Sadman Ahmed **Shanto**

Budding Physicist · Aspiring Mathematician · Ardent Programmer

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Education

University of Southern California (USC) — *Los Angeles, CA*

Doctor of Philosophy (PhD) in Physics — *2021 – 2026*

Texas Tech University (TTU) — *Lubbock, TX*

Bachelor of Science (BSc) in Applied Physics — *2017 – 2021*

- Minors: *Computer Science* and *Mathematics*

Peer Review Publications

1. SQuADDS: A validated design database and simulation workflow for superconducting qubit design — *2024*
   SA Shanto, A Kuo, C Miyamoto, H Zhang, V Maurya, EM Levenson-Falk — *arXiv preprint arXiv:2312.13483*
2. On-demand driven dissipation for cavity reset and cooling — *2024*
   V Maurya, H Zhang, D Kowsari, A Kuo, DM Hartsell, C Miyamoto, J Liu, SA Shanto, E Vlachos, A Zarassi, KW Murch, EM Levenson-Falk — *PRX Quantum*
3. Quasiparticle Dynamics in Epitaxial Al-InAs Planar Josephson Junctions — *2023*
   BH Elfeky, WM Strickland, J Lee, JT Farmer, SA Shanto, A Zarassi, D Langone, MV Vavilov, EM Levenson-Falk, J Shabani — *PRX Quantum*
4. Electron-phonon interactions in the Andreev bound states of aluminum nanobridge Josephson junctions — *2023*
   JT Farmer, A Zarassi, SA Shanto, D Hartsell, EM Levenson-Falk — *Physical Review B*
5. Challenges of Microsimulation Calibration with Traffic Waves using Aggregate Measurements — *2021*
   SA Shanto, G Gunter, DB Work, R Ramadan, B Seibold — *2021 Transportation Research Board Annual Meeting*
6. High-Resolution Muography Using a Prototype Portable Muon Telescope — *2020*
   R Perez, SA Shanto, M Moosajee, S Cano — *Journal of Undergraduate Reports in Physics*

Employment

Levenson-Falk Lab (LFL) — *Los Angeles, CA, USA*

Graduate Research Assistant — *Jan. 2022 - Present*

- Advisor: Eli Levenson-Falk PhD.
- Working on development of superconducting quantum devices with Josephson-tunnel junctions and nano-bridge resonators to improve de-coherence and dephasing times of various superconducting qubit architectures
- Mentoring two senior physics undergraduates for their thesis work
- Designed various Quantum Devices using Qiskit Metal and HFSS (NBR, qubits, etc)
- Conducted end to end nano-fabrication for various quantum devices in USC's Cleanroom and Nano-Imaging facilities
- Created multiple SOPs with best practices for our fab process that resulted in significantly higher device yield
- Developed Measurement Agnostic Optimization Drivers (Labber, OPX, Zurich) for various paramater sweeps on devices inside our dilution fridge
- Installed and maintained various quantum devices inside two dilution fridges (Oxford System and BlueFors) for multiple experiments and projects in our lab
- Designed and Implemented Quasiparticle Dynamics Simulation and Analysis package for various non-Poission process
- Implemented qubit spectroscopy techniques to be used for a hybrid dynamical-decoupling and bath-engineering project
- Used Hidden Markov Models to retrieve real time series QP trapping occupations from experimental data

University of Southern California

Los Angeles, CA, USA

Teaching Assistant

Aug. 2021 - May 2022

- Mentored and led 36 undergraduate engineering students for the lab section for the *"Fundamentals of Physics II: Electricity and Magnetism"* course
- Materials covered: *physical circuit implementation; experimental verification of the existence of EM fields, potentials, Gauss' law and Faraday's Law; use of oscilloscope and function generators; analysis of RC & LC circuits, transformers and toroids; study of resonance; calculation of Planck's constant*
- Supervising Professor: *Gökhan Esirgen*, PhD.

Advanced Particle Detector Laboratory (APDL)

Lubbock, TX, USA

Undergraduate Research Assistant

Nov. 2018 - Aug. 2021

- Led a team of 3 Summer Interns to use Machine Learning to develop auto-focus, depth perception and non-linear Filtered Back Propagation algorithms in the field of Muon Tomography
- Developed a Neural Network Architecture (Asymmetric Deep Mixture Density NN) that predicts muon hit locations from photon time propagation with a 87% accuracy
- Designed a 3D reconstruction algorithm that uses CNN's to approximate a binary focus metric and dynamic k-means clustering with Image Segmentation and homomorphic transforms
- Designed and implemented Monte Carlo simulations (Geant4, ROOT) and wrote fully automated analysis programs (python) to test experimental data integrity, assess theorized designs and measure telescope efficiency
- Conducted Monte Carlo studies on the scattering/absorption behaviour of muons and the consequent effects in image quality
- Refactored and deployed all software used by the lab on our university's High Performance Computing (HPC) Cluster
- Engineered the calibration and installation of 40 SiPM's (Phase 1) and 44 PMTs (Phase 2) on the telescopes
- Facilitated the design of custom PCB's (kiCAD, LTspice) and designed (CAD and CNC machines) custom Winston Cone light collectors for increased optical transmission from Scintillators to SiPM array
- Supervisors: Shuichi Kunori, PhD. & Nural Akchurin, PhD.

