Curriculum Vitae

Praveen Jayakumar

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Last updated: October 2026

RESEARCH

Making quantum computers useful and reliable.

PUBLICATIONS

P. Jayakumar, T. Zeng, A. F. Izmaylov, "On the Feasibility of Exact Unitary Transformations for Many-body Hamiltonians." J. Chem. Theory Comput. 2026, 22, 8, 3916–3926, April 2026.

S. Patel, **P. Jayakumar**, R. Huang, T. Zeng, A. F. Izmaylov, "Quantum Seniority-based Subspace Expansion: Linear Combinations of Short-Circuit Unitary Transformations for Efficient Quantum Measurements." J. Chem. Theory Comput. 2026, 22, 8, 3937–3949, April 2026.

S. Patel, **P. Jayakumar**, T. C. Yen, A. F. Izmaylov, "Quantum Measurement for Quantum Chemistry on a Quantum Computer." Chem. Rev. 2025, 125, 16, 7490–7524, July 2025.

P. Jayakumar, P. J. Nadkarni, and S. S. Garani, "Efficient recursive encoders for quantum Reed-Muller codes towards Fault tolerance." arXiv:2405.14549, May 2024.

P. J. Nadkarni, **P. Jayakumar**, A. Behera, and S. S. Garani, "Entanglement-assisted Quantum Reed-Muller Tensor Product Codes." Quantum 8:1329, May 2024.

CONFERENCES

Talk titled "*Ground State Disentanglement with Clifford Transformations via Approximate Pauli Symmetries*" presented at the Annual General Meeting of the Quantum Software Consortium. — June, 2026

Poster titled "*Quantum Chemistry on a Quantum Computer.*" presented at the Frontiers of Innovation conference 2026, University of Toronto. **poster contest - 2nd** place. — March, 2026

Poster titled "*On the Feasibility of Exact Unitary Transformations for Many-body Hamiltonians.*" presented at the Applied Quantum Computing Symposium 2025, University of Sherbrooke. — November, 2025

Talk titled "*Conditions for Efficient Unitary Transformation of Many-Body Hamiltonians*" presented at the Symposium of Chemical Physics, University of Waterloo. — November, 2025

Poster titled "*Reductions in Heisenberg transformed Hamiltonians for Distributed Quantum Chemistry.*" presented at the Annual General Meeting of the Quantum Software Consortium. — July, 2025

Talk titled "*Error mitigation via measurement groups: Making quantum computers to do chemistry*" presented at the Symposium of Chemical Physics, University of Waterloo. — November, 2023

PREVIOUS RESEARCH PROJECTS

Fermionic reflection ansatze for efficient VQE methods — July, 2021- May, 2022
Under the guidance of Prof. Artur F. Izmaylov.
Novel variational ansatz construction. Published in JCTC.

Quantum communication and error correction — May, 2019- July, 2021
Under the guidance of Dr Shayan Srinivasa Garani[1]
− Studied entanglement properties of quantum RM codes and it's usecases on quantum networks and entanglement distribution/purification. arXiv:2405.14549
− Designed entanglement assisted codes, quantum tensor product codes from RM codes and their entanglement assisted versions that show postive catalytic rates. **Presented, ITA 2023** and Published in Quantum

iGEM 2019, Hardware team — December, 2018- November, 2019
Designed the hardware for the project titled Synshine, IISc Bangalore.

Ion trapping for Ca^+ ions — May, 2018- July, 2018
Under the guidance of (late) Prof. Vasant Natarajan[2]
Constructing a linear Paul trap to trap singly ionized Calcium ions.

