

Praveen Sriram

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Education

- Sept 2019– **Stanford University**, CA, USA
Ph.D. candidate in Applied Physics.
Advisor : David Goldhaber-Gordon
Thesis topic : Quantum simulation of charge Kondo interactions in a hybrid metal/InAs platform
- Jul 2014– **Indian Institute of Technology Bombay**, Mumbai, India
- Aug 2019 B.Tech. & M.Tech. (Dual Degree) in Electrical Engineering with specialization in Microelectronics, GPA-**9.82/10**. **Ranked 2nd/70** in Electrical Engineering, and **3rd/880** in the Class of 2019.
Advisor : Bhaskaran Muralidharan
Master's Thesis : Quantum transport in hybrid superconductor-semiconductor nanostructures

Publications

- C.L. Hsueh*, P. Sriram*, T. Wang, C. Thomas, G. Gardner, M.A. Kastner, M.J. Manfra, and D. Goldhaber-Gordon. [Clean quantum point contacts in an InAs quantum well grown on a lattice-mismatched InP substrate](#). Phys. Rev. B **105**, 195303 (2022) (*Editors' Suggestion*)
- C. Duse, P. Sriram, K. Gharavi, J. Baugh, and B. Muralidharan. [Role of dephasing on the conductance signatures of Majorana zero modes](#). J. Phys.: Condens. Matter **33** 365301 (2021)
- P. Sriram, S. S. Kalantre, K. Gharavi, J. Baugh, and B. Muralidharan. [Supercurrent Interference in Semiconductor Nanowire Josephson junctions](#). Phys. Rev. B **100**, 155431 (2019)
- M. Gopalkrishnan, V. Kandula, P. Sriram, A. Deshpande, and B. Muralidharan. [Bayesian view of single-qubit clocks, and an energy versus accuracy tradeoff](#). Phys. Rev. A, **96**, 032339 (2017)

Conference Proceedings

- P. Sriram, C.L. Hsueh, T. Wang, C. Thomas, G. Gardner, M.A. Kastner, M.J. Manfra and D. Goldhaber-Gordon. [Towards tunable quantum criticality in InAs quantum wells: hybrid metal-semiconductor quantum dots for charge Kondo effects](#). APS March Meeting 2022, Chicago IL
- P. Sriram, S.S. Kalantre, K. Gharavi, J. Baugh and B. Muralidharan. [Quantum-Transport in Semiconductor Nanowire Josephson Junctions](#). APS March Meeting 2019, Boston MA
- M. Gopalkrishnan, V. Kandula, P. Sriram, A. Deshpande, and B. Muralidharan. [A Bayesian view of Single-Qubit Clocks, and an Energy versus Accuracy tradeoff](#). Proceedings of the 2016 IEEE Symposium on Information Theory (ISIT)

Invited Talks

- "Building blocks for quantum simulators in InAs : quantum point contacts submicron ohmic islands." QDev Seminar, Niels Bohr Institute, Copenhagen, Denmark (October 26, 2021)
- "Quantum point contacts and transparent submicron ohmic islands in InAs, towards quantum simulation of non-Fermi liquid physics." IST Quantum Seminar, Institute of Science and Technology Austria, Klosterneuberg, Austria (October 21, 2021)
- "Quantum point contacts and transparent submicron ohmic islands in InAs, towards quantum simulation of non-Fermi liquid physics." ETH Zürich, Zürich, Switzerland (October 19, 2021)
- "Supercurrent Interference in Semiconductor Nanowire Josephson junctions." Pittsburgh Quantum

Scholarships & Awards

- 2019 **Undergraduate Research Award** (URA 03) for exceptional work, both in quality and in extent, in the Dual Degree Project (Master's Thesis 2018-19).
- 2019 Electrical Engineering **Department Color** at IIT Bombay for exceptional contribution towards the department.
- 2018 **Undergraduate Research Award** of C\$6000 for pursuing research at the Institute for Quantum Computing, in the University of Waterloo (awarded to 21 students worldwide)
- 2018 **Undergraduate Research Award** (URA 01) by IIT Bombay for IRNSS Receiver design
- 2017 **Scholarship** of €3200 by the Austrian Agency for International Cooperation in Education and Research ([OeAD](#)) for pursuing research in IST Austria (awarded to 40 students worldwide)
- 2017 **Student Excellence Award** of ₹1,00,000 by the Lions Club of North Bombay
- 2016–2018 **Institute Academic Prize**, for the highest GPA for (2015-16 & 2016-17), and second-highest GPA in 2018 (in the Electrical Engineering Department)

