar, “Analog Errors in Quantum Annealing: Doom and Hope”, *npj Quantum Information* 5, 107 (2019). arXiv:1907.12678 (2019).
- (18) M. Slutskaa, T. Albash, L. Barash and I. Hen, “Analog Nature of Quantum Adiabatic Unstructured Search”, *New Journal of Physics* 21, 113025 (2019). arXiv:1904.04420.
- (19) L. Barash, J. Marshall, M. Weigel and I. Hen, “Estimating the Density of States of Frustrated Spin Systems”, *New Journal of Physics* 21, 073065 (2019). arXiv:1808.04340.
- (20) I. Hen, “Equation Planting: A Tool for Benchmarking Ising Machines”, *Phys. Rev. Applied* 12, 011003 (2019). arXiv:1903.10928.
- (21) T. Albash and I. Hen, Future of physical quantum annealers: impediments and hopes, *Science and Culture* 85 163-170 (2019).
- (22) I. Hen, “How quantum is the speedup in adiabatic unstructured search?”, *Quant. Inf. Proc.* 18, 162 (2019). arXiv:1811.08302.
- (23) J. Marshall, D. Venturelli, I. Hen and E. G. Rieffel, “The power of pausing: advancing understanding of thermalization in experimental quantum annealers”, *Phys. Rev. Applied* 11, 044083 (2019). arXiv:1810.05881.
- (24) T. Albash, V. Martin-Mayor and I. Hen, “Analog Errors in Ising Machines”, *Quantum Science & Technology* 4 02LT03 (2019). arXiv:1806.03744.
- (25) I. Hen, “Resolution of the Sign Problem for a Frustrated Triplet of Spins”, *Phys. Rev. E* 99, 033306 (2019). arXiv:1811.03027.

- (26) M. Marvian, D. A. Lidar and I. Hen, “On the Computational Complexity of Curing Non-Stoquastic Hamiltonians”, *Nature Communications* **10**, 1571 (2019). arXiv:1802.03408.
- (27) Y. Susa, Y. Yamashiro, M. Yamamoto, I. Hen, D. Lidar and H. Nishimori, “Quantum annealing of the p -spin model under inhomogeneous transverse field driving”, *Phys. Rev. A* **98**, 042326 (2018). arXiv:1808.01582
- (28) I. Hen and T. Albash, “Solving Quantum Spin Glasses with Off-Diagonal Expansion Quantum Monte Carlo”, *Journal of Physics: Conference Series (JPCS)* **1136**, 012007 (2018).
- (29) I. Hen, “Off-Diagonal Series Expansion for Quantum Partition Functions”, *J. Stat. Mech* 053102 (2018). arXiv:1802.08333.
- (30) B. Zhang, G. Wagenbreth, V. Martin-Mayor and I. Hen, “Advantages of unfair quantum ground-state sampling”, *Scientific Reports* **7**, 1044 (2017). arXiv:1701.01524.
- (31) I. Hen, “Realizable quantum adiabatic search”, *Europhysics Letters* **118**, 30003 (2017). arXiv:1612.06012.
- (32) I. Hen, “Solving spin glasses with optimized trees of clustered spins”, *Phys. Rev. E* **96**, 022105 (2017). arXiv:1705.02075.
- (33) T. Albash, V. Martin-Mayor and I. Hen, “Temperature scaling law for quantum annealing optimizers”, *Phys. Rev. Lett.* **119**, 110502 (2017), arXiv:1703.03871.
- (34) J. Marshall, E. Rieffel and I. Hen, “Thermalization, freeze-out and noise: deciphering experimental quantum annealers”, *Phys. Rev. Applied* **8**, 064025 (2017). arXiv:1703.03902.
- (35) T. Albash, G. Wagenbreth and I. Hen, “Off-diagonal expansion quantum Monte Carlo”. *Phys. Rev. E* **96**, 063309 (2017). arXiv:1701.01499.
- (36) I. Hen and F. M. Spedalieri, “Quantum annealing for constrained optimization”, *Phys. Rev. Applied* **5**, 034007 (2016). arXiv:1508.04212.
- (37) I. Hen and M. S. Sarandy, “Driver Hamiltonians for constrained optimization in quantum annealing”, *Phys. Rev. A* **93**, 062312 (2016). arXiv:1602.07942.
- (38) J. Marshall, V. Martin-Mayor and I. Hen, “Practical Engineering of Hard Spin-Glass Instances”, *Phys. Rev. A* **94**, 012320 (2016). arXiv:1605.03607.
- (39) I. B. Coulamy, A. C. Santos, I. Hen and M. S. Sarandy, “Energetic cost of superadiabatic quantum computation”, *Frontiers in ICT* **3**, 19 (2016). arXiv:1603.07778.
