

Sandesh S. Kalantre

Knight-Hennessy Fellow, Stanford University | sandeshkalantre.github.io | [Google Scholar](#)

EDUCATION

- Stanford University** *June 2022 - Sep 2026 (exp.)*
PhD in Physics, Knight-Hennessy Fellow
Advisor: Prof. David Goldhaber-Gordon
- University of Maryland (UMD), College Park** *Aug 2018 - May 2022*
JQI-QuICS Lanczos Graduate Fellow (transferred to Stanford)
Advisor: Prof. James R. Williams
- Indian Institute of Technology (IIT), Bombay - India** *Aug 2014- May 2018*
B.Tech in Engineering Physics with Honors and Minor in CS, GPA: 9.87/10

HONORS AND AWARDS

- Knight-Hennessy Fellowship (\$60,000/yr) *2023-2026*
For visionary & collaborative leaders addressing complex real-world challenges at Stanford
- Lanczos Graduate Fellowship *2018-2020*
Awarded to top incoming 2-3 students (\$36,000/yr) at Joint Quantum Institute, UMD
- Institute Silver Medal for graduating at the top of Engineering Physics program, IIT Bombay *2018*
- S. N. Bose Scholarship (\$2000) awarded to top 50 students from India in STEM *2017*
- Institute Academic Award and R.P. Singh Memorial Award, IIT Bombay *2015-2017*
- ISTernship at IST Austria (\$2500) awarded to around 40 students worldwide *2016*
- National Initiative on Undergraduate Science (NIUS) Program in Physics *2014-2015*
- Kishore Vigyan Protsahan Yojana (KVPY), financial award for basic science high-school students *2013*
- 2 Gold and 1 Silver medals at International Olympiads on Astronomy and Astrophysics *2011-2013*
- National Talent Search Scholarship (NTSE) in science and math for high school students *2010*

PATENTS

- Ray-based Classification Framework for Machine Learning-based Tuning Techniques *2023*
J.P. Zwolak, **S.S. Kalantre**, J.M. Taylor, T.W. McJunkin, US Patent App. 18/028,154

PUBLICATIONS

Over 500 citations, h-index = 10, i10-index = 10

12. D.L. Buterakos, **S.S. Kalantre**, J. Ziegler, J.M. Taylor, J.P. Zwolak, QDFlow: A Python package for physics simulations of quantum dot devices, arXiv preprint arXiv:2509.13298, 2025
11. M. Pendharkar, S.J. Tran, G. Zaborski Jr, J. Finney, A.L. Sharpe, R.V. Kamat, **S.S. Kalantre**, et. al. and Marc A. Kastner, Andrew J. Mannix, David Goldhaber-Gordon, Torsional force microscopy of van der Waals moirés and atomic lattices, *Proceedings of the National Academy of Sciences* 121 (10), e2314083121, 2024
10. J. Ziegler, T. McJunkin, E.S. Joseph, **S.S. Kalantre**, B. Harpt, D.E. Savage, et. al. and M.A. Eriksson, Jacob M. Taylor, Justyna P Zwolak, Toward robust autotuning of noisy quantum dot devices, *Physical Review Applied* 17 (2), 024069, 2022
9. B.J. Weber, **S.S. Kalantre**, T. McJunkin, J.M. Taylor, J.P. Zwolak, Theoretical bounds on data requirements for the ray-based classification, *SN Computer Science* 3 (1), 57, 2022

