Praveen Sriram

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EDUCATION

Stanford University **September 2019 – Present**

Ph.D. Candidate in Applied Physics *GPA 4.0*

Advisor : David Goldhaber-Gordon

Thesis : Quantum simulation of non-Fermi liquid physics with hybrid metal/semiconductor dots

Indian Institute of Technology Bombay, *Mumbai, India* **July 2014 – June 2019**

B.Tech. & M.Tech. (Dual Degree) in Electrical Engineering with specialization in Microelectronics *GPA 9.82/10*

Advisor : Bhaskaran Muralidharan

Master's Thesis : Quantum transport

PUBLICATIONS

1. C.L. Hsueh[*], **P. Sriram**[*], T. Wang, C.Thomas, G.C. Gardner, M.A. Kastner, M.J. Manfra, 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)*

2. 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)

3. **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)

4. 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)

5. 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), 2016, pp. 2239-2243

CONFERENCE PRESENTATIONS

1. 5th International Conference on Spin-based Quantum Information Processing, Pontresina, Switzerland
   Quantum simulation of charge Kondo critical points in hybrid metal-InAs quantum dots **2022**

2. APS March Meeting 2022, Chicago IL
   Towards tunable quantum criticality in InAs quantum wells: hybrid metal-semiconductor quantum dots for charge Kondo effects **2022**

3. APS March Meeting 2019, Boston MA
   Quantum Transport in Semiconductor Nanowire Josephson Junctions **2019**

4. Q-Turn Workshop, Florianopolis, Brazil
   A Bayesian view of Single-Qubit Clocks, and an Energy versus Accuracy tradeoff **2018**

TALKS & SEMINARS

1. QDev Seminar, Niels Bohr Institute, Copenhagen, Denmark
   Building blocks for quantum simulators in InAs : quantum point contacts & (October 26, 2021)
   submicron ohmic islands.

2. IST Quantum Seminar, Institute of Science and Technology Austria, Klosterneuberg, Austria
   Building blocks for quantum simulators in InAs : quantum point contacts & (October 21, 2021)
   submicron ohmic islands.

3. ETH Zürich, Zürich, Switzerland
   Quantum point contacts & transparent submicron ohmic islands in InAs : to- (October 19, 2021)
   ward quantum simulation of non-Fermi liquid physics.

4. Pittsburgh Quantum Institute (PQI) seminar, Pittsburgh PA
   Supercurrent Interference in Semiconductor Nanowire Josephson junctions. (March 15, 2019)

ACHIEVEMENTS & AWARDS

- **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. **2019**
- **Undergraduate Research Award** 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. **2018**
- **Scholarship** 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** by the Lions Club of North Bombay. **2017**
- Institute Academic Award, IIT Bombay. **2016–2018**

RESEARCH EXPERIENCE

Quantum simulation of many-body phase transitions with quantum dot arrays   2019 − Present
Ph.D. thesis supervised by Prof. David Goldhaber-Gordon & Prof. Marc Kastner, at Stanford University
- Developing a hybrid metal/semiconductor quantum dot platform for analog quantum simulation of phase transitions in Kondo lattices.
- Demonstrated clean InAs quantum point contacts, highly transparent ($> 99\%$) **sub-micron** metal island/quantum Hall edge state interface, and hybrid metal/semiconductor quantum dots fabricated on a high-mobility InAs quantum well.
- Designed an RF reflectometry setup and performed high-bandwidth measurements of quantum dot charge transitions.
- Fabricated GaAs quantum dots for Coulomb blockade thermometry, investigated electrical noise in dry dilution fridges and designed a grounding scheme.
- Performed Schrödinger-Poisson simulations to compute the self-consistent potential, electron density distributions and incompressible strip widths for quantum point contacts in the quantum Hall regime.

Quantum transport in hybrid superconductor-semiconductor devices   2018 − 2019
Master's thesis supervised by Prof. Bhaskaran Muralidharan & Prof. Jonathan Baugh, at IIT Bombay, IQC Waterloo
- Employed Keldysh Green's function formalism to model transport. Computed the Andreev bound state spectrum and current-phase relationship for nanowire Josephson junctions.
- Simulations of nanowire critical current oscillations in an axial magnetic field captured the characteristic features of experimental data resulting from supercurrent interference in the angular momentum subbands.

Spin qubits in Germanium nanostructures   Summer 2017
Summer internship supervised by Prof. Georgios Katsaros, at IST Austria
- Imaged Germanium hutwires on a Silicon substrate using a Scanning Electron Microscope (SEM) and designed ohmic contacts using CAD tools.
- Performed DC transport at 4 Kelvin in a liquid He dewar to screen hutwires for dilution fridge measurements.
- Designed coplanar waveguide resonators for coupling spin qubits, performed FEM simulations to extract loaded quality factor & coupling rate, and measured the spectral response of a Niobium resonator centered at 7.5 GHz.

Bayesian view of quantum clocks   Jun 2015 − Apr 2017
Undergraduate research supervised by Prof. Manoj Gopalkrishnan & Prof. Bhaskaran Muralidharan, at IIT Bombay
- Analyzed a Bayesian 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 versus accuracy tradeoff.
- Developed a physical realization of the single qubit quantum clock based on capacitively coupled quantum dots with ferromagnetic contacts.

INTERNATIONAL SCHOOLS & WORKSHOPS

Fundamentals and advances in mesoscopic quantum physics — Oct 2021
Institut d'Études Scientifiques de Cargese, France
- Attended a 2-week school on mesoscopic physics, superconducting quantum circuits and topolgical phases organized by CNRS, ENS Lyon, LPS Orsay and CEA Saclay.

Undergraduate School on Experimental Quantum Information Processing (USEQIP) — May 2018
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 algortihms on an NMR quantum computer, and used Qiskit for IBM's Quantum Experience.

Quantum Transport: Atom to Transistor — Dec 2016
Global Initiative of Academic Networks (GIAN) Course at Jawaharlal Nehru University, New Delhi, India
- Attended a week-long course by Prof. Supriyo Datta on quantum transport and the Keldysh Green's function formalism (NEGF).

Summer School on Modern Physics at All Scales — Jul 2016
Universitiet 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).

TECHNICAL SKILLS

- **Programming**: Python, C++, VHDL
- **Engineering Tools**: Qiskit, QCoDeS, SPICE, AutoCAD, Eagle, Sonnet, Synopsys TCAD, Cadence Virtuoso
- **Systems & Electronics**: low-frequency lock-in techniques, RF reflectometry, dry dilution fridges, variable temperature inserts
- **Nanofabrication**: e-beam lithography, evaporation, etching, scanning electron microscopy, atomic force microscopy

MENTORSHIP & TEACHING EXPERIENCE

Mentor, *Future Advancers in Science and Technology (FAST) Stanford* — 2022–Present
- A mentor for high school students in San Jose, California toward their goal of exploring questions in science & engineering through projects and demonstrations.

Mentor, *Research Science Institute (RSI)* — Summer 2020
- Mentored a high school student on the fundamentals of mesoscopic physics and quantum transport.

Department Academic Mentor, *Electrical Engineering, IIT Bombay* — 2018–2019
- Mentored four junior undergraduate students in navigating challenges with academic coursework.

Teaching Assistant, *IIT Bombay* — 2016–2019
- Conducted weekly sections for 50 students and assisted in evaluation of examinations.