- (40) I. Hen and A. P. Young, “Performance of the quantum adiabatic algorithm on constraint satisfaction and spin glass problems”, *European Physical Journal Special Topics* **224**, 63-73 (2015).
- (41) I. Hen, “Quantum gates with controlled adiabatic evolutions”, *Phys. Rev. A* **91**, 022309 (2015). arXiv:1401.5172.
- (42) A. Kalev and I. Hen, “Fidelity-optimized quantum state estimation”, *New Journal of Physics* **17** 092008 (2015). arXiv:1409.1952.
- (43) I. Hen and A. P. Young, “Numerical Studies of the Quantum Adiabatic Algorithm, and spin glass problems”, *Proceedings of CCP2014, J. Phys.: Conf. Ser.* **640**, 012038 (2015).
- (44) V. Martin-Mayor and I. Hen, “Unraveling Quantum Annealers using Classical Hardness”, *Scientific Reports* **5**, 15324 (2015). arXiv:1502.02494.
- (45) I. Hen, J. Job, T. Albash, Troels F. Roennow, M. Troyer, D. A. Lidar, “Probing for quantum speedup in spin glass problems with planted solutions”, *Phys. Rev. A* **92**, 042325 (2015). arXiv:1502.01663.
- (46) W. Vinci, T. Albash, G. Paz-Silva, I. Hen and D. A. Lidar, “Quantum annealing correction with minor embedding”, *Phys. Rev. A* **92**, 042310 (2015). arXiv:1507.02658.

- (47) T. Albash, I. Hen, F. M. Spedalieri and D. A. Lidar, “Reexamination of the evidence for entanglement in the D-Wave processor”, *Phys. Rev. A* **92**, 062328 (2015). arXiv:1506.03539.
- (48) I. Hen, “How Fast Can Quantum Annealers Count?”, *J. Phys. A: Math. Theor.* **47**, 235304 (2014). arXiv:1301.4956.
- (49) I. Hen, “Continuous-Time Quantum Algorithms for Unstructured Problems”, *J. Phys. A: Math. Theor.* **47**, 045305 (2014). arXiv:1302.7256
- (50) I. Hen, “Period finding with Adiabatic Quantum Computation”, *Europhysics Letters* **105**, 50005 (2014). arXiv:1307.6538.
- (51) E. G. Rieffel, M. Do, D. Venturelli, I. Hen and J. Franks, “Phase Transitions in Planning Problems: Design and Analysis of Parameterized Families of Hard Planning Problems”, *AAAI 2014*: 2337-2343 (2014).
- (52) I. Hen, “Fourier-transforming with quantum annealers”. *Front. Phys.* **2**, 44 (2014).
- (53) I. Hen, “Excitation Gap from Optimized Correlation Functions in Quantum Monte Carlo Simulations”, *Phys. Rev. E* **85**, 036705 (2012). arXiv:1112.2269.
- (54) I. Hen and A. P. Young, “Solving the Graph Isomorphism Problem with a Quantum Annealer”, *Phys. Rev. A* **86**, 042310 (2012). arXiv:1207.1712.
- (55) E. Farhi, D. Gosset, I. Hen, A. W. Sandvik, P. Shor, A. P. Young, and F. Zamponi, “The performance of the quantum adiabatic algorithm on 3 Regular 3XORSAT and 3 Regular Max-Cut”, *Phys. Rev. A* **86**, 052334 (2012). arXiv:1208.3757.
- (56) I. Hen and A. P. Young, “Exponential Complexity of the Quantum Adiabatic Algorithm for certain Satisfiability Problems”, *Phys. Rev. E* **84**, 061152 (2011). arXiv:1109.6872.
- (57) I. Hen and M. Rigol, “Strongly interacting atom lasers in three dimensional optical lattices”, *Phys. Rev. Lett.* **105**, 180401 (2010). arXiv:1010.5553.
- (58) I. Hen and M. Rigol, “Analytical and numerical study of trapped strongly correlated bosons in two- and three-dimensional lattices”, *Phys. Rev. A* **82**, 043634 (2010). arXiv:1005.1915.
- (59) I. Hen, M. Iskin and M. Rigol, “Phase diagram of the hardcore Bose-Hubbard model on a checkerboard superlattice”, *Phys. Rev. B* **81**, 064503 (2010). arXiv:0911.0890.
- (60) F. Alexander Wolf, I. Hen and M. Rigol, “Collapse and revival oscillations as a probe for the tunneling amplitude in an ultracold Bose gas”, *Phys. Rev. A* **82**, 043601 (2010). arXiv:1010.1776.
