

Research Books

Quantum techniques for stochastic mechanics

J Baez and J Biamonte

World Scientific Publishing Co Pte Ltd, 276 print pages (2018)

ISBN: 978-981-3226-96-8 (softcover), 978-981-3226-93-7 (hardcover)

Theses

On the mathematical structure of quantum models of computation based on Hamiltonian minimisation

Doctor of Physical and Mathematical Sciences, Mathematical Physics

Moscow Institute of Physics and Technology, Department of Higher Mathematics, Moscow, Russia

242 pages (2022), doi.org/10.48550/arXiv.2009.10088

Categorical models of quantum information in many-body systems

Doctor of Philosophy, Computer Science

University of Oxford, Oxford, United Kingdom, 127 pages (2010)

Undergraduate Thesis

Portland State University, The Department of Electrical and Computer Engineering and The Department of Physics, Portland Oregon, United States. Advised by M Perkowski and published in condensed form as: Automated Test Pattern Generation for Quantum Circuits, Portland State University Ronald E McNair Scholars Online Journal **1**(3), 38 (2004), doi.org/10.15760/mcnair.2005.38

Book Chapters

Tensor networks for entanglement evolution

S Meznaric and J Biamonte

Book Series: Advances in Chemical Physics, Quantum Information and Computation for Chemistry

Edited by S Rice and R Dinner

John Wiley & Sons Ltd, pages 567-580 (2014)

ISBN: 978-111-8742-63-1

10.1002/9781118742631.ch17

Articles

Complex systems in the spotlight: next steps after the 2021 Nobel Prize in Physics

G Bianconi, A Arenas, J Biamonte, L Carr, B Kahng, J Kertesz, J Kurths, L Lü, C Masoller, A Motter, M Perc, F Radicchi, R Ramaswamy, F Rodrigues, M Sales-Pardo, M San Miguel, S Thurner and T Yasseri
Journal of Physics: Complexity **4**, 010201 (2023)

10.1088/2632-072x/ac7f75

Circuit depth scaling for quantum approximate optimization

V Akshay, H Philathong, E Campos, D Rabinovich, I Zacharov, X-M Zhang and J Biamonte

Physical Review A **106**, 042438 (2022)

10.1103/PhysRevA.106.042438

Quantum-machine-learning channel discrimination

A Kardashin, A Vlasova, A Pervishko, D Yudin and J Biamonte

Physical Review A **106**, 032409 (2022)

10.1103/PhysRevA.106.032409

Ion-native variational ansatz for quantum approximate optimization

D Rabinovich, S Adhikary, E Campos, V Akshay, E Anikin, R Sengupta, O Lakhmanskaya, K Lakhmanskiy and J Biamonte

Physical Review A **106**, 032418 (2022)

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Progress towards analytically optimal angles in quantum approximate optimisation

D Rabinovich, R Sengupta, E Campos, V Akshay and J Biamonte

Mathematics **10**, 2601 (2022)

10.3390/math10152601

Experimental quantum adversarial learning with programmable superconducting qubits

W Ren, W Li, S Xu, K Wang, W Jiang, F Jin, X Zhu, J Chen, Z Song, P Zhang, H Dong, X Zhang, J Deng, Y Gao, C Zhang, Y Wu, B Zhang, Q Guo, H Li, Z Wang, J Biamonte, C Song, D Deng and H Wang

Nature Computational Science **2**, 711 (2022)

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Tensor networks in machine learning

R Sengupta, S Adhikary, I Oseledets and J Biamonte

European Mathematical Society Magazine **101**, 9 (2022)

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Reachability deficits implicit in quantum approximate optimization of graph problems

V Akshay, H Philathong, I Zacharov and J Biamonte

Quantum **5**, 532 (2021)

10.22331/q-2021-08-30-532

Parameter concentrations in quantum approximate optimization

V Akshay, D Rabinovich, E Campos and J Biamonte

(Letter) Physical Review A **104**, L010401 (2021)

10.1103/PhysRevA.104.L010401

Universal variational quantum computation

J Biamonte

(Letter) Physical Review A **103**, L030401 (2021)

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– *Editors' Selection*

Topological classification of time-asymmetry in unitary quantum processes

J Biamonte and J Turner

Journal of Physics A: Mathematical and Theoretical **54**, 235301 (2021)

10.1088/1751-8121/abf9d0

Variational simulation of Schwinger's Hamiltonian with polarization qubits

O Borzenkova, G Struchalin, A Kardashin, V Krasnikov, N Skryabin, S Straupe, S Kulik and J Biamonte

Applied Physics Letters **118**, 144002 (2021)

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Abrupt transitions in variational quantum circuit training

E Campos, A Nasrallah and J Biamonte

Physical Review A **103**, 032607 (2021)

10.1103/PhysRevA.103.032607

Training saturation in layerwise quantum approximate optimisation

E Campos, D Rabinovich, V Akshay and J Biamonte
(Letter) Physical Review A **104**, L030401 (2021)
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Unraveling the effects of multiscale network entanglement on empirical systems

A Ghavasieh, M Stella, J Biamonte and M De Domenico
Communications Physics **4**, 129 (2021)
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Numerical hardware-efficient variational quantum simulation of a soliton solution

A Kardashin, A Pervishko, J Biamonte and D Yudin
(Letter) Physical Review A **104**, L020402 (2021)
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Quantum machine learning tensor network states

A Kardashin, A Uvarov and J Biamonte
Frontiers in Physics **8**, 586374 (2021)
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Deep learning super-diffusion in multiplex networks

V Leli, S Osat, T Tlyachev, D Dylov and J Biamonte
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Computational phase transitions: benchmarking Ising machines & quantum optimisers

