

Grant Salton

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 Scholar

Quantum Information Scientist

quantum { error_correction, algorithms, applications, solutions }

Seasoned quantum information scientist with broad research experience (quantum error correction, quantum algorithms, quantum and classical optimization, NISQ applications, numerical simulations, etc.) Stanford PhD in quantum error correction, Caltech postdoc in applications of near-term hardware, AWS lead for customer-facing quantum applications research, and co-founder of the Amazon Quantum Solutions Lab. Strong product, program, and project management skills.

Senior Quantum Research Scientist
Amazon Web Services (**AWS**)

Feb. 2020 – present

IQIM Postdoctoral Scholar in Theoretical Physics
Institute for Quantum Information and Matter, **Preskill Group**
California Institute of Technology (**Caltech**)

Nov. 2018 – Feb. 2020

Visiting Researcher
Institute for Quantum Information and Matter
Caltech

Apr. 2020 – Apr. 2023

Visiting Postdoctoral Scholar
Department of Physics
Stanford University

Jan. 2019 – Jan. 2020

Education

PhD Physics

Stanford University

Stanford, California, USA

Sept. 2013 – Sept. 2018

Supervisor: Prof. Patrick Hayden

PhD Thesis: Quantum Error Correction and Spacetime

M.Sc. Physics

Stanford University

Stanford, California, USA

Sept. 2013 – Sept. 2016

M.Sc. Thesis: Universal quantum computation by scattering in the Fermi-Hubbard model

M.Sc. Physics

McGill University

Montréal, Québec, Canada

Sept. 2011 – Dec. 2013

M.Sc. Thesis: Power spectrum of CMB polarization due to cosmic string wakes

B.Sc. (Hons) Co-operative

University of Waterloo

Waterloo, Ontario, Canada

Sept. 2005 – Apr. 2010

Major: Mathematical Physics **Minor:** Pure Mathematics **Specialization:** Astrophysics