- (61) I. Hen and M. Karliner, “Review of rotational symmetry breaking in baby Skyrme models”, in G. Brown and M. Rho, Eds., *The Multifaceted Skyrmion*, (World Scientific, Singapore, 2010).
- (62) I. Hen and M. Rigol, “Superfluid to Mott-insulator transition of hardcore bosons in a superlattice”, *Phys. Rev. B* **80**, 134508 (2009). arXiv:0905.4920.
- (63) I. Hen and M. Karliner, “Lattice structure of baby skyrmions”, *Theoretical and Mathematical Physics* **160(1)**, 934 (2009).
- (64) I. Hen and A. Kalev, “Equations of motion for the quantum characteristic functions”, arXiv:0803.0108 (2008).
- (65) I. Hen and M. Karliner, “Rotational symmetry breaking in baby Skyrme models”, *Nonlinearity* **21**, 399 (2008). arXiv:0901.1489.
- (66) A. Kalev and I. Hen, “No-broadcasting theorem and its classical counterpart”, *Phys. Rev. Lett.* **100**, 210502 (2008). arXiv:0704.1754.
- (67) I. Hen and M. Karliner, “Spontaneous breaking of rotational symmetry in rotating solitons: a toy model of excited nucleons with high angular momentum”, *Phys. Rev. D* **77**, 116002 (2008). arXiv:0802.2348.

- (68) I. Hen and M. Karliner, “Baby skyrmions on the two-sphere”, *Phys. Rev. E* **77**, 036612 (2008). arXiv:0711.1974.
- (69) I. Hen and M. Karliner, “Hexagonal structure of baby skyrmion lattices”, *Phys. Rev. D* **77**, 054009 (2008). arXiv:0711.2387.
- (70) I. Hen and A. Kalev, “Classical states and their quantum correspondence”, arXiv:quant-ph/0701015 (2007).
- (71) H. Braunstein-Bercovitz, I. Hen and R. E. Lubow, “Masking task load modulates latent inhibition”, *Cognition and Emotion* **18**, 1135 (2004).
- (72) I. Hen, A. Sakov, N. Kafkafi, I. Golani and Y. Benjamini, “The dynamics of spatial behavior: how can robust smoothing techniques help?”, *Journal of Neuroscience Methods* **133**, 161 (2004).

Conference and seminar talks:

- “Hexagonal Structure of Baby Skyrmion Lattices”, Israel Physical Society, Weizmann Institute of Science, Rehovot, Israel, December 2007 (conference talk).
- “Hexagonal Structure of Baby Skyrmion Lattices”, Integrable Systems Seminar, University of Leeds, Leeds, UK, March 2008 (seminar talk).
- “Spontaneous Breaking of Rotational Symmetry in Field Theory Solitons”, Particle Physics Seminar, Tel-Aviv University, Tel-Aviv, Israel, June 2008 (seminar talk).
- “Hexagonal Structure of Baby Skyrmion Lattices”, Nonlinear Physics: Theory and Experiment V, Gallipoli, Italy, June 2008 (conference talk).
- “Superfluid to Mott-insulator Transition of Hardcore Bosons in a Superlattice”, Condensed Matter Physics Seminar, Georgetown University, Washington DC, March 2009 (seminar talk).
- “Superfluid to Mott-insulator Transition of Hardcore Bosons in a Superlattice”, APS March Meeting, Pittsburgh, PA, March 2009 (conference talk).
- “Superfluid to Mott-insulator Transition of Hardcore Bosons in a Superlattice”, Condensed Matter Physics Seminar, Georgetown University, Washington DC, May 2009 (seminar talk).
- “No-Broadcasting Theorem and Its Classical Counterpart”, 2nd Vienna Symposium on the Foundations of Modern Physics, Vienna, Austria, June 2009 (poster).
- “Phase Diagram of the Hardcore Bose-Hubbard Model in the Presence of a Superlattice”, Quantum Information/Bose-Einstein Condensation Seminar, NIST, Gaithersburg, MD, December 2009 (seminar talk).
- “Phase Diagram of the Hardcore Bose-Hubbard Model in the Presence of a Superlattice”, Condensed Matter Physics Seminar, Georgetown University, Washington DC, November 2009 (seminar talk).
- “Phase Diagram of the Hardcore Bose-Hubbard in the Presence of a Superlattice”, AMOPP group talk, University College London, London, UK, January 2010 (Job talk).
- “Phase Diagram of the Hardcore Bose-Hubbard Model in the Presence of a Superlattice”, Condensed Matter Seminar, UC Santa Cruz, Santa Cruz, CA, January 2010 (seminar talk).
- “Phase Diagram of the Hardcore Bose-Hubbard Model in the Presence of a Superlattice”, APS March Meeting, Portland, OR, March 2010 (conference talk).
