Shayan Majidy

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Research Positions

Banting Postdoctoral Fellow, Harvard University 2024–Current

Education

PhD in Physics, University of Waterloo 2019–2024

– Vanier Scholar from 2021-2024

MSc in Physics, University of Waterloo 2018–2019

BSc in Theoretical Physics, University of Guelph 2011–2015

Publications

Textbooks

1. **S. Majidy**, C. Wilson, and R. Laflamme, "Building quantum computers: A practical introduction," Cambridge University Press, (2024).

Journal publications

2. **S. Majidy** "Noncommuting charges can remove non-stationary quantum many-body dynamics ," Nat. Comm. (2024).
3. **S. Majidy**, W. F. Braasch, Jr., A. Lasek, T. Upadhyaya, A. Kalev, and N. Yunger Halpern, "Noncommuting conserved charges in quantum thermodynamics and beyond," Nat. Rev. Phys. (2023).
4. **S. Majidy**, U. Agrawal, S. Gopalakrishnan, A. Potter, R. Vasseur, and N. Yunger Halpern "Critical phase and spin sharpening in SU(2)-symmetric monitored quantum circuits," Phys. Rev. B 108, 054307 (2023).
5. **S. Majidy** "A unification of the coding theory and OAQEC perspective on hybrid codes," Int. J. Theor. Phys. 62.8: 177 (2023).
6. **S. Majidy**, A. Lasek, D. A. Huse, and N. Yunger Halpern, "Non-abelian symmetry can increase entanglement entropy," Phys. Rev. B, 107, 045102 (2023).
7. N. Yunger Halpern and **S. Majidy**, "How to build hamiltonians that transport noncommuting charges in quantum thermodynamics," npj Quantum Information 8, 10 (2022)
8. **S. Majidy**, J. J. Halliwell, and R. Laflamme, "Detecting violations of macrorealism when the original Leggett-Garg inequalities are satisfied," Phys. Rev. A 103, 062212 (2021)
9. **S. Majidy**, H. Katiyar, G. Anikeeva, J. Halliwell, and R. Laflamme, "Exploration of an augmented set of Leggett-Garg inequalities using a noninvasive continuous-in-time velocity measurement," Phys. Rev. A, 100, 042325 (2019).

Scholarships & Awards

Select Scholarships and Awards

- Banting Fellowship (**$140,000**) 2024–2026
  Canada's highest-valued Postdoctoral Fellowship. I was ranked 3rd out of 185 applicants in my field.
- Vanier Scholarship (**$150,000**) 2021–2024
  Canada's highest-valued PhD scholarship.
- John Brodie Memorial Award (**$1,000**) 2024
  The Perimeter Institute's highest valued PhD award, evaluated on research impact and independence.
- Institute for Quantum Computing's Achievement Award (**$5,000**) 2022
  IQC's highest valued PhD award, evaluated on "exceptional achievement in research."

Others

PhD Residency Program Award		2023
David Johnston International Experience Award	($2,500)	2023
Best Talk at CGQC 2023	($200)	2023
Best Talk at PGSC 2022		2022
Information Scholar Award	($450)	2022
President's Graduate Scholarship for Vanier	($15,000)	2021–2024
University of Waterloo Graduate Scholarship for Vanier	($15,000)	2021–2024
NSERC PGS D	($63,000)	2021–2024
OGS/QEII-GSST	($15,000)	2021–2024
Ontario Graduate Scholarship	($15,000)	2020
President's Graduate Scholarship for OGS	($5,000)	2020
Ontario Graduate Scholarship	($15,000)	2019
President's Graduate Scholarship for OGS	($5,000)	2019
Science Graduate Award	($6,264)	2019
University of Waterloo Graduate Scholarship	($3,000)	2019
IQC David Johnston Award for Scientific Outreach	($2,500)	2018
Marie Curie Graduate Student Award	($20,000)	2018
University of Waterloo Graduate Scholarship	($3,000)	2018
Undergraduate Student Research Award	($6,000)	2013

Teaching Accreditations

- **Certificate in University Teaching**, Graduate Studies and Postdoctoral Affairs 2022
- **Fundamentals of University Teaching**, Centre for Teaching Excellence 2020

Academic Talks

Invited Conference & Workshop Talks (3)

1. "Quantum + The Near Future" Quantum Connections, Institute for Quantum Computing, Ontario (May 2, 2024)
2. "Non-Abelian symmetry can increase entanglement entropy" RQS annual workshop, University of Maryland, Maryland (June 22, 2023).
3. "Non-Abelian symmetry can increase entanglement entropy" Quantum Non-Markovianity 2022, Online, (Dec 8, 2022).