Thesis: Entanglement degradation from acceleration

Selected Publications

- ★ [1] “**A distillation-teleportation protocol for fault-tolerant QRAM**” A. M. Dalzell, A. Gilyén, C. T. Hann, S. McArdle, G. Salton, Q. T. Nguyen, A. Kubica, F. G. S. L. Brandão. (arXiv:2505.20265) **Accepted to FOCS 2025.**
- [2] “**qReduMIS: A Quantum-Informed Reduction Algorithm for the Maximum Independent Set Problem**” M. J. A. Schuetz, R. Yalovetzky, R. S. Andrist, G. Salton, Y. Sun, R. Raymond, S. Chakrabarti, A. Acharya, R. Shaydulin, M. Pistoia, H. G. Katzgraber. (arXiv:2503.12551) Submitted to *PRX Quantum*
- [3] “**Quantum Compilation Toolkit for Rydberg Atom Arrays with Implications for Problem Hardness and Quantum Speedups**” M. J. A. Schuetz, R. S. Andrist, G. Salton, R. Yalovetzky, R. Raymond, Y. Sun, A. Acharya, S. Chakrabarti, M. Pistoia, H. G. Katzgraber. *Phys. Rev. Research* 7, 033107. (arXiv:2412.14976)
- [4] “**Decomposition pipeline for large-scale portfolio optimization with applications to near-term quantum computing**” A. Acharya, R. Yalovetzky, P. Minssen, S. Chakrabarti, R. Shaydulin, R. Raymond, Y. Sun, D. Herman, R. S. Andrist, G. Salton, M. J. A. Schuetz, H. G. Katzgraber, M. Pistoia. *Phys. Rev. Research* 7, 023142. (arXiv:2409.10301)
- ★ [5] “**Quantum algorithms: A survey of applications and end-to-end complexities**” A. M. Dalzell, S. McArdle, M. Berta, P. Bienias, C. Chen, A. Gilyén, C. T. Hann, M. J. Kastoryano, E. T. Khabiboulline, A. Kubica, G. Salton, S. Wang, F. G. S. L. Brandão. *Cambridge University Press*, 2025. (arXiv:2310.03011) **Published textbook.**
- [6] “**Hardness of the Maximum Independent Set Problem on Unit-Disk Graphs and Prospects for Quantum Speedups**” R. S. Andrist, M. J. A. Schuetz, P. Minssen, R. Yalovetzky, S. Chakrabarti, D. Herman, N. Kumar, G. Salton, R. Shaydulin, Y. Sun, M. Pistoia, H. G. Katzgraber. *Phys. Rev. Research* 5, 043277. (arXiv:2307.09442)
- [7] “**Explainable AI using expressive Boolean formulas**” G. Rosenberg, J. K. Brubaker, M. J. A. Schuetz, G. Salton, Z. Zhu, E. Y. Zhu, S. Kadioglu, S. E. Borujeni, H. G. Katzgraber. *Mach. Learn. Knowl. Extr.* 2023, 5(4), 1760-1795. (arXiv:2306.03976)
- [8] “**End-to-end resource analysis for quantum interior point methods and portfolio optimization**” A. M. Dalzell, B. D. Clader, G. Salton, M. Berta, C. Y. Lin, D. A. Bader, N. Stamatopoulos, M. J. A. Schuetz, F. G. S. L. Brandão, H. G. Katzgraber, W. J. Zeng. *PRX Quantum* 4, 040325. (arXiv:2211.12489)
- ★ [9] “**Quantum Resources Required to Block-Encode a Matrix of Classical Data**” B. D. Clader, A. M. Dalzell, N. Stamatopoulos, G. Salton, M. Berta, W. J. Zeng. *IEEE Trans. on Q. Eng.* 3 (2022): 1-23. (arXiv:2206.03505)
- [10] “**Quantum Gravity in the Lab: Teleportation by Size and Traversable Wormholes, Part II**” S. Nezami, H. W. Lin, A. Brown, H. Gharibyan, S. Leichenauer, G. Salton, L. Susskind, B. Swingle, M. Walter. *PRX Quantum* 4.1 (2023): 010321. (arXiv:2102.01064)
- ★ [11] “**Quantum Gravity in the Lab: Teleportation by Size and Traversable Wormholes**” A. Brown, H. Gharibyan, S. Leichenauer, H. W. Lin, S. Nezami, G. Salton, L. Susskind, B. Swingle, M. Walter. *PRX Quantum*, 4.1 (2023): 010320. (arXiv:1911.06314)
- ★ [12] “**Continuous Symmetries and Approximate Quantum Error Correction**” P. Faist, S. Nezami, V. Albert, G. Salton, F. Pastawski, P. Hayden, J. Preskill. *Phys. Rev. X* 10.4 (2020): 041018. (arXiv:1902.07714) **Selected for plenary talk at QIP2020.**
- [13] “**Entanglement Wedge Reconstruction using the Petz Map**” C. Chen, G. Penington, G. Salton. *J. High Energ. Phys.* 2020, 168 (2020). (arXiv:1902.02844)
- [14] “**Error Correction of Quantum Reference Frame Information**” P. Hayden, S. Nezami, S. Popescu, G. Salton. *PRX Quantum* 2.1 (2021): 010326. (arXiv:1709.04471) **Awarded “Best Poster” at QIP2017.**
- ★ [15] “**Entanglement Wedge Reconstruction via Universal Recovery Channels**” J. Cotler, P. Hayden, G. Penington, G. Salton, B. Swingle, M. Walter. *Phys. Rev. X* 9.3 (2019): 031011. (arXiv:1704.05839) **Accepted talk at QIP2018.**
- [16] “**Entanglement from Topology in Chern-Simons Theory**” G. Salton, B. Swingle, M. Walter. *Phys. Rev. D* 95 (2017) 10, 105007. (arXiv:1611.01516)
- [17] “**Spacetime replication of continuous variable quantum information**” P. Hayden, S. Nezami, G. Salton, B. Sanders. *New J. Phys.* 18 (2016) 8, 083043. (arXiv:1601.02544)
- [18] “**Universal quantum computation by scattering in the Fermi-Hubbard model**” N. Bao, P. Hayden, G. Salton, N. Thomas. *New J. Phys.* 17 (2015) 9, 093028. (arXiv:1409.3585) **Included in IOPSelect.**
- [19] “**Acceleration-assisted entanglement harvesting and rangefinding**” G. Salton, R. B. Mann, N. C. Menicucci. *New J. Phys.* 17 (2015) 3, 035001. (arXiv:1408.1395) **“Best talk” prize at INTRIQ conference.**
- [20] “**Angular Power Spectrum of B-mode Polarization from Cosmic String Wakes**” R. Brandenberger, N. Park, G. Salton. (arXiv:1308.5693)

Invited Talks

2025 Panel Discussion: Quantum Computing for Industry

Texas Quantum Summit, College Station, TX, Sep. 2025

A Distillation-Teleportation Scheme for Fault-Tolerant Quantum Random Access Memory