- “No-Broadcasting Theorem and Its Classical Counterpart”, ARO/ NSA 2010 Quantum Computing, Quantum Algorithms & Multi-Qubit Coherent Operations Program Review, Cincinnati, OH, August 2010 (poster).
- “Phase Diagram of Hardcore Bose-Hubbard Model in the Presence of a Superlattice”, Condensed Matter Seminar, Boston University, Boston, MA, November 2010 (seminar talk).

- “*Strongly Interacting Atom Lasers in 3D Optical Lattices*”, 2011 Mini Stat Mech Meeting, UC Berkeley, Berkeley, CA, January 2011 (poster).
 - “*Implementation of the Quantum Adiabatic Algorithm*”, Farhi Group Meeting, MIT, Cambridge, MA, February 2011 (Informal seminar talk).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, ARO/ NSA 2011 Quantum Computing and Quantum Algorithms Program Review, Denver, CO, August 2011 (poster).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, International Workshop on Simulation and Manipulation of Quantum Systems for Information Processing, Jülich, Germany, October 2011 (poster).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, Condensed Matter Seminar, Weizmann Institute of Science, Rehovot, Israel, November 2011 (seminar talk).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, Condensed Matter Seminar, Ben-Gurion University, Beer Sheva, Israel, December 2011 (seminar talk).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, Condensed Matter Seminar, Bar-Ilan University, Ramat Gan, Israel, December 2011 (seminar talk).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, Condensed Matter Seminar, Tel Aviv University, Tel Aviv, Israel, December 2011 (seminar talk).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, Condensed Matter Seminar, Hebrew University, Jerusalem, Israel, December 2011 (seminar talk).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, Condensed Matter Seminar, Rutgers Center for Materials Theory, Piscataway, NJ, December 2011 (seminar talk).
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- “*Complexity of the Quantum Adiabatic Algorithm*”, 2012 Mini Stat Mech Meeting, UC Berkeley, Berkeley, CA, January 2012 (poster).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, First NASA Quantum Future Technologies Conference, Moffett Field, CA, January 2012 (poster).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, Quantum Computing Group Seminar, LPS, College Park, MD, January 2012 (seminar talk).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, APS March Meeting, Boston, MA, February 2012 (conference talk).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, NASA Space Research Expo, Moffett Field, CA, March 2012 (poster).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, Condensed Matter Seminar, UC Santa Cruz, Santa Cruz, CA, April 2012 (seminar talk).
 - “*Adiabatic Quantum Computing*”, Advanced Machine Learning Class, UC Santa Cruz, Santa Cruz, CA, June 2012 (tutorial).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, Workshop on Complex quantum systems: Nonergodicity, glassiness and localization, The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy, August 2012 (invited talk).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, Condensed Matter Seminar, Universidad Complutense de Madrid, Madrid, Spain, September 2012 (seminar talk).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, Quantum Information Laboratory Workshop, NASA Ames research center, Moffett Field, CA, November 2012 (seminar talk).
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- “*Some New Quantum Adiabatic Algorithms*”, AQC 2013 – 2nd International Workshop on Adiabatic Quantum Computing, London, UK, March 2013 (conference talk).
 - “*Complexity of the Quantum Adiabatic Algorithm*”, APS March Meeting, Baltimore, MD, March 2013 (invited talk).
 - “*Harnessing Adiabatic Quantum Computing for Operational Planning Problems*”, NASA-Ames QuAIL Seminar, Moffett Field, CA, June 2013 (seminar talk).

- “*Harnessing Adiabatic Quantum Computing for Operational Planning Problems*”, 2nd D-Wave Application Colloquium, ISI/USC, Marina del Rey, CA, June 2013 (invited talk).
- “*Programming the D-Wave Chip*”, NASA Ames Research Center, Moffett Field, CA, August 2013.
- “*New Quantum Adiabatic Algorithms*”, Quantum Computing Meetup Group, Mountain View, CA, October 2013 (invited talk).
- “*Period Finding with Adiabatic Quantum Computation*”, Daniel Lidar’s Group Meeting, University of Southern California, Los Angeles, CA, October 2013.
- “*Hardness of D-Wave-specific problems with planted solutions*”, Google’s Quantum Computing Group, Venice–Los Angeles, CA, December 2013.
- “*Hardness of D-Wave-specific problems with planted solutions*”, Daniel Lidar’s Group Meeting, University of Southern California, Los Angeles, CA, December 2013.
- “*Period Finding and other Quantum Adiabatic Algorithms*”, Condensed Matter Seminar, Ben-Gurion University, Beer Sheva, Israel, December 2013 (seminar talk).
