Himanshu Sahu

Curriculum Vitæ

We have art in order not to die of the truth. – Nietzsche

Personal Information

Nome e Cognome	Himanshu Sahu
Gender	Male
Date of Birth	22-07-2002
Address	Perimeter Institute, 31 Caroline Street North, Waterloo, ON, N2L 2Y5, Canada.
Nationality	Indian

Google Scholar • iNSPIRE-HEP • ORCiD • Linkedin • Github

Experience

09/2024-Present	**Teaching Assistant**, University of Waterloo,, Waterloo, Ontario, Canada.
07/2024-09/2024	**Junior Research Fellow**, Department of Instrumentation and Applied Physics, Indian Institute of Science, Bangalore, India.
03/2024-08/2024	**Extern**, IBM Quantum, IBM Research Lab, Bangalore, India.

Education

Fall 2024	**PhD in Quantum Information**, Perimeter Institute for Theoretical Physics and Institute for Quantum Computing, University of Waterloo, Waterloo, Ontario, Canada. • Perimeter Institute PhD Residency Fellow • Graduate program supervisors – Prof. Sisi Zhou and Ray Laflamme
07/2021–06/2024	**Masters (Research) in Physics**, Indian Institute of Science, Bangalore, India. • CGPA : 9.10/10 (max. typically $\sim$ 9.4) • On track for Distinction in the Major
06/2018-06/2021	**Bachelor in Physics**, Banaras Hindu University, Varanasi, India.. • CGPA : 9.15/10 • Passed in First Division with Distinction

Master thesis

Title	Quantum walk based simulations & algorithms
Supervisor	Prof. Subroto Mukerjee & Prof. CM Chandrashekar
Description	This dissertation details our research on a wide range of ideas from quantum computing – quantum simulation, quantum algorithms, and quantum complexity which are brought together under the umbrella of quantum walks.

Research activity

Brief description	I am a physicist broadly interested in the ideas at the intersection between condensed matter theory, quantum computing, and information theory.

Research Interests

Main interests Quantum metrology, Quantum information, Quantum computation, Quantum simulation, Quantum error correction, Quantum algorithms, Quantum many-body physics, Open quantum systems, Quantum communication, Quantum chaos.

Publications

Peer-reviewed journals

[1] A. Bhattacharya, P.P. Nath & H. Sahu, Speed limits to the growth of Krylov complexity in open quantum systems, (2024). Phys. Rev. D 109, L121902 (2024) Letter .
All authors contributed equally to this work.

[2] A. Bhattacharya, P.P. Nath & H. Sahu, Krylov complexity for non-local spin chains. Phys. Rev. D 109, 066010 (2024) .
All authors contributed equally to this work.

[3] A. Bhattacharya, H. Sahu, A. Zahed, and K. Sen, Complexity for one-dimensional Discrete Time Quantum Walk Circuits. Phys. Rev. A 109, 022223 (2024).

[4] H. Sahu & K. Sen, Quantum-walk search in motion. Scientific Reports 14, 2815 (2024) .

[5] H. Sahu & C.M. Chandrashekar, Open system approach to Neutrino oscillations in a quantum walk framework. Quantum Information Processing 23, 7 (2024) .

[6] A. Bhattacharya, P. Nandy, P.P. Nath & H. Sahu, On Krylov complexity in open systems: an approach via bi-Lanczos algorithm. Journal of High Energy Physics 2023, 66 (2023) .
All authors contributed equally to this work.

[7] A. Bhattacharya, P. Nandy, P.P. Nath & H. Sahu, H. Operator growth and Krylov construction in dissipative open quantum systems. Journal of High Energy Physics 2022, 81 (2022).
All authors contributed equally to this work.

Pre-prints under review

[1] H. Sahu, A. Bhattacharya, and P.P. Nath, Quantum complexity and localization in random quantum circuits, (2024). arXiv:2409.03656 [quant-ph].

[2] H. Sahu, Information scrambling in quantum walks, (2024). arXiv:2406.05865 [quant-ph] .

[3] K.V. Sharma, H. Sahu & S. Mukerjee, Quantum chaos in $\mathcal{PT}$-symmetric Quantum Kicked Rotor, (2023). arXiv:2401.07215 [quant-ph].

Bibliometric parameters

Indices h-index 4 total citations 190 (Oct 2024), iNSPIRE-HEP
h-index 3 total citations 154 (Oct 2024), Google-Scholar

Conferences, Seminars, and Schools

Talks

2023 Quantum Information Scrambling in non-local systems.
CHEP In-House Symposium, Centre for High Energy Physics, Indian Institute of Science, Bangalore, India 18-19 November 2023

Posters

2023 Simulating Neutrino Oscillations Using Quantum-walk .
Quantum Information Processing and Applications, Harish-Chandra Research Institute, Prayagraj, India 04-10 December 2023.

2023 Quantum Information Scrambling in Dissipative Open Quantum Systems.
Emerging Topics in Quantum Technology, Indian Institute of Technology, Palakkad, India 02-04 November 2023.

2023 Operator Complexity in Open Quantum System.
Condensed Matter meets Quantum Information, International Centre for Theoretical Sciences (ICTS), Bengaluru, India 25 Sep-06 Oct 2023.

2023 Neutrino oscillations in discrete-time quantum walk framework.
Student Conference in Optics and Photonics, Physical Research Laboratory, Ahmedabad, India 27-29 September 2023.

2023 Exploring Operator Growth and Krylov Complexity in Dissipative Open Quantum Systems.
It from Qubit, Perimeter Institute for Theoretical Physics, Waterloo, Ontario, Canada 31 July-4 August 2023 (Online)

Teaching Activity

Teaching Assistant

Fall 2024 NE 216 - Advanced Calculus and Numerical Methods 1.
University of Waterloo

Spring 2023 UP 204 - Intermediate Thermal Physics.
Indian Institute of Science

Honors, Awards & Scholarships

2024-Present Perimeter Institute (PI) Residency Graduate Scholarship.
Perimeter Institute for Theoretical Physics

2024-Present International Doctoral Student Award & Graduate Research Studentship.
University of Waterloo

2023 Semi-Finalist, Rhodes Scholarship.

2018-2021 INSPIRE Scholarship Awardee (SHE Program).
Department of Science and Technology, Government of India.

Other skills

Computer skills

OS Windows, Linux, HPC

Languages Python, Processing3, JavaScript, CSS, HTML

Software Mathematica, LaTeX, Matlab, Microsoft office, Origin, ...

Libraries Numpy, Scipy, Qiskit, QuSpin, QuTip, Sympy, Open Fermion, joblib, p5.js, ...

Linguistic skills

Hindi Mother tongue

English Fluent : TOEFL iBT Score - 99/120 (L:28-R:25-W:25-S:21)

Volunteering

2020-Present Contributor on Physics Stack Exchange.
• Top 2% overall • 11K+ Reputation • ∼ 284K people reached

2023 & 2024 IISC Annual Open Day.

Github Directories

pyhobo PyHOBO allows to construct Hamiltonian for VQAs based on Higher-Order Binary Optimization.

q-complexity The directory contains code files related to work done in finding the quantum circuit complexity of quantum walk.

q-search The directory contains code files related to work done in quantum-walk search in motion.