Amazon ASL Seminar, Virtual, Aug. 2025

Quantum Embark and AWS Quantum Technologies

PS UKI Summit 2025, Virtual, Feb. 2025

2024 Quantum Computing in the Cloud

MIT BWSI 2024, Virtual, MIT Summer Program, Aug. 2024

QSL Customer Engagements

QSL Seminar, Virtual, Apr. 2024

2023 Practical Implementations of Quantum Communication Networks

AWS re:Invent 2023, Las Vegas, NV, Nov. 2023

Panel Discussion: Novel Quantum Applications and Use Cases

Stanford Responsible Quantum Technology Conference, Stanford University, Stanford, CA, May 2023

Quantum Computing in the Cloud and Industrial Quantum Technology

Silicon Valley Quantum Computing Group, Virtual, Feb. 2023

2022 Analyzing Use Cases and Running Applications on Quantum Computers

AWS re:Invent 2022, Las Vegas, NV, Nov. 2022

Quantum Computing in the Cloud and Industrial Quantum Technology

Physics Colloquium, Cal State Long Beach, Colloquium, Nov. 2022

2021 Financial Portfolio Optimization with Quantum Computing

AWS re:Invent 2021, Las Vegas, NV, Nov. 2021

How to Get Started with Quantum Computing on Amazon Braket

AWS re:Invent 2021, Las Vegas, NV, Nov. 2021

Repeat session: How to Get Started with Quantum Computing on Amazon Braket

AWS re:Invent 2021, Las Vegas, NV, Nov. 2021

Quantum Computing in Practice

CDSE Days 2021, SUNY at Buffalo, virtual conference, Mar. 2021

2020 Is Now the Right Time to Explore Quantum Computing?

AWS re:Invent 2020, virtual conference, Dec. 2020

Entanglement Wedge Reconstruction and the Petz Map

Caltech High Energy Seminar, Caltech, Pasadena, CA, Jan. 2020

2019 Symmetries and Quantum Error Correction

IBMQ Seminar, IBM Watson Research Center, Yorktown Heights, NY, Nov. 2019

Covariant Quantum Error Correction: Symmetries, Reference Frames, and AdS/CFT

Last Frontiers in Quantum Information Science, Talkeetna, AK, July 2019

Covariant Quantum Error Correction

Quantum Information Seminar, Perimeter Institute, Waterloo ONT, April 2019

2018 Resource Theory of Non-Gaussian Operators

Stanford Quantum Information Seminar, Stanford University, Stanford CA, May 2018

Entanglement Wedge Reconstruction via Approximate Operator Algebra QEC

String Seminar, University of Amsterdam, Amsterdam, the Netherlands, Jan. 2018

- 2017 Approximate Operator Algebra QEC and Entanglement Wedge Reconstruction**
Perimeter Institute Quantum Information Seminar, Waterloo, ONT, Nov. 2017
- Replicating Quantum Information in Spacetime using Continuous Variables**
Canadian Institute for Advanced Research Meeting, Niagara Falls, ONT, Oct. 2017
- Entanglement Wedge Reconstruction from a Quantum Bayes' Rule**
Stanford Quantum Information / Quantum Gravity Seminar, Stanford, CA, June 2017
- Entanglement Wedge Reconstruction from a Quantum Bayes' Rule**
Caltech High Energy Theory Seminar, California Institute of Technology, Pasadena, CA, May 2017
- Public Lecture: Spacetime Replication of Continuous Variable Quantum Info**
IEEE Information Theory and IEEE Photonics Societies, Stanford University, Stanford, CA, April 2017
- Entanglement Wedge Reconstruction from a Quantum Bayes' Rule**
High Energy Theory Seminar, University of British Columbia, Vancouver, BC, March 2017
- 2015 Spacetime Replication of Continuous Variable Quantum Information**
Institute for Quantum Science and Technology Seminar, University of Calgary, Calgary, AB, Aug. 2015

