Hemant Katiyar | Curriculum Vitæ

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Education

Institute for Quantum Computing, University of Waterloo **Ontario, Canada**
Post-Doctoral Fellow *2019–Now*
Supervisor: Prof. Raymond Laflamme

Institute for Quantum Computing, University of Waterloo **Ontario, Canada**
PhD-Physics (Quantum Information)
Thesis title : Control techniques in spin based quantum computation. *2014–2019*
Supervisor: Prof. Raymond Laflamme

Indian Institute of Science Education and Research **Pune, India**
Research Assistant *2012–2014*

Indian Institute of Science Education and Research **Pune, India**
BS-MS Dual Degree (Major in Physics)
Thesis title : Estimation of Quantum Correlations in Nuclear Spin Ensembles. *2007–2012*
Supervisor: Prof. T. S. Mahesh

Research Interests

- Quantum Control.
- Experimental Quantum Computation and Information processing.
- Nuclear/Electron Magnetic Resonance.
- Quantum Machine Learning.

Research Publications

Experimental activation of strong local passive states with quantum information. Nayeli A. Rodríguez-Briones, **Hemant Katiyar**, Eduardo Martín-Martínez, Raymond Laflamme. arXiv:2203.16269 (2022)

Efficient decomposition of Unitary gates for practical quantum computing. **Hemant Katiyar**, Raymond Laflamme. Manuscript Under Preparation

Fast Simulation of Magnetic Field Gradients for Optimization of Pulse Sequences. John P. S. Peterson, **Hemant Katiyar**, Raymond Laflamme. arXiv 2006.10133 (2020)

Exploration of an augmented set of Leggett-Garg inequalities using a noninvasive continuous-in-time velocity measurement. Shayan-Shawn Majidy, **Hemant Katiyar**, Galit Anikeeva, Jonathan Halliwell, Raymond Laflamme. Phys Rev A 100 042325 (2019)

Gradient-based closed-loop quantum optimal control in a solid-state two-qubit system. Guanru

Feng, Franklin H Cho, **Hemant Katiyar**, Jun Li, Dawei Lu, Jonathan Baugh, Raymond Laflamme. Phys Rev A 98 052341 (2018)

Enhancing quantum control by bootstrapping a quantum processor of 12 qubits. Dawei Lu, Keren Li, Jun Li, **Hemant Katiyar**, Annie Jihyun Park, Guanru Feng, Tao Xin, Hang Li, Guilu Long, Aharon Brodutch, Jonathan Baugh, Bei Zeng, Raymond Laflamme. npj Quantum Information volume 3, Article number: 45 (2017)

Experimentally superposing two pure states with partial prior knowledge. K Li, G Long, **Hemant Katiyar**, T Xin, G Feng, D Lu, R Laflamme. Phys. Rev. A 95, 022334 (2017)

Experimental violation of the Leggett-Garg inequality in a 3-level system. **Hemant Katiyar**, A Brodutch, D Lu, R Laflamme. New J Phys. 19 023033 (2017)

NMR investigation of contextuality in a quantum harmonic oscillator via pseudospin mapping. **Hemant Katiyar**, CSS Kumar, TS Mahesh. EPL (Europhysics Letters) 113 (2), 20003 (2016)

NMR quantum information processing. Dawei Lu, Aharon Brodutch, Jihyun Park, **Hemant Katiyar**, Tomas Jochym O'Connor, Raymond Laflamme. Electron Spin Resonance(ESR) Based Quantum Computing, Biological Magnetic Resonance, vol 31, Springer, New York, NY (2016)

Ancilla assisted measurements on quantum ensembles: General protocols and applications in NMR quantum information processing. TS Mahesh, A Shukla, SS Hegde, CS Kumar, **Hemant Katiyar**, S Joshi, KR Rao. arXiv 1509.04506 (2015)

Freezing a quantum magnet by repeated quantum interference: An experimental realization. Swathi Hegde, **Hemant Katiyar**, Arnab Das and T S Mahesh. Phys. Rev. B 90, 174407 (2014)

Estimating Franck-Condon factors using an NMR quantum processor. S Joshi, A Shukla, **Hemant Katiyar**, A Hazra, TS Mahesh. Phys. Rev. A 90, 022303 (2014)