- “*Period Finding and other Quantum Adiabatic Algorithms*”, Quantum Seminar, Tel Aviv University, Tel Aviv, Israel, January 2014 (seminar talk).
- “*Hardness of D-Wave-specific problems with planted solutions*”, QRA/Lockheed-Martin/USC Meeting, University of Southern California, Los Angeles, CA, January 2014.
- “*Quantum Adiabatic Circuits*”, 3rd D-Wave Application Colloquium, Google, Venice, CA, January 2014.
- “*Power of Adiabatic Quantum Computation*”, Physics Colloquium, University of Southern California, Los Angeles, CA, February 2014 (colloquium).
- “*Controlled Quantum Adiabatic Evolution*”, Quantum Control MURI retreat, Laguna Beach, CA, February 2014.
- “*Period Finding with Adiabatic Quantum Computation*”, SQuInT (Southwest Quantum Information and Technology), Santa Fe, NM, February 2014 (conference talk).
- “*Period Finding with Adiabatic Quantum Computation*”, APS March Meeting, Denver, CO, March 2014.
- “*Period Finding with Adiabatic Quantum Computation*”, Aspen Winter Conference on Advances in Quantum Algorithms and Computation, Aspen, CO, March 2014 (invited talk).
- “*Performance of D-Wave Two on Problems with Planted Solutions*”, AQC 2014, Los Angeles, CA, June 2014 (invited talk).
- “*Performance of D-Wave Two on Problems with Planted Solutions*”, Google Quantum Group Seminar, Google, Venice, CA, June 2014.
- “*Quantum Computational Science*”, 2014 OLCF Users Meeting, Oak Ridge, TN, July 2014 (invited talk).
- “*Optimization via Open System Quantum Annealers*”, ARO Program Review, Arlington VA, August 2014.
- “*Quantum versus Thermal Annealing: Seeking a Fair Comparison*”, Workshop on heuristic and quantum-inspired optimization, Zurich, Switzerland, August 2014 (invited talk).
- “*Performance of D-Wave Two on Problems with Planted Solutions*”, Practical Applications of Quantum Annealing Workshop, Griffiss Air Force Base, Rome, NY, September 2014 (invited talk).
- “*Quantum versus Thermal Annealing: Seeking a Fair Comparison*”, D-Wave Users Colloquium, Sunnyvale, CA, September 2014 (invited talk).
- “*Quantum Speedups with D-Wave Two*”, Lawrence Livermore National Laboratory, Livermore, CA, October 2014 (seminar talk).
- “*Role of Classical Hardness for Quantum Annealers*”, Peter Young Retirement Conference, Santa Cruz, CA, February 2015 (invited talk).

- “*Effects of Classical Control Errors on the Performance of Quantum Annealers*”, Quantum Control MURI Retreat, Huntington Beach, CA, February 2015.
 - “*Near-Future Quantum Advantages Beyond Speedup*”, ASCR Workshop on Quantum Computing for Science, Bethesda, MD, February 2015 (invited talk).
 - “*Classical Simulations of Large-Scale Quantum Computers*”, ASCR Workshop on Quantum Computing for Science, Bethesda, MD, February 2015 (invited talk).
 - “*Role of Classical Hardness for Quantum Annealers*”, SQuInT (Southwest Quantum Information and Technology), Berkeley, CA, February 2015 (conference talk).
 - “*Role of Classical Hardness for Quantum Annealers*”, APS March Meeting, San Antonio, TX, March 2015.
 - “*Harnessing Spin-Glass Theory to Probe Quantum Annealers*”, Condensed-Matter seminar, Bar-Ilan University, Ramat Gan, Israel, April 2015 (seminar talk).
 - “*Optimized Adaptive Tomography*”, Daniel Lidar’s Group Meeting, University of Southern California, Los Angeles, CA, April 2015.
 - “*Power of Adiabatic Quantum Computation: Theory and Reality*”, Physics Seminar, San Jose State University, San Jose CA, April 2015.
 - “*Power of Adiabatic Quantum Computation: Theory and Reality*”, QCD: from Theory to Experiment (symposium in honor of Marek Karliner’s 60th birthday), Tel Aviv University, Tel Aviv, Israel, May 2015 (invited talk).
 - “*Generating hard problems on the Chimera*”, Fourth Conference in Adiabatic Quantum Computing, ETH Zurich, Switzerland, June 2015.
 - “*Quantum Annealing for Constrained Optimization*”, D-Wave/Lockheed-Martin/USC Meeting, University of Southern California, Los Angeles, CA, September 2015.
 - QEO proposers’ day, IARPA, College Park, MD, October 2015.
