Pranav **Kairon**

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Education

University of British Columbia
Vancouver, Canada

Master's in Physics — *2021 - Sept. 2023*

- CGPA: 3.65/4
- Teaching Assistant for PHYS 100 and PHYS 131

Delhi Technological University
New Delhi, India

Bachelor of Technology in Engineering Physics with Majors in Electronics — *2017 - 2021*

- CGPA: 8.96/10

St. Xavier's Senior Secondary School
New Delhi, India

Grade 12 (Senior Secondary Level) — *2017*

- Percentage: 89.2%

Experience

University of British Columbia
Vancouver, Canada

Graduate Research Assistant under Prof. Roman Krems — *Sept, 2021 - Present*

- Working on designing a quantum analogue for Bayesian optimization algorithm
- Using kernel regression methods to predict polaron dispersion relation for various electron phonon models. Ground state energy is obtained using variational monte carlo approaches
- Using gaussian process regression to extrapolate gapped band structure to gappless state, and predict dirac cones for twisted-Bilayer cuprates
- Worked on quantum dot based analogue simulator for simulating attosecond physics in atoms

HCL Technologies
Bengaluru, India

Research Internship — *August, 2021 - September, 2021*

- Benchmarked various methods present for solving electronic structure problem on DWave quantum annealer (AWS Amazon Braket).
- Presented a report on error mitigation schemes for variational quantum eigensolver, where error is mitigated by exploiting the symmetries in Hamiltonian.

Conduit Computing
Boston, USA (Remote)

Research Internship — *March, 2020 - January, 2021*

- Worked on drug development for Covid-19 by simulating proteins using NAMD and VMD with help of Fronterra supercomputer.
- Project selected for White House HPC consortium and Nvidia Supercomputers.
- Literature survey for using Quantum tensor network methods to perform Quantum Monte Carlo simulations for applications to risk analysis.
- Full research proposal presented at Quantum British Columbia, Virtual Poster Presentation on quantum computing.

Qnu Labs {India's first Quantum Company}
Bengaluru, India

Research Internship under Dr. Anindita Banerjee — *December, 2019 - January, 2020*

- Worked on discrete phase randomization of Differential Phase shift QKD and COW protocol.
- Developed MATLAB/Mathematica programs to calculate key rate deterioration with distance for various DPS protocols.
- Developing reports on high throughput Quantum random number generators which can be simulated experimentally in the lab, that rely on random generation using phase noise of LASER.

Solid State Physics Laboratory - DRDO
Delhi, India

Research Internship — *May, 2019 - August, 2019*

- Worked on characterizing Gold, HOPG, MCT, GaAs samples using Scanning Tunnelling Microscopy and Electrical characterization AlN thin films on Si(111) by fabricating MIS structures.
- Renewed a broken 40K $ worth of table top STM and configured the software re-installation and hardware setup by myself.

Solid State Physics Laboratory - DRDO
Delhi, India

Research Internship — *Dec, 2018 - February, 2019*

- MATLAB modelling of Thin film characterization using X-ray reflectivity.
- Composition, Stress & Strain determination of AlGaN/GaN multilayer for HEMT devices

Laser Science and Technology Center – DRDO
Delhi, India

Research Internship — *May, 2018 - August, 2021*

- Worked on development of optical resonator for high power Lasers using Nd-doped PoCl3 as the gain medium Developed MATLAB program for the same.
- Surveyed various optical coatings for laser grade mirrors.

Projects

Coherence based inequality for state discrimination

Delhi Technological University, Delhi, India

Bachelor's Thesis under Dr. Satyabrat Adhikari and Dr. Mukhtiyaar Singh — *August, 2020 - June, 2021*

- Worked on relationship between coherence and entanglement measures.
- Developed coherence based inequality for the classification of GHZ class and W class of three-qubit states.
- Extended it further to possible implementation of the scheme in an experiment.

Quantum Neural Networks for multi-dimensional regression

Christ University, India

Research project under Prof. Siddhartha Bhattacharya — *April, 2020 - December, 2020*

- Performed a comparative analysis of continuous variable quantum neural networks (variational circuits) and quantum backpropagation multilayer perceptron.
- Presented the paper and gave a talk at Second Doctoral Symposium on Intelligence Enabled Research (2020) .
- Designing a novel Fuzzy Quantum Neural Network based on quantum backpropagation for solving multi dimensional regression problems and surveying literature of neutrosophic quantum computing.