CONTRIBUTED WORKSHOPS

"*Developing Effective Methodologies to Teach Quantum Information Science to Early-Stage Learners*", IEEE Quantum Week 2021. — October, 2021

"*Introduction to Quantum Computing*", Quantum Communications Workshop 2021, IEEE-IISc. — September, 2021

"*Introduction to Quantum Computing Algorithms*", IEEE-IISc Student Seminar Series. — July, 2021

PARTICIPATED WORKSHOPS

IBM GSS 2021, IBM GSS 2020, STAQ summer school (online) — 2020, 2021
Radio Astronomy Workshop at ICTS, Bengaluru, India. — 2018
Duke TIP India Summer workshop on Cryptography by Duke University. — 2012

EDUCATION

University of Toronto — Fall, 2022 - 2026
PhD, under supervision of Prof. Artur F. Izmaylov[3]
Department of Chemistry
Research focus: Quantum computing algorithms for Quantum Chemistry
Grade: A

Indian Institute of Science (IISc), Bengaluru, India — Fall, 2017 - Winter, 2022
5-Year Bachelor of Science + Masters of Science with a major in **Physics**
CGPA - **8.9** / 10.0 (Distinction)
GRE (General): **326**/340 ToEFL: **103**/120

AMM Matriculation — Fall, 2015 - Winter, 2017

[1]Department of Electronic Systems Engineering, IISc. shayangs@iisc.ac.in
[2]Department of Physics, Indian Institute of Science
[3]Department of Physical and Environmental Sciences, University of Toronto Scarborough. artur.izmaylov@utoronto.ca

PUC I and II (equivalent to grades 11 and 12),
Department of Government Examinations, Tamil Nadu.
Class 12 : 96 %

AMM Matriculation — Fall, 2005 - Winter, 2015
Grades 1 - 10, Department of Government Examinations, Tamil Nadu.
Class 10 : 97.2 %

WORK EXPERIENCE

Xanadu Quantum Technologies Inc., Toronto, Canada. — May, 2024 - August, 2024
Summer Resident - Error correction researcher - GKP code and decoder design.

Office of Communication, Indian Institute of Science, Bengaluru, India. — March, 2022 - July, 2022
Scientific journalism summer internship

TEACHING

Teaching assistant, CHM21B (Chemical Structure and Spectroscopy)	Winter, 2025
Teaching assistant and lab demonstrator, PHYA11	Winter, 2024; Fall, 2025
Marker, CHM1478HS (Quantum Mechanics for Physical Chemists)	Winter, 2024; Fall 2025
Teaching assistant and lab demonstrator, PHYA10H	Fall, 2023; Fall, 2024
Lab demonstrator, CHM135H	Fall, 2022
TA, Digital signal processing (NPTEL)	2020, 2021

RELEVANT COURSES

Graduate level
Completed
Quantum computing, Quantum Mechanics for Quantum Chemists, Quantum information Theory, Quantum Optics, Linear Algebra and Optimization, Statistical Mechanics, Advanced Math methods, Information theory, Quantum mechanics, Advanced cryptography (Pseudo-randomness, randomness extractors and expanders), Quantum measurements, Theoretical foundations of Cryptography

TECHNICAL SKILLS

Programming languages
Python, LaTeX, C, C++, Octave, MATLAB, R
Quantum computing packages: Qiskit, Cirq, Tequila, Pennylane

FELLOWSHIPS AND AWARDS

Kishore Vaigyanik Protsahan Yojana [**KVPY-SA**] — August, 2017- July, 2022
All India Rank : 94
Includes stipend and contingency

Student of the year — 2017
AMM School, Chennai, India

EXTRA-CURRICULAR

Member, University of Toronto Toastmasters club — May, 2023 - February, 2025
Region 6, district 60, Division A, Area 11.

Contributor and curator - quantumuniversal.org	August, 2020 - Present
Executive member - IEEE IISc Communication Society student chapter.	April, 2021 - April, 2022
Quarks 2019 IISc UG's Anuual magazine - design coordinator.	June, 2019 - March, 2020
Notebook drive, IISc Teach basic English, computer skills and science to underprivileged children.	August, 2018 - January, 2020
Pravega - Coordinator - Corporate relations Managing corporate communications and sponsorship for Pravega 2019, IISc's Annual Science, technical and cultural fest.	January, 2018 - January, 2019
Undergraduate engineering club, IISc - Coordinator Conduct and arrange seminars on engineering topics.	June, 2018 - June, 2019
Student Council (School) - Head	July, 2016 - April, 2017