 - *R&D in Computing*, Rethink Disruption CTO Forum, San Francisco, CA, November 2015 (panelist, invited).
 - “*Simulations, modeling and benchmarking of experimental quantum annealing optimizers*”, SC15 (USC booth), Austin, TX, November 2015.
 - “*Fidelity-optimized quantum state estimation*”, Neural Information Processing Systems (NIPS) 2015, Montreal, CA, December 2015.
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- “*Quantum Annealing for Constrained Optimization*”, SQuInT (Southwest Quantum Information and Technology), Santa Fe, NM, February 2016 (conference talk).
 - “*Quantum Annealing for Constrained Optimization*”, Google Quantum Group meeting, Venice, CA, March 2016.
 - “*Quantum Annealing for Constrained Optimization*”, APS March meeting, Baltimore, MD, March 2016.
 - “*Practical Engineering of Hard Spin-Glass Instances*”, Daniel Lidar’s Group Meeting, University of Southern California, Los Angeles, CA, May 2016. .
 - “*Classical Modeling of Quantum Tunneling*”, Adiabatic Quantum Computing Conference, Venice, CA, June 2016.
 - “*Temperature chaos, J-chaos and the like in quantum annealers*”, NASA Ames Research Center, Moffett Field, CA, August 2016.
 - “*Role of classical hardness for quantum annealers*”, Berkeley Quantum Information and Computation Center, Berkeley, CA, August 2016.
 - “*Quantum-Classical Hybrid Monte Carlo Algorithms with Applications to AQC*”, Workshop on Theory and Practice of Adiabatic Quantum Computers and Quantum Simulation, The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy, August 2016 (invited).
 - “*A Scaling Law for Dilution Fridges*”, Lockheed Martin/D-Wave/USC technical exchange meeting, Marina del Rey, CA, October 2016.

- “*Probing Analog Quantum Annealers with High Performance Computers*”, SC16 (USC booth), Salt Lake City, UT, November 2016.
- “*The fair in unfair quantum ground state sampling*”, AGU meeting, San Francisco, CA, December 2016 (poster).
- “*The fair in unfair quantum ground state sampling*”, Daniel Lidar’s group meeting, Los Angeles, CA, January 2017.
- “*Quantum annealers: Past and Future*”, ISI’s CS&T Monthly meeting, Marina del Rey, CA, January 2017.
- “*Realizable quantum adiabatic search*”, SQuInT (Southwest Quantum Information and Technology), Baton Rouge, Louisiana, February 2017 (poster).
- “*Thermalization, freeze-out and J-chaos: deciphering experimental quantum annealers*”, APS March Meeting, New Orleans, Louisiana, March 2017 (conference talk).
- “*Beyond HFS*”, Lockheed Martin/D-Wave/USC technical exchange meeting, Marina del Rey, CA, April 2017.
- “*Quantum Computing at ISI: D-Wave and Beyond*”, Air Force Space Command SMC visit, Marina del Rey, CA, April 2017.
- “*Power of Adiabatic Quantum Computing: Theory and Reality*”, Dahlem Center Colloquium, Dahlem Center for Complex Quantum Systems — Free University of Berlin, Berlin, Germany, June 2017.
- “*Limitations of Physical Quantum Annealers*”, AQC 2017 – 5th International Workshop on Adiabatic Quantum Computing, Tokyo, Japan, June 2017 (invited).
- “*Off-diagonal Expansion Quantum Monte Carlo*”, Conference of Computational Physics 2017, Paris, France, July 2017.
- “*Understanding Analog Quantum Computers with Digital Supercomputers*”, CECAM Workshop — Synergy between quantum computing and high-performance computing, Zurich, Switzerland, August 2017 (invited).
- “*Power of Adiabatic Quantum Computing: Theory and Reality*”, Physics Colloquium, Universidade Federal Fluminense, Niteroi, RJ, Brasil, October 2017.
- “*Limitation of and Hopes for Physical Quantum Annealers*”, Quantum Information Seminar, Universidade Federal Fluminense, Niteroi, RJ, Brasil, October 2017.
- “*Quantum Enhancement*”, QEO Kickoff Meeting, San Diego, CA, October 2017.
- “*Searching for Optimal Quantum Annealing Architectures*”, QEO Kickoff Meeting, San Diego, CA, October 2017.
- “*Limitation of and Hopes for Physical Quantum Annealers*”, DARPA/MEC Quantum Applications Workshop, Berkeley, CA, November 2017 (invited).
- “*Different Facets of Benchmarking*”, QEO Technical Exchange Meeting, Moffett Field, CA, February 2018.
- “*Can Analog Quantum Computers Solve Spin Glasses?*”, APS March Meeting, Los Angeles, CA, March 2018 (invited).