Quantum Game theory

Roorkee, India

Research project under Prof. Anirban Pathak — *May, 2018 - June, 2018*

- Worked on practical realization of the three-player dilemma game under the action of noise on IBM quantum computer.
- Published the results in a journal article and presented the poster at .
- Worked on quantum satellite communication under atmospheric noise and game theoretic analysis of entanglement based QKD protocols.

Publications and Posters

Noisy three-player dilemma game: robustness of the quantum advantage

Journal Article — *April, 2020*

- Kairon, P., Thapliyal, K., Srikanth, R. et al. Noisy three-player dilemma game: robustness of the quantum advantage. Quantum Inf Process 19, 327 (2020) (Link)

Coherence-based inequality for the discrimination of three-qubit GHZ and W class

Journal Article — *January, 2020*

- Kairon, P., Singh, M., Adhikari, S. Coherence-based inequality for the discrimination of three-qubit GHZ and W class. Quantum Inf Process 21, 173 (2022) (Link)

COVID-19 Outbreak Prediction Using Quantum Neural Networks

DoSIER 2020 (Virtual)

Conference Paper — *June, 2021*

- Kairon, P., Bhattacharyya, S. (2021). COVID-19 Outbreak Prediction Using Quantum Neural Networks. In: Bhattacharyya, S., Dutta, P., Datta, K. (eds) Intelligence Enabled Research. Advances in Intelligent Systems and Computing, vol 1279. Springer, Singapore (Link)

Simulation of 2019-nCoV envelope formation as a platform for screening therapeutics which may interfere with viral protein-protein interactions

Abstract presented at ICCS, 2020 — *May, 2020*

- The abstract is available at (Link)

Experimental test of quantum advantage 3- player noisy dilemma game

Munich, Germany (Virtual)

Poster presented at MCQST — *July, 2020*

- The poster is available at (Link)

Honours & Scholarships

2022	**Quantum BC Roadmapping Workshop,** Won first place in Roadmapping workshop, Developed quantum based solution for an industrially relevant genomics problem	*Quantum Algorithms Institute, Canada*
2021	**QuEST Fellowship,** Stewart Blusson Quantum Matter Institute, University of British Columbia, Canada	
2021	**NSERC Quantum Computing CREATE Scholarship,** University of British Columbia, Vancouver, Canada	
2021	**MCQST Summer School 2021,** Shortlisted among 20 students among 500 applicants all over the world for first Munich Center of Quantum Science and Technology Summer School	
2020	**Cornerstone Models of Quantum Computing online summer school,** Selected for summer school conducted by Quantum British Columbia among 130 undergraduate & graduate candidates	
2017	**All India Rank - 4922,** JEE Main, taken by approximately 1.5 million students.	

Skills

Programming Languages	Python, C++, MATLAB, Mathematica
Packages and Environments	Qiskit, Numpy, Pennylane, IBMQ Experience, JAX, Tensorflow, Pytorch
Utilities	Git, Linux Shell, VScode, Jupyter

Extracurricular Activity

Deltech Engineering Physics Technological Hub, Delhi Technological University *Delhi, India*

Vice-President, Lecturer for the term 2020-21 *2017 - 2021*

- DEPTH is an undergraduate society which organizes seminars, debates, guest lectures, paper presentations intended at enhancement in knowledge of and unfolding of various scientific fields before its members.
- Conducted lectures on various topics not covered in university courses.
- Mentored beginners in the field to explore the various topics systematically.

Invictus-Tech festival *Delhi, India*

Team Leader for Public-Relations team during 2019 Tech-fest *2017 - 2021*

- Carrying on the legacy of the technical fests at Delhi Technological University, the fest is a platform for budding technocrats to explore and put their talent to test when they get to compete with other prodigies of their field in the nation.
- I was in-charge of public relations team

Student Mentorship Programme *Delhi, India*

Mentor *2019 - 2021*

- Personally mentored five freshmen from the Engineering Physics Department.
- Individually guided them through personal and academic problems for the entire year.

References

Prof. Roman Krems
rkrems@chem.ubc.ca

Prof. Anirban Pathak
anirban.pathak@jiit.ac.in