PRADEEP KUMAR

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University of Calgary, 2500 University Drive N.W., Calgary, Alberta, Canada

EDUCATION

University of Calgary, Calgary, AB *Sep 2023 - Present*
Department of Physics and Astronomy
Graduate Studies, Quantum Computation, GPA 4.0/4.0
Supervisors: Dr. Barry C. Sanders(Physics) and Dr. Peter Høyer(Computer Science)

Harish-Chandra Research Institute, Prayagraj *Aug 2021 - Jul 2023*
Master of Science, Physics

Indian Institute of Technology, Bombay, Mumbai
Bachelor of Technology, Mechanical Engineering

SCHOLARSHIP AND ACADEMIC ACHIEVEMENTS

- Awarded Alberta Graduate Excellence Scholarship (AGES 2024), a competitive scholarship which recognizes outstanding academic achievement of students pursuing graduate studies in Alberta
- All India Rank of 5 in JEST 2023 for admission to Doctoral Programmes in Physics
- Awarded Department of Atomic Energy Fellowship for Masters Programme in Physics at HRI

RESEARCH PUBLICATION

Quantum Resources in Harrow-Hassidim-Lloyd Algorithm
P. Kumar, T. K. Konar, L.K.C. Lakkaraju, A. Sen De
Phys. Lett. A, 129668, 2024

- Analyzed the role of quantum resources in the successful execution of the HHL algorithm
- Demonstrated that genuine multipartite entanglement(GME) is critical for the HHL algorithm
- Established correlation between quantum coherence and the success probability of the algorithm

Poster Presentation

- Quantum Days 2024, Calgary, Alberta, February 22nd, 2024.
- Quantum Alberta Research Showcase 2024, Calgary, Alberta, October 1st, 2024

RESEARCH EXPERIENCE

Quantum Resources in Quantum Algorithms [Github Repository] *May 2022 - Aug 2023*
Supervisor: Prof. Aditi Sen De

- Established the role of entanglement as a resource in solving linear systems of equations
- Evaluated the impact of noise in the input on the accuracy of the results
- Reviewed literature on Entanglement Theory and Quantum Algorithms

Erogdicity *Nov 2021 - Jan 2022*
Supervisor : Prof. Pinaki Majumdar

- Analyzed foundational principles underpinning Ergodic Theory in statistical physics
- Explored the Ergodic Hypothesis' impact on systems, focusing on Sinai Billiards

Transverse-field Ising Model *Nov 2021 - Jan 2022*
Supervisor : Prof. Aditi Sen De

- Computationally solved Hamiltonian of the Transverse-field Ising Model
- Simulated the impact of varying magnetic field on magnetisation and classical correlation

PROFESSIONAL AND LEADERSHIP EXPERIENCE

UofC Quantum Club *Oct 2024 - Present*
Founding President

- Built an executive team to plan and execute events focused on community, education and career development in quantum computing.
- Initiated planning for activities, including workshops, seminars, and an industry night to connect members with professionals.
- Built an inclusive space aimed at fostering student connections and hands-on learning in quantum technologies.
- Initiated recruitment efforts for hackathon teams and organized training sessions to prepare members for participation in quantum computing competitions

MathPro, Calgary, AB *Sep 2024 - Present*
Tutor: Mathematics and Physics

- Instructed high school students in Physics 20, Physics 30, and Math 30, implementing personalized learning plans to accommodate individual learning styles and challenges.
- Consistently helped students achieve scores above 90%, surpassing initial goals by an average of 15% through targeted practice and conceptual reinforcement.

Institute for Quantum Science and Technology, Calgary, AB *Sep 2023 - Present*
Webmaster - iqst.ca, iqst.ucalgary.ca

- Developed and maintained websites for IQST using Drupal and HTML
- Managed the institute's database, ensuring data integrity and seamless integration with web services
- Improved the content management system based on user feedback

University of Calgary, Calgary, AB *Sep 2023 - Present*
Graduate Teaching Assistant

- Assisted in teaching Classical Physics, Quantum Physics, and Electromagnetism courses, facilitating student understanding through lectures, labs, and tutorials.
- Provided personalized guidance to students, resulting in improved academic performance and enhanced grasp of complex concepts.

HACKATHONS

GenQ Quantum Computing Hackathon *Oct 4th, 2024 - Oct 6th, 2024*
Platform, Calgary, Alberta

- Secured **third place** in the GenQ Quantum Computing Hackathon organized by QAI-Ventures
- Translated an optimization problem from Markowitz Portfolio Theory into QUBO and solved using Quantum Approximate Optimization Algorithm (QAOA)
- Developed a mathematical model to incorporate ESG risk factors as constraints in optimization
- Proposed a business plan for commercializing the quantum-based solution

Mphasis Quantum Challenge - Passenger Rescheduling Problem *Sep 2024 - Nov 2024*
Quantum City, Calgary, Alberta

- Competing in a 3-month Quantum Challenge by Mphasis, developing a quantum algorithm for passenger rescheduling to optimize flight disruptions.
- Utilizing Quantum Annealing and QAOA to model and solve complex scheduling constraints, aiming to minimize passenger inconvenience in cases of flight cancellations.

Canadian Quantum Cup Challenge 2023 *Nov 2023*
Team Leader, University of Calgary

- Led the University of Calgary team to the finals in a national quantum programming competition, securing a top 4 finish among 15 universities across Canada.
- Tackled complex quantum challenges, working intensively for over 50 hours of coding across three competitive rounds.

SUMMER SCHOOL AND BOOTCAMPS

International Summer School on Near-Term Quantum Algorithms 2024 *June 2024*
Centre de Villégiature Jouvence, Québec, Canada

- Selected for a competitive quantum computing program organised by Université de Sherbrooke.
- Gained expertise in noise-resistant algorithms through lectures and hands-on programming sessions
- Collaborated with leading researchers and innovators in quantum computing

Lab2Market Discover - Quantum Cohort *Oct 2024 - Present*
Calgary, AB

- Selected for a competitive 10-week bootcamp focused on exploring entrepreneurship as a career path and identifying commercial applications for quantum technologies.
- Engaged in hands-on learning to bridge the gap between research and market, gaining insights into innovation, commercialization, and building a network within the entrepreneurship ecosystem.
- Part of a national initiative aimed at transforming researchers into innovation leaders and entrepreneurs, with a focus on bridging the knowledge and skills needed to bring research to market.

Post-Hackathon Bootcamp – QAI Ventures *Oct 2024 - Present*
Calgary, AB

- Attending a series of intensive workshops focused on startup fundamentals, market validation, and pitching, designed to commercialize and refine the product developed during the hackathon.
- Engaging in hands-on training covering market research, value proposition development, and strategies for bringing innovative ideas to market.

TECHNICAL SKILLS

Languages	Python, C++, HTML
Libraries	Numpy, Scipy, Matplotlib, Qutip
Softwares & Tools	Drupal, Excel, LaTeX, MySQL, Linux

COURSES

Physics	Quantum Computation, Quantum Information, Quantum Optics, Statistical Physics, Condensed Matter, Quantum Field Theory, Correlated Quantum Systems
Others	Industrial Engineering and Operation Research, Economics, Probabilistic Models