Hemant Katiyar | Senior Engineer & Quantum Physicist

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Ph.D. in Quantum Information with 10+ years of experience in experimental quantum computing, spin-based, superconducting, and ion traps systems. Expert in quantum control, pulse sequence optimization, unitary decomposition, and simulation using Python and MATLAB. Currently developing control solutions for trapped-ion systems at IonQ.

Technical Skills

Quantum Computing: Quantum Control, Pulse Shaping, Theoretical modelling, Unitary Decomposition, NMR, Trapped Ions, Error Characterization, Sensitivity studies

Programming: Python, MATLAB, Git

Simulation: Hamiltonian Simulation, Gradient-based Optimization, Open Quantum Systems

Lab & Tools: Bruker TopSpin, RF/Microwave electronics, Experimental Automation

Professional Experience

IonQ **Toronto, Ontario**
Senior Engineer *Jan 2023 – Present*

- Leading efforts in error budgeting to improve gate fidelities on trapped-ion quantum processors.
- Collaborating with hardware and theory teams to translate system phsicys into executable simulations packages.

Entangled Networks & IQC **Waterloo, Ontario**
Mitacs Accelerate Post-Doctoral Fellow *Aug 2022 – Dec 2022*

- Collaborated on the architectural design of multi-node quantum network protocols.
- Developed strategies to reduce gate times for multi qubit gates on superconducting qubit architectures.

Institute for Quantum Computing (IQC) **Waterloo, Ontario**
Post-Doctoral Fellow *Nov 2019 – Aug 2022*

- Developed novel gradient-based algorithms for closed-loop quantum optimal control, significantly reducing pulse duration.
- Led the maintenance and operation of the NMR quantum information laboratory, ensuring 99% uptime for experimental research.
- Authored documentation and open-source code for NMR pulse finding, automating experimental workflows for junior researchers.

Education

Institute for Quantum Computing, University of Waterloo **Canada**
PhD in Physics (Quantum Information) *2014–2019*

Indian Institute of Science Education and Research **Pune, India**
BS-MS Dual Degree (Major in Physics) *2007–2012*

Selected Publications

Selected from 17+ peer-reviewed publications. Full list available on Google Scholar.

2023: **Phys. Rev. Lett.** | Experimental Activation of Strong Local Passive States with Quantum Information. N. A. Rodríguez-Briones, **H. Katiyar**, et al.

2020: **arXiv** | Fast Simulation of Magnetic Field Gradients for Optimization of Pulse Sequences. J. P. S. Peterson, **H. Katiyar**, R. Laflamme.

2018: **Phys. Rev. A** | Gradient-based closed-loop quantum optimal control in a solid-state two-qubit system. G. Feng, F. H. Cho, **H. Katiyar**, et al.

2017: **npj Quantum Information** | Enhancing quantum control by bootstrapping a quantum processor of 12 qubits. D. Lu... **H. Katiyar**, et al.

Honors & Awards

2014 – 2018: Marie Curie Graduate Student Award & International Doctoral Student Award

2007 – 2012: INSPIRE Scholarship (Innovation in Science Pursuit for Inspired Research)

Leadership & Mentorship

Instruction: Designed and taught a 30-hour course on NMR Quantum Information Processing (PHYS468), enabling students to run independent quantum experiments.

Mentorship: Instructor for the Undergraduate School on Experimental Quantum Information Processing (USEQIP) for 5 consecutive years (2015-2019).