Texas Tech University

Lubbock, TX, USA

Teaching Assistant, *"Introduction to Quantum Information and Computation (QIC)"*

Aug. 2020 - Dec. 2020

- Delivered supplemental lecture notes and interactive jupyter notebooks to teach quantum computing through the use of IBM's qiskit
- Prepared bi-weekly computational assignments on the implementation of various Quantum Information and Computing topics
- Helped students with their problems during office hours each week
- Graded both computational and theoretical/mathematical assignments for the 25+ students enrolled in the course
- Assisted and collaborated with the students in their semester research project
- Materials covered: *qiskit API, single and multi qubit systems, statevector evolution, superposition and entanglement, quantum circuit model, quantum teleportation, Deutsch's algorithm, Deutsch-Jozsa Algorithm, Grover's Algorithm, Bernstein-Vazirani algorithm, VQE, and Jordan's Algorithm*
- Supervising Professor: Ismael Regis de-Farias, PhD.

Institute for Software Integrated Systems (ISIS), Vanderbilt University

Nashville, TN, USA

Summer Research Intern

Jun. – Aug. 2020

- Designed computationally efficient models for various microscopic traffic simulations using a system written in C++, Python, Bash and XML
- Contributed to developing a computational framework (Flow by UC Berkeley) for deep RL and control experiments for traffic microsimulation
- Established an objected oriented system for calibrating results from stochastic simulations under multi-objective methods using gradient free algorithms
- Incorporated Ray to the software package to parallelize the simulations resulting in massive speedup of running simulation experiments
- Developed scripts to convert microscopic data from the Intelligent Driver Model (IDM) to RDS/radar style data
- Implemented various non-trivial optimization routines to fit simulation data to macroscopic RDS data sets
- Studied the various challenges of Microsimulation Calibration with Traffic Waves using Aggregate Measurements and co-authored a conference paper
- Supervisors: Daniel Work, PhD. & George Gunter (PhD Candidate)

Texas Tech Multidisciplinary Research in Transportation (TechMRT)

Lubbock, TX, USA

Undergraduate Research Assistant

Jan. 2019 - Jun. 2020

- Developed an open source analysis and simulation software for studying various heterogeneous traffic flow of Human Driven (HVs) and Autonomous Vehicles (AVs)
- Designed and tested various AV models for efficient shared lane mobility in multi-lane networks using a novel approach based on the Nagel-Schreckenberg Cellular Automaton Model
- Observed and explained intelligent herding phenomena in certain regimes of heterogeneous traffic flow in a journal paper
- Incorporated Reinforcement Learning functionality to the simulation and analysis software
- Supervisor: Jia Li, PhD.

Seminars, Poster Presentations, Conferences & Invited Talks

Jul. 2024	**Poster and Talk at Lincoln Labs**, *SQUILL User Foundry Meeting*	*Lincoln Labs, USA*
Jun. 2024	**Invited Lectures at Fermilab**, *Qubit Design and ML Summer School*	*Fermilab, USA*
Apr. 2024	**Going from Hamiltonian to GDS File: An Open Source Package for Generating Qubit Designs**, *APS March Meeting, 2024*	*Minneapolis, USA*
Jan. 2024	**Invited Talk at Lincoln Labs**, *Introducing SQuADDS*	*Lincoln Labs, USA*
2022-2024	**Invited Lectures on "How to be an Effective TA 101"**, *PHYS 593: Practicum in Teaching Physics and Astronomy, USC*	*Los Angeles, USA*
2023	**Quasiparticle Dynamics in Andreev Bound States Part 2: Photon Interactions**, *APS March Meeting, 2023*	*Las Vegas, USA*
2021	**American Physical Society April Meeting**, *Machine Learning in Muon Tomography Talk*	*Online*
	Physics Departmental Colloquium, *Dancing in the "Muon" light*	*Lubbock, USA*
	University Research Conference, TTU, *Economic Impact of Quantum Computers*	*Virtual*
	SPS and Women In Physics (WiP) Programming Principles, *Speaker*	*Lubbock, USA*
2020	**SPS and Women In Physics (WiP) Introduction to Programming**, *Speaker*	*Lubbock, USA*
	Departmental Poster Competition, Department of Physics and Astronomy, TTU	*Lubbock, USA*
	Quantum 2020 (Institute Of Physics) Virtual Conference, *Analysis of VQE Regimes in NISQ Era*	*Virtual*
	Summer Showcase! at the Institute for Software Integrated Systems	*Tennessee, USA*
	International Symposium on Transportation Data and Modeling (ISTDM), *Postponed*	*Michigan, USA*
	TTU Undergraduate Research Conference, *Muon Tomography Talk*	*Virtual Conference*
	TTU Undergraduate Research Conference, *Autonomous Vehicle Model Poster*	*Virtual Conference*
2019	**Far West Section of American Physical Society (FWSAPS), Stanford University**	*Stanford, USA*
	Texas Section of American Physical Society (TSAPS)	*Lubbock, USA*
	Departmental Poster Competition, Department of Physics and Astronomy, TTU	*Lubbock, USA*
	International Conference for Physics Students 2019, University of Köln	*Köln, Germany*
2018	**Undergraduate Colloquium: Programming Principles**, *SPS TTU*	*Lubbock, USA*