Contributed Conference & Workshop Talks (7)

1. "Non-Abelian symmetry can increase entanglement entropy," CQIQC-X, University of Toronto, Ontario (Aug 26, 2024). [Recording]
2. "Non-Abelian symmetry can increase entanglement entropy" Raymond Laflamme's 60th Birthday Conference, University of Waterloo, Ontario (Jul 19, 2023).
3. "Non-Abelian symmetry can increase entanglement entropy" IQC Graduate Student Conference, University of Waterloo, Ontario (May 18, 2023).
4. "Non-Abelian symmetry can increase entanglement entropy" Canadian Graduate Quantum Conference 2023, University of Waterloo, Ontario (Jan 25, 2023).
5. "Noncommuting charges: Bridging theory to experiment" Perimeter Institute Graduate Students' Conference 2022, Perimeter Institute, Ontario (Sep 1, 2022).
6. "Noncommuting charges: Bridging theory to experiment" Information Engines at the Frontiers of Nanoscale Thermodynamics 2022, Telluride Science Research Center, Colorado (July 22, 2022).
7. "Exploration of an augmented set of Leggett-Garg inequalities using a noninvasive continuous-in-time velocity measurement" CAM Graduate Student Physics Conference 2019, Laurentian University, Ontario (Jul 25th, 2019).

Invited Seminars (20)

1. "Physics of noncommuting charges," Harvard Quantum Institute, Cambridge, Massachusetts (Nov 13, 2024)
2. "A Noncommuting-Charge Puzzle & Hybrid Encoding Applications on Current Hardware" Harvard Quantum Institute, Cambridge, Massachusetts (Jun 28, 2024)
3. "Noncommuting charges can increase entanglement and induce critical dynamics" Yale Quantum Institute Talk, Yale, Connecticut (Jan 16, 2024)
4. "Non-abelian symmetries can increase entanglement and induce critical dynamics" Quantum Information Seminar, Perimeter Institute, Ontario (Nov 29, 2023) [Recording]
5. "The effect of noncommuting charges on entanglement dynamics" Princeton Centre for Theoretical Physics seminar organized by Biao Lian, Princeton, New Jersey (Sept 22, 2023).
6. "Monitored Quantum Circuits with Noncommuting Conserved Quantities" Qiskit Seminar, IBM, Online (Sept 15, 2023). [Recording]
7. "Non-Abelian symmetry can increase entanglement entropy" NSF site visit, University of Maryland, Maryland (July 14, 2023).
8. "Non-Abelian symmetry can increase entanglement entropy" PIQuIL Seminar, Perimeter Institute, Ontario (Apr, 21 2023).
9. "Non-Abelian symmetry can increase entanglement entropy" InfoQ Seminar, Institut Quantique, Quebec (Mar 28, 2023).

10. "Non-Abelian symmetry can increase entanglement entropy" Special INTRIQ/CPM Seminar, McGill University, Quebec (Mar 24, 2023).
11. "Non-Abelian symmetry can increase entanglement entropy" Stanford Institute for Theoretical Physics seminar organized by Xiaoliang Qi, Stanford, California (Feb 24, 2023).
12. "Non-Abelian symmetry can increase entanglement entropy" Pitzer Center Theoretical Chemistry Seminar, Berkeley, California (Feb 22, 2023).
13. "Non-Abelian symmetry can increase entanglement entropy" Redwood seminar, Berkeley, California (Feb 22, 2023).
14. "Non-Abelian symmetry can increase entanglement entropy" Würzburg Seminar on Quantum Field Theory and Gravity, Universitat Wurzburg, Online (Feb 7, 2023).
15. "Non-Abelian symmetry can increase entanglement entropy" CQIQC seminar, University of Toronto, Ontario (Feb 3, 2023). [Recording]
16. "Noncommuting charges: Bridging theory to experiment" Theoretical Physics Seminar Series, Australian Institute for Physics, Online (Aug 18, 2022). [Recording]
17. "Noncommuting charges: Bridging theory to experiment" RQS Seminar, University of Maryland, Maryland (Aug 2, 2022).
18. "An introduction to quantum thermodynamics" Mila, Online (Dec 1st, 2021).
19. "Noncommuting charges: Bridging theory to experiment" Bristol QIT Online Seminar Series, University of Bristol, Online (Jun 9th, 2021).
20. "Noncommuting charges: Bridging theory to experiment" David Jenning's group, University of Leeds, Online (Jun 3rd, 2021).

Other Seminars (9)

1. "Noncommuting charges' effect on the thermalization of local observables" Perimeter Institute Student Seminar, Waterloo, Ontario (Apr 29, 2024).
2. "Monitored Quantum Circuits with Noncommuting Conserved Quantities" Eduardo Martin-Martinez's Group, Waterloo, Ontario (Aug 30, 2023).
3. "Monitored Quantum Circuits with Noncommuting Conserved Quantities" IQC Student Seminar, Waterloo, Ontario (Aug 29, 2023).
4. "Non-Abelian symmetry can increase entanglement entropy" Irfan Siddiqi's group, Berkeley, California (Feb 25, 2023).
5. "Non-Abelian symmetry can increase entanglement entropy" Ehud Altman's group, Berkeley, California (Feb 25, 2023).
6. "Non-Abelian symmetry can increase entanglement entropy" Eduardo Martin-Martinez's Group, Waterloo, Ontario (Feb 16, 2023).
7. "Noncommuting charges: Bridging theory to experiment" Institute for Quantum Computing Student Seminar, Waterloo, Ontario (Aug 10, 2022).
8. "Noncommuting charges: Bridging theory to experiment" University of Waterloo Student seminar, Waterloo, Ontario (Dec 16th, 2021).
9. "Exploration of an augmented set of Leggett-Garg inequalities using a noninvasive continuous-in-time velocity measurement." Eduardo Martin-Martinez's Group, Waterloo, Ontario (Mar 3rd, 2021).