- “*Off-Diagonal Series Expansion for Quantum Partition Functions*”, Daniel Lidar’s group meeting, Los Angeles, CA, April 2018.
- “*Quantum Annealers as Substitutes to QMC Algorithms*”, D-Wave/L,CO/USC Technical exchange meeting, Marina del Rey, CA, April 2018.
- “*Future of Analog Quantum Computing and ISI’s Role in It*”, CS&T monthly meeting, Marina del Rey, CA, April 2018.
- “*Solving NP-hard problems with Janus*”, Janus Collaboration meeting, Madrid, Spain, June 2018.
- “*Analog Errors in Ising Machines*”, NASA Ames research center, Moffett Field, CA, June 2018.
- “*Quantum Annealers as QMC Substitutes*”, AQC 2018, Moffett Field, CA, June 2018.

- “*Quantum Enhancements Task One Year Review*”, QEO Review Meeting 2018, Moffett Field, CA, June 2018.
- “*Analog Quantum Computers: Hopes and Limitations*”, HPC workshop, Cetraro, Italy, July 2018 (invited).
- “*Probing Analog Quantum Machines with Supercomputer Simulations*”, Computer Simulations in Physics and Beyond (3rd International Conference), Moscow, Russia, September 2018 (invited).
- “*A Center for Quantum Simulations*”, USC Quantum Center brainstorming workshop, Los Angeles, CA, November 2018.
- “*Quantum Annealing, Analog Errors, Quantum Simulations and more*”, ASCR DOE QCAT Kickoff Meeting, Online Meeting, November 2018.
- “*Paths to quantum enhancements.*”, QEO Program Review, San Diego, CA, January 2019.
- “*Center for Quantum Simulations*”, DOE QIS Kickoff Meeting, Bethesda, MD, January 2019.
- “*Off-diagonal series expansion quantum Monte Carlo*”, APS March meeting, Boston, MA, March 2019.
- “*Errors in Analog Quantum Computers*”, Virtual meeting on error mitigation for near-term QCs, March 2019.
- “*Equation Planting: A Tool for Benchmarking Ising Machines*, Daniel Lidar’s group meeting, Los Angeles, CA, March 2019.
- “*Off-Diagonal Series Expansion: From QMC to Hamiltonian Simulation*”, STAQC Application Team, April 2019.
- “*Quantum Enhancement: Progress Report and Outlook*”, QEO MIT LL site visit, Boston, MA, April 2019.
- “*Quantum Computing at ISI*”, What’s Going On Breakfast Meeting at ISI, Marina del Rey, CA, April 2019.
- “*Future of Analog Quantum Computing: Hopes and Hinderances*”, Condensed Matter Seminar, Tel Aviv University, Tel Aviv, Israel, April 2019.
- “*Future of Analog Quantum Computing: Hopes and Hinderances*”, Quantum Optics Seminar, Bar-Ilan University, Ramat Gan, Israel, May 2019.
- “*Future of Analog Quantum Computing: Hopes and Hinderances*”, Condensed Matter Seminar, Hebrew University, Jerusalem, Israel, May 2019.
- “*Future of Analog Quantum Computing: Hopes and Hinderances*”, AMOS Seminar, Weizmann Institute of Science, Rehovot, Israel, May 2019.
- “*Equation Planting: A Tool for Benchmarking Ising Machines*, Lockheed Martin/D-Wave/USC technical exchange meeting, Los Angeles, CA, June 2019.
- “*Paths to supremacy with quantum annealers*”, Cetraro, Italy, June 2019 (invited).
- “*Future of Analog Quantum Computing: Hopes and Hinderances*”, Condensed Matter Seminar, University of Napoli, Napoli, Italy, June 2019.
- “*Future of Analog Quantum Computing: Hopes and Hinderances*”, Quantum Information Seminar, La Sapienza, Rome, Italy, June 2019.
- “*Quantum annealing with non-stoquastic interactions: Promising paths and likely dead ends*”, AQC 2019- Adiabatic Quantum Computing Conference, Innsbruck, Austria, June 2019.
- “*Can Analog Quantum Computers Solve Classical Spin Glasses?*”, Workshop on Breakdown Of Ergodicity In Isolated Quantum Systems: From Glassiness To Localization, Galileo Galilei Institute for Theoretical Physics, Firenze, Italy, July 2019 (invited).
- “*Equation Planting: A Tool for Benchmarking Ising Machines*”, USC-Fujitsu research kickoff meeting, Los Angeles CA, September 2019.

- “*Simulating quantum many-body physics on classical and quantum computers*”, Nuclear theory seminar, University of Maryland, College Park, MD, October 2019.