Honors & Awards

2022 – 2024	**GSG Professional Development Fund Award**	*Los Angeles, CA, USA*
2021 – 2026	**University of Southern California Dornsife College of Arts, Sciences and Letters Graduate Fellowship**	*Los Angeles, CA, USA*
2017 – 2021	**Texas Tech University Presidential Scholarship**	*Lubbock, TX, USA*
2017 – 2021	**Dean's Honor List**, *TTU*	*Lubbock, TX, USA*
2021	**Best Talk in *Economic* Impact**, *Undergraduate Research Conference, TTU*	*Lubbock, TX, USA*
2021	**Best Virtual Presentation in *Economic* Impact**, *Undergraduate Research Conference, TTU*	*Lubbock, TX, USA*
2020	**Certification of Quantum Excellence**, *IBM Qiskit*	*International*
2020	**TrUE Undergraduate Scholar Project Fund**, *Center for Transformative Undergraduate Experiences, TTU*	*Lubbock, TX, USA*
2020	**Second Place for Best Undergraduate Presenter**, *Department of Physics and Astronomy, TTU*	*Lubbock, TX, USA*
2020	**C.C. Schmidt and Alma K. Schmidt Award in Physics**, *Physics and Astronomy Department, TTU*	*Lubbock, TX, USA*
2018-2019	**Bucy Undergraduate Scholarship Physics Award**, *Physics and Astronomy Department, TTU*	*Lubbock, TX, USA*
2018-2019	**Raiders Who Rock: Pursuit of Excellence Award**, *Office of Engagement and Transition, TTU*	*Lubbock, TX, USA*
2019	**Outstanding Student Presenter**, *Texas Section of APS*	*Texas, USA*
2019	**Best Poster Presenter**, *Department of Physics and Astronomy, TTU*	*Lubbock, TX, USA*
2019	**Certified Tutor, Level II**, *College Readiness and Learning Association (CRLA)*	*International*
2019	**Honorable Mention: Best Undergraduate Poster Presenter**, *Far West Section of APS, Stanford University*	*Stanford, CA, USA*
2019	**TrUE Undergraduate Scholar Project Fund**, *Center for Transformative Undergraduate Experiences, TTU*	*Lubbock, TX, USA*
2019	**TrUE Travel Funds Award**, *Center for Transformative Undergraduate Experiences, TTU*	*Lubbock, TX, USA*
2018	**Silver Medal**, *University Physics Competition (UPhysC)*	*International*
2017	**Gangapadhaya Physics Scholarship Award**, *Department of Physics and Astronomy, TTU*	*Lubbock, TX, USA*
2017	**Glen Mann Physics Scholarship Award**, *Department of Physics and Astronomy, TTU*	*Lubbock, TX, USA*

Leadership & Involvement

Graduate Association of Students in Physics — *California, USA*
President — *2022-Present*

Dornsife Graduate Students Association — *California, USA*
Director — *2023-Present*

Graduate Students Government — *California, USA*
Senator — *2023-Present*

American Physical Society (APS) — *North America*
Member and Student Ambassador (2023-Present) — *2019-Present*

Sigma Pi Sigma Physics Honor Society — *North America*
Member — *2020-Present*

PrivaC Female Only Virtual Hackathon — *Bangladesh*
Team Mentor — *2020*

National Science Foundation (NSD) Regional Innovation Corporations (I-Corps) Program — *Texas, USA*
Entrepreurial Lead — *2019*

Free Market Institute — *Texas, USA*
McLane Political Economy Scholar — *2018 - 2019*

College of Arts & Sciences, TTU — *Lubbock, USA*
Student Ambassador — *2018-2019*

Society of Physics Students (SPS) — *Lubbock, USA*
Public Relations Officer (TTU Chapter) & Member — *2017-2019*