International Schools & Workshops

- Oct 2021 **Fundamentals and advances in mesoscopic quantum physics: quantum circuits, topology and correlations**, *Institut d'Études Scientifiques de Cargese, France*
Attended a 2-week school on mesoscopic physics, superconducting quantum circuits and topological phases organized by CNRS, ENS Lyon, LPF Orsay and CEA Saclay
- May 2018 **Undergraduate School on Experimental Quantum Information Processing (USE-QIP)**, *Institute for Quantum Computing, University of Waterloo, Canada*
Attended a 2-week school on the theoretical & experimental aspects of Quantum Information Processing; worked with 2-qubit algorithms on an NMR quantum computer
- Dec 2016 **Quantum Transport: Atom to Transistor**, *Global Initiative of Academic Networks (GIAN) Course at Jawaharlal Nehru University, New Delhi*, by Prof. Supriyo Datta
Attended a week-long course on Quantum Transport and the NEGF formalism
- Jul 2016 **Summer School on Modern Physics at All Scales**, *Universiteit Leiden, The Netherlands*, by Dirk Bouwmeester, Carlo Beenakker, Leiden Physics Faculty
Attended a 10-day summer school organised by the faculty of Leiden Institute of Physics (LION)

Research

Areas of Interest

experimental condensed matter physics, quantum simulation, low-temperature transport, topological physics

Research Experience

- Sept 2019 – **Quantum simulation of charge Kondo critical points in hybrid InAs quantum dots**, *Stanford University & Stanford Institute for Materials and Energy Sciences (SLAC)*, Prof. David Goldhaber-Gordon & Prof. Marc Kastner
 - Developing a hybrid metal/InAs-based analog quantum simulator for probing novel phase transitions based on charge Kondo interactions
 - Demonstrated highly transparent interfaces between quantum Hall edge states and sub-micron metal islands, and clean quantum point contacts in high-mobility InAs quantum well grown on InP

- 2018-2019 **Quantum transport in hybrid superconductor-semiconductor devices**, *Indian Institute of Technology Bombay & Institute for Quantum Computing, University of Waterloo*, Master's Thesis, Prof. Bhaskaran Muralidharan & Prof. Jonathan Baugh
- Employed the Keldysh Green's function formalism (NEGF) to model quantum transport in hybrid nanodevices; computed the Andreev Bound State spectrum and current-phase relationship for SNS devices
 - Simulated the Critical Current Oscillations in nanowire Josephson junctions, resulting from subband supercurrent interference in presence of an axial magnetic field (Peierls substitution)
- May-Jul 2017 **Spin Qubits in Germanium Nanostructures & Circuit QED**, *Institute of Science and Technology, Austria (IST Austria)*, Nanoelectronics Group, Prof. Georgios Katsaros
- Used a Scanning Electron Microscope (SEM) to image Germanium Hut Wire samples and designed hut wire devices using CAD tools.
 - Performed DC transport measurements on the hut-wires at 4 Kelvin in a liquid He dewar interfaced with TU Delft electronics
 - Designed Niobium resonators, performed FEM simulations on Sonnet to extract loaded quality factor & coupling rate and measured the spectral response of a resonator centred at 7.5 GHz
- Jun 2015–Apr 2017 **Bayesian View of Quantum Clocks**, *Indian Institute of Technology Bombay*, Prof. Manoj Gopalkrishnan & Prof. Bhaskaran Muralidharan
- Analyzed the protocol of a quantum clock using an exponential random event coupled to a qubit
 - Conducted an information theoretic treatment of clock random variables and used Landauer's Principle to theorize an energy/accuracy tradeoff.
 - Developed a physical realisation of the single qubit quantum clock based on capacitively coupled quantum dots with ferromagnetic contacts.

Course Projects

- Autumn 2019 **Numerical Renormalization Group solution to the Kondo problem**, PHYSICS 212 Statistical Physics
- Spring 2020 **Random-matrix theory of quantum transport in topological superconductors**, PHYSICS 470 Many-Body Quantum Dynamics
- Autumn 2021 **Random-matrix theory of zero-bias conductance in a chaotic topological superconducting nanowire**, PHYSICS 450 Random Matrices in Physics
- Autumn 2021 **Magnetic disorder-induced topological phase transitions in two-dimensional superconductors**, MATSCI 326 X-Ray Science and Techniques

Skills & Experience

- Programming C/C++, Python, HTML, VHDL
- Science QISKit, QCoDeS, SciPy, NumPy, MATLAB, Mathematica, Scilab, Octave
- Software L^AT_EX, SPICE, AutoCAD, EAGLE, Sonnet, Synopsys - TCAD, Cadence - Virtuoso ADE
- Electronics Low-frequency lock-in measurements, RF circuit design, filter design

Postions of Responsibility & Extracurriculars

- 2020– **Pianist for Stanford New Ensemble**, *Department of Music, Stanford University*
- 2018–2019 **Department Academic Mentor**, *Electrical Engineering*
- Mentor to students facing challenges in coursework; helping them improve their performance
 - Serving as a communication channel between the faculty and students for grievance redressal
- 2016–2019 **Teaching Assistant**, *Quantum Physics, Differential Equations, Linear Algebra*
- Mentoring a batch of 50 students with the course content
 - Conducted weekly tutorials and involved in grading of quizzes/exams