H Philathong, V Akshay, K Samburskaya and J Biamonte
Journal of Physics: Complexity **2**, 011002 (2021)
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On barren plateaus and cost function locality in variational quantum algorithms

A Uvarov and J Biamonte
Journal of Physics A: Mathematical and Theoretical **54**, 245 (2021)
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Reachability deficits in quantum approximate optimization

V Akshay, H Philathong, M Morales and J Biamonte
Physical Review Letters **124**, 090504 (2020)
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Probing criticality in quantum spin chains with neural networks

A Berezutskii, M Beketov, D Yudin, Z Zimborás and J Biamonte
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Entanglement scaling in quantum advantage benchmarks

J Biamonte, M Morales and D Koh
Physical Review A **101**, 012349 (2020)
10.1103/PhysRevA.101.012349

Certified variational quantum algorithms for eigenstate preparation

A Kardashin, A Uvarov, D Yudin and J Biamonte
Physical Review A **102**, 052610 (2020)
10.1103/PhysRevA.102.052610

The urgent need for integrated science to fight COVID-19 pandemic and beyond

N Moradian, H Ochs, C Sedikies, M Hamblin, C Camargo, J Martinez, J Biamonte, M Abdollahi, P Torres, J Nieto, S Ogino, J Seymour, A Abraham, V Cauda, S Gupta, S Ramakrishna, F Sellke, A Sorooshian, A Hayes and N Rezaei

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On the universality of the quantum approximate optimization algorithm

M Morales, J Biamonte and Z Zimborás

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A Palmieri, E Kovlakov, F Bianchi, D Yudin, S Straupe, J Biamonte and S Kulik

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Variational quantum eigensolver for frustrated quantum systems

A Uvarov, J Biamonte and D Yudin

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Machine learning phase transitions with a quantum processor

A Uvarov, A Kardashin and J Biamonte

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Adiabatic quantum computation

J Biamonte

Frontiers in Physics **7**, 130 (2019)

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Keep quantum computing global and open

J Biamonte, P Dorozhkin and I Zacharov

Nature **573**, 190 (2019)

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Complex networks from classical to quantum

J Biamonte, M Faccin and M De Domenico

Communications Physics **2**, (2019)

10.1038/s42005-019-0152-6

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Quantum technologies in Russia

A Fedorov, A Akimov, J Biamonte, A Kavokin, F Ya Khalili, E Kiktenko, N Kolachevsky, Y Kurochkin, A Lvovsky, A Rubtsov, G Shlyapnikov, S Straupe, A Ustinov and A Zheltikov

Quantum Science and Technology **4**, 040501 (2019)

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Pushing tensor networks to the limit

A Pervishko and J Biamonte

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Variational learning of Grover's quantum search algorithm

M Morales, T Tlyachev and J Biamonte

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Charged string tensor networks

J Biamonte

Proceedings of the National Academy of Sciences **114**, 2447 (2017)

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Quantum machine learning

J Biamonte, P Wittek, N Pancotti, P Rebentrost, N Wiebe and S Lloyd

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Spectral entropies as information-theoretic tools for complex network comparison

M De Domenico and J Biamonte

Physical Review X **6**, 041062 (2016)

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D Lu, J Biamonte, J Li, H Li, T Johnson, V Bergholm, M Faccin, Z Zimborás, R Laflamme, J Baugh and S Lloyd

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J Biamonte, J Morton and J Turner

Journal of Statistical Physics **160**, 1389 (2015)

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Hamiltonian gadgets with reduced resource requirements

Y Cao, R Babbush, J Biamonte and S Kais

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Quantum simulation of helium hydride cation in a solid-state spin register

Y Wang, F Dolde, J Biamonte, R Babbush, V Bergholm, S Yang, I Jakobi, P Neumann, A Aspuru-Guzik, J Whitfield and J Wrachtrup

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Tensor networks and graphical calculus for open quantum systems

C Wood, J Biamonte and D Cory

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F Dolde, V Bergholm, Y Wang, I Jakobi, B Naydenov, S Pezzagna, J Meijer, F Jelezko, P Neumann, T Schulte-Herbrüggen, J Biamonte and J Wrachtrup

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M Faccin, P Migdał, T Johnson, V Bergholm and J Biamonte

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J Biamonte, V Bergholm and M Lanzagorta

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M Faccin, T Johnson, J Biamonte, S Kais and P Migdal
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T Johnson, J Biamonte, S Clark and D Jaksch
Scientific Reports **3**, 1235 (2013)
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Quantum transport enhancement by time-reversal symmetry breaking

Z Zimborás, M Faccin, Z Kadar, J Whitfield, B Lanyon and J Biamonte
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Algebraically contractible topological tensor network states

S Denny, J Biamonte, D Jaksch and S Clark
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J Whitfield, J Biamonte and A Aspuru-Guzik
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Fault models for quantum mechanical switching networks

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Towards quantum chemistry on a quantum computer

B Lanyon, J Whitfield, G Gillett, M Goggin, M Almeida, I Kassal, J Biamonte, M Mohseni, B Powell, M Barbieri, A Aspuru-Guzik and A White
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Realizable Hamiltonians for universal adiabatic quantum computers

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Sign- and magnitude- tunable coupler for superconducting flux qubits

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Milestones of research activity in quantum computing: EPS grand challenges

Z Seskir and J Biamonte
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Embracing diversity and innovation in teaching: a reflective journey towards fellowship of the Higher Education Academy

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The ZX-calculus is canonical in the Heisenberg picture for stabilizer quantum mechanics

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R Sengupta and J Biamonte
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G Verdon, M Broughton and J Biamonte
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Lectures on quantum tensor networks [book draft]

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