Shawn E. S. Skelton

PhD Student in Theoretical Physics / Quantum Information Theorist

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Professional Summary

I am a researcher in quantum information theory, currently completing my PhD in the Institute for Theoretical Physics at the University of Leibniz Hanover (LUH).

I specialize in quantum algorithm and applications research; my PhD topic has focused on pre-proceessing, applications, and interpretations of templates for creating quantum algorithms such as quantum signal processing (QSP). My other research has included high-level algorithm benchmarking, many body physics, and tensor networks.

I am also interested in ethics and trajectories of developing technologies, and concurrently with my PhD, I am completing on a masters in philosophy of science at LUH.

Education

10.2022 - 8.2026	**Leibniz University Hanover**, Hanover, Germany *Ph.D. in Theoretical Physics*
9.2021 - 6.2022	**University of Waterloo/Perimeter Institute for Theoretical Physics**, Waterloo, Canada *M.Sc. in Physics + Perimeter Scholars International Certificate*
9.2016 - 4.2021	**University of Winnipeg**, Winnipeg, Canada *B.Sc(Hons) in Mathematical Physics*

Professional Experience

10.2022 - 5.2026	**University of Leibniz Hanover** *Research Assistant* 75% position in support of my PhD degree, funded through the ProvideQ consortia and the Quantum Valley Lower Saxony project. I provided approximate oracle calls to quantum algorithm subroutines for linear solvers and the quantum simplex algorithm, and participated in paper writing for two technical papers. I also provided a hybrid classical-quantum algorithm suite with expert advising on quantum algorithms and simple algorithm simulations.
5.2018 - 8.2021	**University of Winnipeg** *Research Assistant* A variety of 4 month undergraduate summer research positions in quantum gravity. In 2021, I continued my BSc thesis research, and constricted a toy model of de Sitter space with a quantum tunneling event in a multiscale entanglement renormalization ansatz (MERA) tensor network. In 2018, 2020 (part-time), I wrote a python-based numerical solver for linear and non-linear differential equations of motion, using the modified Callan-Giddings-Harvey-Strominger (CGHS) model of a black hole.
5.202 - 8.202	**Perimeter Institute for Theoretical Physics** *Research Assistant* Part-time undergraduate summer research positions. Obtained ground states using Exact Diagonalization and density matrix renormalization groups (DMRG) for a modified transverse field Ising model (TFIM) Hamiltonian.

Publications and Pre-Prints

1. Arnab Adhikary, **S. E. Skelton**, Alberto Nocera, Mona Berciu. (2025) Advantage of Warm Starts for Electron-Phonon Systems on Quantum Computers. In submission to Quantum Science and Technology. (IOP). arXiv:2512.16879.

2. **S. E. Skelton.** (2025). Qubit-optimal quantum phase estimation of block-encoded Hamiltonians. In submission to Quantum. arXiv:2509.04246

3. Ugnė Liaubaitė, **S. E. Skelton**. (2025). Prospects of Quantum Error Mitigation for Quantum Signal Processing. Physics Scripta, Vol. 100. DOI 10.1088/1402-4896/ae216a

4. Andreea-Iulia Lefterovici, Michael Perk, Debora Ramacciotti, Antonio F. Rotundo, **S. E. Skelton**, Martin Steinbach. (2025). Beyond asymptotic scaling: Comparing functional quantum linear solvers, In submission to IEEE Transactions on Quantum Engineering. arXiv:2503.21420.

5. **Skelton, S. E.**. (2024). A Hitchhiker's Guide to QSP pre-processing. arXiv:2501.05977.

6. **Skelton, S. E.**. (2024). Mostly Harmless Methods for QSP-Processing with Laurent Polynomials. 2024 IEEE International Conference on Quantum Computing and Engineering. DOI 10.1109/QCE60285.2024.0002, arXiv:2408.04321.

7. Sabrina Ammann, Maximilian Hess, Debora Ramacciotti, Sándor P. Fekete, Paulina L. A. Goedicke, David Gross, Andreea Lefterovici, Tobias J. Osborne, Michael Perk, Antonio Rotundo, **S. E. Skelton**, Sebastian Stiller, Timo de Wolff. (2023). Realistic Runtime Analysis for Quantum Simplex Computation. In submission to INFORMS Journal on Computing. arXiv:2311.09995

Teaching Experience

2024 - 2026	**Teaching Assistant duties**, University of Leibniz Hannover
	Periodically acted as a tutorial instructor, assignment marker, and oral exam assessor for the institute of theoretical physics at LUH
2018 - 2021	**Tutoring and marking mathematics and physics**, University of Winnipeg
	Professor: Andrew Bendor-Samuel, Dr. Andrew Frey, Dr. Jeff Martin, Dr. Gabor Kunstatter
	Peer-turoing position for first, second-year mathematics and physics courses at the University of Winnipeg tutoring center. I provided both indivigual and group tutoring, in person or online (2020-2021)). Assignment marking for Quantum Mechanics (2019-2020), Modern and Thermal Physics (2018-2020), Advanced Quantum Mechanics (2021), and Cosmology (2020).
2020	**Textbook editing**, University of Winnipeg
	Professor: Dr. Gabor Kunstatter, Dr. S. Das
	Reviewed a modern physics textbook designed for second year students prior to publication, with an eye to scientific content, grammar, and consistency between sections. The text is "A First Course on Symmetry, Special Relativity, and Quantum Mechanics", Springer 2020.