- “*The sign problem, non-stoquasticity and everything in between*”, USC Condensed Matter/ Quantum Information seminar, Los Angeles CA, October 2019.
- “*The sign problem, non-stoquasticity and everything in between*”, Quantum Information seminar, NASA Ames Research Center, Moffett Field CA, December 2019.
- “*Non-stoquasticity and quantum annealing*”, QEO YR2 Program Review, Marina del Rey CA, December 2019.
- “*Non-stoquasticity going forward*”, QEO YR2 Program Review, Marina del Rey CA, December 2019.
- “*Future of Analog Quantum Computing: Hopes and Hinderances*”, LBNL Advanced Quantum Testbed Colloquium, Berkeley CA, February 2020.
- “*Future of Analog Quantum Computing: Hopes and Hinderances*”, UCSB Quantum Foundry seminar, Santa Barbara CA, February 2020.
- “*Power of Non-Stoquastic Quantum Annealing Optimization*”, AFRL Program Review, Virtual meeting, April 2020.
- “*Simulating Hamiltonian Dynamics with the Off-diagonal Series Expansion*”, DOE QCAT meeting, Virtual meeting, April 2020 .
- “*Quantum Annealers as Quantum Simulators*”, QEO Milestone Review Meeting, Virtual meeting, June 2020 .
- “*Quantum Algorithms with the Off-diagonal Series Expansion*”, DOE STAQC re-kickoff meeting, Virtual meeting, September 2020.
- “*Simulating Hamiltonian Dynamics with the Off-diagonal Series Expansion*”, Quantum Algorithms 2020, Virtual meeting, September 2020.
- “*An integral-free representation of the Dyson series using divided differences*”, STAQC Applications team meeting (virtual), November 2020.
- “*Quantum algorithm for simulating Hamiltonian dynamics with an off-diagonal series expansion*”, QIP 2021, virtual, February 2021 (poster).
- “*Analog Quantum Computing*”, UC Santa Barbara Winter School on Quantum Science, January 2021.
- “*Simulating Hamiltonian Dynamics with the Off-diagonal Series Expansion*”, Quantum Computing seminar, University of Southern California Virtual meeting, February 2021.
- “*Quantum Algorithm for Simulating Hamiltonian Dynamics with the Off-diagonal Series Expansion*”, APS March Meeting, Virtual, March 2021.
- “*Novel methods for simulating quantum many-body systems on classical and quantum computers*”, ACS Spring 2021, Virtual, April 2021 (poster).
- “*Novel methods for simulating quantum many-body systems on classical and quantum computers*”, ISI’s CS&T Monthly meeting, Virtual, April 2021.
- “*TEQUILAS: Towards enhanced quantum annealing in learning and simulation*”, DARPA/DSO Reversible Quantum Machine Learning and Simulation mini kickoff meeting, Virtual, April 2021.
- “*Quantum algorithm for simulating evolution under time-dependent Hamiltonians*”, DOE STAQC bi-weekly meeting, Virtual meeting, May 2021.
- “*Quantum algorithm for simulating evolution under time-dependent Hamiltonians*”, LBNL/UCSB/USC bi-weekly meeting, Virtual meeting, June 2021.
- “*Non-stoquasticity and non-simulability in AQC*”, AQC 2021, Virtual meeting/Japan, June 2021 (invited).
- “*Quantum Algorithm for Simulating Hamiltonian Dynamics with the Off-diagonal Series Expansion*”, IBM Quantum seminar, Virtual, July 2021.

- “*Permutation Matrix Expansion Quantum Monte Carlo*”, XXXII IUPAP Conference on Computational Physics (CCP 2021), Virtual meeting/Coventry, UK, August 2021 (invited).
- “*Simulating topological models with Population Annealing QMC*”, QAFS/QEO telecon, Virtual meeting, August 2021 (invited).
- “*Quantum simulations in the NISQ era: Simulating Hamiltonian dynamics on a quantum computer using the off-diagonal series expansion*”, QEAMS21, Bar-Ilan University, Ramat-Gan Israel, September 2021 (invited).
- “*Analog Quantum Computing*”, IFGW Quantum Technologies School, virtual/Sao Paulo Brazil, October 2021 (invited).

Teaching experience

- **Lecturer** – 438B: Introduction to Quantum Mechanics, University of Southern California, 2021.
- **Lab instructor** – Physics Laboratory for 2nd year students, Tel Aviv University, 2001-2008.
- **Teaching assistant** – Analytical Mechanics, Tel Aviv University, 2002-2008.
- **C++ Programming Instructor** – for middle-school, Weizmann Institute of Science, Israel, 1999.
- **Math Teacher** – Municipal High School #9, Tel-Aviv, Israel (1998).