University Teaching Experience

Sessional Lecturer (1 course), University of Waterloo 2022
Courses: PHYS 468 (Fall 22)

Teaching Assistant (5 courses), University of Waterloo 2020–2022
Courses: QIC 750 (Winter 20-22), PHYS 242 (Winter 21), PHYS 468 (Fall 21)

Graduate Educational Developer, Centre for Teaching Excellence 2022

TA Workshop Facilitator, Centre for Teaching Excellence 2021

Service and Leadership

Organizations founded

- Unentangled, Brief documentary: https://vimeo.com/316304696

Journal Review Activities

- Physical Review Letters, Number of works reviewed: 2.
- PRX Quantum, Number of works reviewed: 2.
- Physical Review A, Number of works reviewed: 6.

Conference Review

- TQC (Theory of Quantum Computation, Communication and Cryptography) 2024: Subreviewer for 1 submission.

Undergraduate Student Supervision

- Jade LeSchack, University of Waterloo
- Mayukh Dewan, University of Waterloo
- Galit Anikeeva, University of Waterloo

Event administration

- Sole Organizer, *Raymond Laflamme's 60th Birthday Conference* 2023
- Seminar organizer, *Quantum Steampunk Seminars, University of Maryland* 2021
- Organizing committee, *Canadian Graduate Quantum Conference 2020, University of Waterloo* 2020

Mentoring and outreach

- Panelist, *From TA to Course Instructor Workshop* 2023
- Panel Facilitator, *Developing Your Teaching Skills in Grad School* 2021
- Session Chair, *University of Waterloo Teaching and Learning Conference* 2021
- Facilitator, *Quantum Cryptography School for Young Students* 2018–2021
- Facilitator, *IQC Science Outreach* 2017–2021
- Panelist, *Tech Under Twenty Expo* 2020
- Facilitator, *USEQIP* 2019–2020
- Facilitator, EinsteinPlus 2019
- Youth Group Facilitator, *The Ruhi Institute* 2007–2016

- Sub-regional Coordinator, *The Ruhi Institute* 2008–2014

Committee Memberships

- Member *Physics GSA* 2019–Current
- Member, *Institute for Quantum Computing GSA* 2019–Current
- Graduate student member, *Faculty Committee on Student Appeals* 2020–2021
- Co-President, *Physics GSA*, 2019–2020
- Executive member, *Institute for Quantum Computing GSA* 2019–2020

Interviews & Media Relations

- **Invited Panelist: Quantum + The Near Future** https://uwaterloo.ca/institute-for-quantum-computing/quantum-connections-conference/conference-programming
- **National Radio Interview: CBC's Quirks and Quarks** https://www.cbc.ca/radio/quirks/dec-30-the-quirks-quarks-listener-question-show-1.7066583
- **Shayan Majidy wins prestigious Vanier Scholarship:** https://uwaterloo.ca/science/news/shayan-majidy-wins-prestigious-vanier-scholarship
- **IQC student awarded Vanier Graduate Scholarship:** https://uwaterloo.ca/institute-for-quantum-computing/news/iqc-student-awarded-vanier-graduate-scholarship
- **IQC Achievement Award recipient Shayan Majidy shares research insights :** https://uwaterloo.ca/institute-for-quantum-computing/news/iqc-achievement-award-recipient-shayan-majidy-shares
- **Quantum Q&A with Shayan Majidy** https://uwaterloo.ca/institute-for-quantum-computing/news/quantum-qa-shayan-majidy
- **Quantum Frontiers: Identical twins and quantum entanglement:** https://quantumfrontiers.com/2023/03/12/identical-twins-and-quantum-entanglement/
- **Quantum Frontiers: Mo' heights mo' challenges – Climbing mount grad school:** https://quantumfrontiers.com/2022/10/03/mo-heights-mo-challenges-climbing-mount-grad-school/
- **Quantum Frontiers: Building a Koi pond with Lie algebras:** https://quantumfrontiers.com/2022/01/30/building-a-koi-pond-with-lie-algebras/
- **Quantum Today: Bridging Quantum Thermodynamics Theory to Experiment:** https://www.youtube.com/watch?v=dYvHPv2b2zk
- **Brief documentary on Unentangled by Ward1 Studios:** https://vimeo.com/316304696
- **IQC Fireside Chat with Shayan Majidy - Sharing quantum science with a young audience:** https://www.youtube.com/watch?v=PbAQKrcFGuI
- **Graduate students recognized for excellence in research and scientific outreach:** https://uwaterloo.ca/institute-for-quantum-computing/news/graduate-students-recognized-excellence-research-and