Honors & Awards

| 2023 - 2026 | **Postgraduate Scholarships – Doctoral (PGS D)**, National Science and Engineering Research Council of Canada |
| | Annual research stipend supporting PhD candidates with exceptional research potential, up to three years of funding. |

9.2021 - 6.2022	**Perimeter Scholars International Scholarship**, Perimeter Institute for Theoretical Physics Masters degree award covering academic costs, housing, living expenses, and travel for the program Perimeter Scholars International and a jointly completed MSc.
1.2023	**Best Poster Award, "Methods in QSP Angle Identification"**, Canadian Graduate Quantum Conference Awarded for presentation of an early version of "Mostly Harmless methods of QSP-processing"
8.2022	**Best Talk Award, Session 1B (Quantum Information and Computing)**, Canadian-Cuban-American-Mexican Graduate Physics Conference Awarded for presentation of my masters thesis, "getting to Low Ground// a QITE Focused Study of Ground State Approximation". Supervised by Dr. Anirban Chowdhury, Dr. David Gosset.

Academic Outreach

6.2024	**A Quantum of Hope** *Sponsored by Two Small Fish and the Perimeter Institute for Theoretical Physics* A play written during the year of quantum science and technology aimed at a science-curious/ science-literate public. Along with Anna Knörr, Jaime Redondo-Yuste, Manu Srivastava, Anna Brandenberger, I distilled many key goals in quantum technologies using a science fiction and a participatory theater element. The work was performed as part of the Perimeter Institute for Theoretical Physics's 25th reunion, and was sponsered by Two Small Fish ventures. More details are available at #link("https://www.aquantumofhope.com/") and the full script is available on arXiv, arXiv:2509.14361
	DEIA Panel *IEEE Quantum Week 2024* Panelist for a session on the topic of accountability in diversity, equity, inclusivity, and accessibility initiatives at a large academic-industry conference
4.2022 - 8.2022	**Committee member** *Canadian-Cuban-American-Mexican Graduate Student Conference Planning Committee* Assisted in planning a fully online conference for masters and PhD students from four participating countries. The event was initially going to be replaced with a research soft skills workshop due to the Covid-19 pandemic. We successfully lobbied for the conference to consist of dozens of research presentations and several keynote talks, across many subjects of physics.
9.2021 - 9.2022	**Committee member and Task Manager** *Canadian Association of Physicists Student Advisory Committee* I joined the student advisory council (SAC)for the Canadian association of physicists (CAP) as it was recovering from an inactive phase. I performed mainly administrative work for the council as it successfully organized several well-attended virtual events across Canada. I also actively participated in building the direction of the CAP-SAC, including shaping the inclusive hiring policies of the council.
9.2018 - 6.2021	**Mathematics and Science tutor** *Newcomers Employment and Education Development Services, INC.* I volunteered as a math and science tutor, at an in-person after school program aimed at newcomer Canadian youth. During 2020-2021, the program moved online and broadened it scope. During this period, I tutored math and science online, for any students aged 6-18.

Featured Conferences and Workshops

9.2025	**HYPE STUDIES CONFERENCE - (DON'T) BELIEVE THE HYPE** *Making Sense of Hype in Funding - A Quantum Technologies Case Study* I presented a preliminary version of a technical paper in philosophy of science (currently in preparation). I used insights from science and technologies studies, where hype in research funding is much better understood, to argue that harm from hype in quantum funding requires

particular epistemic commitments about the purpose and strategy of research funding. Although simple, this point is underrepresented in philosophy of science.

9.2025	**HYPE STUDIES CONFERENCE - (DON'T) BELIEVE THE HYPE** *A Quantum of Hope* I gave a workshop on creative writing for science communication. Participants developed characters and an outline for their own play, using a similar strategy to the one employed by myself and the coauthors of "A Quantum of Hope".
6.2025	**Quantum Dialogues Workshop** *workshop participant* An interdisciplinary workshop hosted by the University of Sherbrook, Canada. The three day event had researchers in quantum technoolgies, social sciences, and education collaborate to discuss quantum technologies.
9.2024	**IEEE Quantum Week 2024** *Responsible Quantum -two students' perspectives* Co-presentation with Anna Kn{\"o}rr, for the responsible quantum event within IEEE quantum week
6.2024	**First Feminist Philosophy of Science Workshop** *Challenges for Feminist Philosophy of Physics - Standpoint theory, practical aims, and the objectivity of human-insensitive science*

Professional Certifications

1. Practical strategies for moving into industry workshop. 7.03.2026. Offered through LUH graduate academy.

2. Communication Strategies for Early Career Researchers – Advocacy and Conflict Resolution. 01.09.2025. Offered through QuantumFrontiers project.

3. Proficiency with python

4. Familiarity with Julia, Mathematica, Matlab