8. C.J. Trimble, M.T. Wei, N.F.Q. Yuan, **S.S. Kalantre** et. al. and J.R. Williams, Josephson Detection of Time Reversal Symmetry Breaking Superconductivity in SnTe Nanowires, *Nature Partner Journal (npj), Quantum Materials* 6 (1), 1-6, 2021
7. **S.S. Kalantre**, F. Yu, M.T. Wei, et. al. and J.R. Williams, Anomalous Phase Dynamics of Driven Graphene Josephson junctions, *Physical Review Research* 2 (2), 023093, 2020
6. J.P. Zwolak, T. McJunkin, **S.S. Kalantre**, J.P. Dodson, E.R. MacQuarrie, et. al. and M.A. Eriksson, J.M. Taylor, Autotuning of Double-Dot Devices In Situ with Machine Learning, *Physical Review Applied* 13 (3), 034075, 2020
5. J.P. Zwolak, T. McJunkin, **S.S. Kalantre**, J.P. Dodson, E.R. MacQuarrie, et. al. and M.A. Eriksson, J.M. Taylor, Ray-based framework for state identification in quantum dot devices, *PRX Quantum* 2 (2), 020335, 2020
4. J.P. Zwolak, **S.S. Kalantre**, T. McJunkin, B.J. Weber, J.M. Taylor, Ray-based classification framework for high-dimensional data, arXiv preprint arXiv:2010.00500, Proceedings of the Machine Learning and the Physical Sciences Workshop at *NeurIPS 2020*, Vancouver, Canada
3. **S.S. Kalantre**, J.P. Zwolak, et. al. and J.M. Taylor, Machine learning techniques for state recognition and auto-tuning in quantum dots, *Nature Partner Journal (npj), Quantum Information* 5 (1), 1-10, 2019
2. P. Sriram, **S.S. Kalantre**, K. Gharavi, J. Baugh, B. Muralidharan, Supercurrent interference in semiconductor nanowire Josephson junctions, *Physical Review B* 100 (15), 155431, 2019
1. J.P. Zwolak, **S.S. Kalantre**, X. Wu, S. Ragole, J.M. Taylor, QFlow lite dataset: A machine-learning approach to the charge states in quantum dot experiments, *PLoS one* 13 (10), e0205844, 2018

INVITED CONFERENCE PRESENTATIONS

1. Microwave resonance in thin films of spin liquid candidate TbInO₃, 7th International Workshop on Complex Oxides, Cargese, France, March 2024

CONTRIBUTED CONFERENCE PRESENTATIONS

1. Microwave resonance probes of frustrated magnets, Capri School on Physics of Superconducting Devices, Capri, Italy, April 2025
2. Flip-chip spectroscopy of frustrated magnet Gd₂Ti₂O₇, MURI program on Interfacial Superconductivity, Annual Review, Stanford University, Dec 2024
3. Low temperature magneto-transport of epitaxial samarium hexaboride films, APS March Meeting, March 2024
4. Low temperature magnetotransport of SmB₆ films, MURI program on Interfacial Superconductivity, Annual Review, Harvard University, Dec 2023
5. Electron spin resonance measurements of spin liquid candidate TbInO₃ with superconducting resonators, APS March Meeting, March 2023
6. Electron spin resonance measurements of spin liquid candidate TbInO₃ with superconducting resonators, MURI program on Interfacial Superconductivity, Annual Review, Harvard University, Dec 2022
7. Electron Spin Resonance near the Metal Insulator Transition in Phosphorous doped Si, APS March Meeting, APS March Meeting, March 2022
8. Anomalous Phase Dynamics of graphene Josephson Junctions, APS March Meeting, APS March Meeting, March 2020

9. In-situ machine learning assisted auto-tuning of quantum dot devices, NISQ, UMD, June 2019
10. Machine Learning Techniques for quantum dots, JQI-QuICS-CMTC seminar, UMD, Dec 2018
11. Non-linear dynamics in graphene Josephson junctions, APS MAS, UMD, Nov 2018
12. ML and Quantum Dots, APS March Meeting, Los Angeles, CA, March 2018
13. ML and Quantum Dots, Quantum Seminar, NIST and UMD, July 2017

RESEARCH

Geballe Lab for Advanced Materials, Stanford University

June 2022 - Present

Advisor: Prof. David Goldhaber-Gordon

- Developed a microwave resonance setup using NbTiN superconducting resonators for probing spin liquid thin films; built a flip-chip assembly for rapid spin resonance characterization of insulating thin films
- Designed and implemented an architecture drawing from cQED techniques for superfluid stiffness measurements of van der Waals (vdW) superconductors at GHz frequencies
- Magneto-transport of topological Kondo insulator SmB₆ films and magnetic topological insulator Eu-InAs (324) nanowires to probe surface states and chiral hinge modes respectively

Quantum Materials Lab (QMDLab), Joint Quantum Institute

August 2018 - June 2022

Advisor: Prof. James R. Williams

- Probed superconducting interfaces to topological materials and vdW heterostructures through quasi-DC transport and microwave Shapiro measurements
- Developed a theory to explain Shapiro measurements of graphene Josephson junctions building on results in non-linear dynamics of the driven pendulum problem

