S. E. Skelton

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Current Research Interests

- Quantum signal processing
- Exploring use cases for quantum singular value transformation (QSVT) algorithms
- Benchmarking quantum algorithm costs

Education

- **Leibniz Universität Hannover** Oct. 2022 -
  - PhD student, Quantum Information Group, Institute for Theoretical Physics
  - Research areas: quantum algorithms, quantum complexity, QSVT
  - Supervisor: Dr. Tobias Osbourne
  - Involvement with ProvideQ toolbox, see https://www.provideq.org/
- **Perimeter Institute for Theoretical Physics** Sept. 2021-June 2022
  - Perimeter Scholars International Certificate
  - MSc. Physics degree, University of Waterloo
  - Research essay focus: quantum algorithms
- **University of Winnipeg** Sept. 2016-June 2021
  - Bachelor of Science 4yr Honours in Mathematical Physics, cumulative GPA 4.25/4.5
  - Thesis: Entangled Webs: Geometric Interpretation of Inhomogeneous MERA Networks.
  - Research areas: quantum gravity, quantum information theory, tensor networks

Publications

- **Mostly Harmless Methods for QSP-Processing with Larent Polynomials**
  - IEEE quantum week 2024
  - Authors : S. E. Skelton
- **Lower Bounds for Practical Quantum Computing**
  - preprint
  - Authors : Sabrina Ammann, Sándor Fekete, Paulina L.A. Goedicke, David Gross, Maximilian Hess, Andreea Lefterovici, Tobias J. Osborne, Michael Perk, Debora Ramacciotti, Antonio Rotundo, S. E. Skelton, Sebastian Stiller and Timo de Wolf

Research Experience

- **Perimeter Institute for Theoretical Physics** Sept. 1st, 2021 to June. 24th, 2022
  - *MSc. essay project. Supervised by Dr. Anirban Chowdhury, Dr. David Gosset*
  - Literature review of two algorithms for ground state preparation and energy approximation
  - Restructured a proof of quantum imaginary time evolution (QITE) to better account for error in the trotter formula
  - Produced worst case bounds on the precision, cost, and quantum run time of each
- **University of Winnipeg** May 3rd, 2021 to Aug. 20th, 2021
  - *Four month, USRA research position. Supervised by Dr. Andrew Frey*
  - Constructed a toy model of de Sitter space with a quantum tunnelling event in a multi-scale entanglement renormalization ansatz (MERA) tensor network
  - Modified quantum channels to justify entropy growth in a region of the network
- **Perimeter Institute of Theoretical Physics** May 1st, 2020 to August 21st, 2020
  - *Four month, part-time research internship within condensed matter physics. Supervised by Dr. A. Szasz*
  - Obtained ground states using Exact Diagonalization and density matrix re-normalization groups (DMRG) for a modified transverse field Ising model (TFIM) Hamiltonian.
  - Examined pairwise entanglement and quantum negativity between sites in the TFIM
- **University of Winnipeg** May 5th, 2020 to Aug. 28th, 2020
  - *Four month, part-time research position within general relativity. Supervised by Dr. G. Kunstatter and Dr. J. Ziprick*
  - Wrote a numerical solver for linear and non-linear differential equations of motion, continuation of 2018 research
- **University of Winnipeg** April 30th, 2018 to Aug. 24th, 2018
  - *Four month, USRA research position. Supervised by Dr. G. Kunstatter and Dr. J. Ziprick*
  - Verified Equations of motion for a modified Callan-Giddings-Harvey-Strominger (CGHS) model of a black hole
  - Wrote a numerical solver for aforementioned equations of motion in python

Recent Awards and Scholarships

- **National Science and Engineering Research Council of Canada** May 2024 - present
  - Postgraduate Scholarships – Doctoral (PGS D)
- **Perimeter Institute for Theoretical Physics** May 2021 to Aug. 2021

  - Perimeter Scholars International Scholarship, 09.2021-06.2022
  - Undergraduate Summer School, May 25th-June 25th, 2020

- **National Science and Engineering Research Council of Canada** May 2021 to Aug. 2021
  - Undergraduate Student Research Award, 05.2021-08.2021
  - Undergraduate Student Research Award, 05.2018-08.2018

- **University of Winnipeg**
  - H. V. Rutherford Scholarship November 2020
  - The Donald Kerr Scholarship in Honours Physics 2020-2021 Academic Year
  - Dr. Herbert Shubin Memorial Scholarship in Physics 2019-2020 Academic Year

Recent Presentation Awards

- **Canadian Graduate Quantum Conference** Jan. 2023
  - Best Poster Award
  - Title: "Methods in QSP Angle Identification"

- **Canadian-Cuban-American-Mexican Graduate Physics Conference** Aug. 2022
  - Best Talk Award, Session 1B: Quantum Information and Computing,
  - Title: "Getting to Low Ground: a QITE Focused Study of Ground State Approximation"
  - Supervised by Dr. Anirban Chowdhury, Dr. David Gosset

Community Involvement and Employment

- **Canadian-Cuban-American-Mexican Graduate Student Conference Planning Committee** July 2022
  - Committee member

- **Canadian Association of Physicists Student Advisory Committee** September 2021 to October 2022
  - Committee member and Task Manager

- **Newcomers Employment and Education Development Services, INC.** 2018 to June 2021
  - Mathematics and Science tutor