Violation of Entropic Leggett-Garg Inequality in Nuclear Spin Ensembles. **Hemant Katiyar**, Abhishek Shukla, Rama Koteswara Rao,and T S Mahesh. Phys. Rev. A 87, 052102 (2013)

Multipartite quantum correlations reveal frustration in a quantum Ising spin system. KRK Rao, **Hemant Katiyar**, TS Mahesh, A Sen, U Sen, A Kumar. Phys. Rev. A 88, 022312 (2013)

Inversion of moments to retrieve joint probabilities in quantum sequential measurements. HS Karthik, **Hemant Katiyar**, A Shukla, TS Mahesh, ARU Devi, AK Rajagopal. Phys. Rev. A 87, 052118 (2013)

Evolution of Quantum Discord and its Stability in Two-Qubit NMR Systems. **Hemant Katiyar**, Soumya Singha Roy, T S Mahesh and Apoorva Patel. Phys. Rev. A 86, 012309 (2012)

Scholarships/Awards

- Marie Curie Graduate Student Award (Spring 2014 - Winter 2018; 12 Terms)
- International Doctoral Student Award (Spring 2014 - Winter 2018; 12 Terms)
- Graduate Research Award (Spring 2014 - Spring 2019; 16 Terms)
- Science Graduate Experience Award (Fall 2014, Spring 2015, Fall 2015, Spring 2016, Spring 2017; 5 Terms)
- Innovation in Science Pursuit for Inspired Research (INSPIRE) scholarship (2007-2012)

Technical Skills

Programming Languages: MATLAB, Mathematica, Python

Markup Languages: CSS, HTML, LaTeX

Operating Systems: Linux, Windows, Mac OS

Tools: Git

Other Software: Bruker TopSpin, Photoshop, Dreamweaver, Illustrator

Teaching Experience

- **PHYS468-Introduction to the Implementation of Quantum Information Processing (2021)** Taught students how to use a NMR quantum computer and helped them perform their first quantum experiment (60Hrs).
- **PHYS242-Electricity and Magnetism 1 (2021)** Taught weeks 5 and 6.
- **PHYS468-Introduction to the Implementation of Quantum Information Processing (2020)** Taught students how to use a NMR quantum computer and helped them perform their first quantum experiment (60Hrs).
- **QIC750-Implementation of Quantum Information Processing (2019)** Teaching assistant along with giving NMR lab introduction to students.
- **PHYS234-Quantum Physics 1 (2017)** Full time teaching assistant.
- **PHYS280-Introduction to Biophysics (2017)** Full time teaching assistant.
- **PHYS234-Quantum Physics 1 (2016)** Full time teaching assistant.
- **PHYS121-Mechanics (2015)** Full time teaching assistant.
- **PHYS364-Mathematical Physics 1 (2015)** Full time teaching assistant.
- **PHYS121-Mechanics (2014)** Full time teaching assistant.

Scientific Outreach

- **Undergraduate School on Experimental Quantum Information Processing (2015-2019).** Taught all the aspects of performing NMR experiments, helped students to be familiar with experimental setup, and engaged them in thinking about the physics behind the experiments.

Talks, Posters, Conferences, and Schools

2017: **School & Conference**, *Machine Learning, University of KwaZulu-Natal, South Africa.*

2016: **School**, *Machine Learning, Perimeter Institute, Canada.*

2015: **Poster**, *University of Guelph, Canada.*

2013: **Poster & Conference**, *Nuclear Magnetic Resonance Society meeting at Indian Institute of Technology, Bombay.*

2012: **Poster & Conference**, *International Conference On Quantum Information and Quantum Computing at Indian Institute of Science, Bangalore.*

2012: **School**, *Mini Winter School on Quantum Information and Computation.*

2012: **Talk**, *On Quantum Discord in Summer School 2012 organized by Centre for Quantum Information and Quantum Computing(CQIQC), Indian Institute of Science, Bangalore.*

2012: **School**, *Attended Summer School 2012 organized by CQIQC, Indian Institute of Science, Bangalore.*

2011: **Conference**, *Attended International School on Quantum and Nano Computing Systems and Applications held at Dayalbagh Educational Institute, Agra, India.*

References

Raymond Laflamme

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T. S. Mahesh

Associate Professor
Dept. of Physics
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