National Institute for Standards and Technology - Gaithersberg

May 2017 - July 2017

Advisor: Prof. Jacob M. Taylor

- Developed novel machine learning techniques with deep and convolutional neural networks to characterize charge configurations of semiconductor quantum dots
- Engineered a “auto-tuning” algorithm to automatically achieve a desired configuration of quantum dot states; this was used to automatically tune a in-situ device to the single-electron regime and was the first demonstration of such approaches in the field

Indian Institute of Technology, Bombay

August 2016 - May 2018

Advisor: Prof. Suddhasatta Mahapatra

- Nano-fabrication of nano-scale devices in semiconductor heterostructures (SiGe)
- Worked on a theoretical problem of Electron Dipole Spin Resonance (EDSR) selectivity of Phosphorous donor qubits in micromagnet fields

Institute for Science and Technology (IST) - Austria, Vienna

May 2016 - July 2016

Advisor: Dr. Giorgos Katsaros

- Studied theoretical aspects of transport in quantum dot and nanowire systems in semi-conductors
- Worked on conductance measurements to observe Coulomb blockade and diamonds in p-type transistors at 4 K cooled with liquid He

Indian Institute of Technology, Bombay

August 2016 - May 2018

Advisor: Prof. Bhaskaran Muralidharan

- Non-equilibrium Green’s function (NEGF) formalism to model electron transport in superconductor-semiconductor systems

- Determined the effects of angular momentum subbands and Andreev Bound states to the current-phase relationship in nanowires connected to superconducting contacts

RESEARCH SKILLS

Experimental

- Photo and electron-beam lithography, magnetron sputtering, e-beam and atomic layer deposition, chemical and plasma etching, SEM imaging
- Metal machining, 3D printing
- Cryogenic instrumentation — mK dilution fridges, variable temperature inserts and liquid He dipsticks
- DC and AC measurements with lock-in amplifiers, PCB design (Kicad), RF reflectometry, RF & microwave measurements with a VNA, custom mixer circuits and high-speed digitizers

Computational

- Simulations of a variety of physical systems in Python using numpy and scipy: capacitance model of quantum dots, tight-binding transport, non-equilibrium Green's functions (NEGF), Josephson junctions
- Machine learning using Tensorflow with emphasis towards physical applications to experiments
- Microwave simulations — Sonnet, Maxwell, HFSS
- Solidworks and FreeCAD for experimental design and assembly
- Comsol for electrostatic and magnetostatic simulations

TEACHING EXPERIENCE

Teaching Assistant, Stanford University

2023-2025

- TA for undergraduate electricity and magnetism and quantum mechanics II
- Mentored student teams in the design of a nuclear quadrupole resonance setup & cryogenic probes for advanced undergraduate physics lab

Teaching Assistant, IIT Bombay

2015-2018

- TA for a range of physics & mathematics undergraduate courses on electricity and magnetism, introductory quantum physics and partial-differential equations; on two occasions was also the head TA responsible for course logistics and personnel management

LEADERSHIP EXPERIENCE

Organizational Volunteer and Board Member, USAAAO

2018-Present

- Designed astronomy and astrophysics problems at the high-school level, and assisted in coaching the US national team to the International Olympiad on Astronomy and Astrophysics (IOAA)

General Secretary, Department of Physics, IIT Bombay

2017-2018

- Elected as the top student representative of the physics department's bachelor and masters students who communicated between students, faculty and other representatives at the institute level; work led to curriculum changes and bridged the gap in student-faculty communication in the department

Institute Student Mentor, IIT Bombay

2017-2018

- Senior mentor to a wing of 12 freshmen to assist them in settling to life at a university

Academic Resource Person, International Physics Olympiad (IPhO), Mumbai

2015

- Exam grader; worked in a team of 2 in development of IPho-rum — a browser based application for tasks such as voting, translation upload and feedback submission among ≈ 100 users

MISCELLANEOUS INTERESTS

- Science popularization at IIT Bombay at the undergraduate-level, gave talks on varied topics such as Celestial mechanics and N-body problem, Cosmology and Quantum Computing
 - Violin and classical music
 - Won a Bronze medal in Astronomy hackathon as part of InterIIT Tech Meet
 - Secured first place with a team of five in *Online Physics Brawl 2016* in the open category
 - Teaching volunteer at NGOs for underprivileged children in Powai, Mumbai
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Last Updated: March 8, 2026