Contributed Talks

- 2019 Covariant Quantum Error Correction, QIST 2019, Kyoto, Japan**
- 2018 Quantum Error Correction and Spacetime PhD defense, Stanford University**
- Approximate Operator Algebra Quantum Error Correction, SQuInT 2018, Santa Fe, NM**
- ★ **Approximate Operator Algebra Quantum Error Correction, QIP2018, Delft, the Netherlands**
- 2017 Covariant Quantum Error Correction in Holography, It from Qubit School, Bariloche, Argentina**
- Entanglement Wedge Reconstruction via Universal Recovery Channels (poster), qinfo17, Santa Barbara, CA**
- Entanglement from Topology in Chern-Simons Theory (poster), qinfo17, Santa Barbara, CA**
- Entanglement Wedge Reconstruction via Universal Recovery Channels (poster), QEC17, Univ. of Maryland**
- Entanglement from Topology in Chern-Simons Theory (poster), SQuInT 2017, Baton Rouge, LA**
- Entanglement from Topology in Chern-Simons Theory (poster), QIP2017, Seattle, WA**
- 2016 Characterizing States in Chern-Simons Theory, It from Qubit Workshop, Waterloo, ONT**
- Spacetime Replication of Continuous Variable Quantum Information, RQI North, Waterloo, ONT**
- Spacetime Replication of Continuous Variable Quantum Information, SQuInT 2016, Albuquerque, NM**
- Spacetime Replication of Continuous Variable Quantum Information (poster), QIP2016, Banff, AB**
- 2015 Spacetime Replication of Continuous Variable Quantum Information, IQIG, Waterloo, ONT**
- Algebraic Quantum Error Correction: a Unified Theory (poster), SQuInT 2015, Berkeley, CA**
- Universal Quantum Computation by Scattering in the Fermi-Hubbard Model (poster), QIP2015, Sydney**
- 2014 Spacetime Replication of Continuous Variable Quantum Information, QEC14, ETH Zurich, Switzerland**
- 2013 Acceleration-Assisted Entanglement Harvesting, CONFETI 2013, Orford, QC. (Award for best talk)**
- 2012 Cosmic String Signals in CMB Polarization, Cosmic Strings in New Windows, Montréal, QC**
- Measuring Distance by Harvesting Entanglement, Quantum Information Seminar, Montréal, QC**
- Black Holes, Information, Complementarity, and Firewalls, Graduate Student Seminar, Montréal, QC**
- Measuring Distance with Acceleration-assisted Entanglement Harvesting, RQI North, Waterloo, ONT**
- Measuring Distance by Harvesting Entanglement, Canadian Student Conf on Quantum Info, Waterloo, ONT**

Referee for Journals and Conferences

- npj Quantum Information
- IEEE Transactions
- PRX Quantum
- New Journal of Physics
- Quantum
- Physical Review X
- Physical Review A
- Quantum Information Processing
- Theory of Quantum Computation, Communication and Cryptography
- Quantum Science and Technology

Other Previous Positions

Scientific Advisor

Area: Cloud Computing

Earth Computing, Palo Alto, California

Dec. 2018 – Oct. 2019

- Served on the board of advisers for a distributed computing startup, providing guidance on its core protocols

Graduate Research Student

Area: Quantum Information Science

Stanford University, Stanford, California

Sept. 2013 – Aug. 2018

- Research at the interface of quantum information theory and other areas of physics
- Emphasis on quantum error correction, quantum computation, and quantum gravity

Graduate Research Student

Area: Quantum Information in Cosmology

McGill University, Montréal, Québec

Sept. 2011 – Aug. 2013

- Researched cosmological models of the early universe with an emphasis on quantum information

Research Affiliate

Project: Relativistic Quantum Information

Perimeter Institute for Theoretical Physics, Waterloo, Ontario

Sept. 2010 – May 2011

- Studied the effects of non-inertial motion on entanglement harvested from quantum fields

Summer Research Intern

Project: Quantum Gambling

Perimeter Institute for Theoretical Physics, Waterloo, Ontario

May 2009 – Sept. 2009

- Developed a theory of decision making in the face of quantum uncertainty (“quantum gambling”)

Astrophysics Research Student

Project: Extremely Isolated Galaxies in the SDSS

University of Waterloo, Waterloo, Ontario

May 2006 – Sept. 2006 and Sept. 2008 – Feb. 2009

- Studied the formation and evolution of extremely isolated galaxies
- Used data science methodology to analyze large astrophysical datasets

Space Plasma Physics Researcher

Project: Magnetospheric Kelvin-Helmholtz Instabilities

Canadian Space Agency, St. Hubert, Quebec

Sept. 2007 – May 2008

- Studied space plasma physics phenomena and developed research simulations

Research Assistant

Project: Chirped-Pulse Interferometry

Institute for Quantum Computing, Waterloo, Ontario

May 2007 – Sept. 2007

- Performed numerical analysis of a new chirped-pulse laser interferometry technique