The Quark Newsletter, SPS — *Lubbock, USA*
Officer in Charge — *2018-2019*

Alpha Lambda Delta & Phi Eta Sigma Honor Society (ALD/PES) — *Lubbock, USA*
Social Coordinator Officer (TTU Chapter) — *2018-2019*

Undergraduate Colloquium Series, SPS — *Lubbock, USA*
Initiator and Organizer — *2018*

Red Raider Orientation, TTU — *Lubbock, USA*
Orientation Crew Leader — *2018*

Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) — *Lubbock, USA*
Vice President (TTU Chapter), Recruitment Chair & Member — *2017-2018*

Technological Skills and Languages

Human Spoken Languages	Bengali (native), English (bilingual), Hindi (intermediate), Urdu (intermediate)
Programming	Python, C++, C, Bash/ZSH, Lua, Mathematica, JAVA, Matlab, R, Julia, TEX, Dart, Swift
Quantum Computing Software	Qiskit, Qiskit Metal, HFSS, QUA, Beamer, KLayout, Labber API, scqubits, Circuit Pro, PennyLane, Forest SDK
Quantum Computing Hardware	Quantum Machines, Keithley, LPKF and Zurich Instruments Systems; VNAs; Spectrum Analyzer; Dil. Fridges
CleanRoom/Nanofab Certifications	EBeam and Laser Lithography; SEM Imaging; EBeam Evaporator, Mask Aligner, Etcher, and Dicing Systems
Operating System	MAC OS, Linux, Raspbian, Windows 10
Data Analysis	Numpy, Scipy, SymPy, Matplotlib, Ray, Vaex, Modin, Pandas, StatsModels, Seaborn, BeautifulSoup
Machine Learning	Tensorflow, Keras, SciKit Learn, Pytorch, Open AI Gym
High-Energy/Particle Physics	CERN Geant4, CERN Root, PyROOT, CAMAC System Analysis
Digital Electronics	LTspice, Vivado Design Suite, KiCad
Microcontrollers	Arduino, Raspberry Pi, Basys 3, Iconikal Rockchip RK3328
3D Modelling	Inventor, Blender,
Database	SQLite, MySQL, Redis, AWS, FireBase
Management	Git, BitBucket, Yarn/NPM, Apache
Web	HTML, CSS, JavaScript, nodeJS, *Flask*

Outreach & Community Service

2022 - 2024	**Representing Dornsife RSOs at GSG Senate Meetings**, Graduate Student Government (GSG), USC	*Los Angeles, CA, USA*
2022 - 2024	**Academic Affairs Committee Member**, Graduate Student Government (GSG), USC	*Los Angeles, CA, USA*
2022 - 2024	**Professional Development Fund Reviewer**, Graduate Student Government (GSG), USC	*Los Angeles, CA, USA*
2024	**Organizer and Speaker, Graduate Research Symposium**, GSG Academic Affairs Committee, USC	*Los Angeles, CA, USA*
2023 - Present	**Organized LA Physics Graduate Students Soccer Game**, USC, UCLA, Caltech	*LA/Pasadena/Westwood, CA, USA*
2023	**Dornsife Soccer Tournament Organizing**, Dornsife Graduate Student Association (DGSA), USC	*Los Angeles, CA, USA*
2023	**Reactivated $30,000 Dornsife Umbrella Funds**, Dornsife Graduate Student Association (DGSA), USC	*Los Angeles, CA, USA*
2023	**Launched "The Dornsife Digest" Newsletter**, Dornsife Graduate Student Association (DGSA), USC	*Los Angeles, CA, USA*
2023	**Organized "Dornsife Write-In," "GSG Family Day," and "Dornsife Picnic Day"**, Dornsife Graduate Student Association (DGSA), USC	*Los Angeles, CA, USA*
2022	**Sigma Pi Sigma Congress Poster Judge**	*Online*
2022 - Present	**Facilitated Discussions on Student Climate and TA Challenges**, Graduate Student Government (GSG), USC	*Los Angeles, CA, USA*
2023	**Organized Successful Soccer Tournament and Colloquium**, USC, UCLA, Caltech	*Los Angeles, CA, USA*
2023 - Present	**President**, Graduate Association for Students in Physics (GASP), USC	*Los Angeles, CA, USA*
2023 - Present	**Organized Annual Departmental Retreat on Catalina Island**, Graduate Association for Students in Physics (GASP), USC	*Los Angeles, CA, USA*
2024	**Graduate Research Symposium Organizer**, GSG Academic Affairs Committee, USC	*Los Angeles, CA, USA*
2018 - 2021	**Organized Sigma Pi Sigma Physics Poster Session and TTU URC Participation**, Sigma Pi Sigma and Texas Tech University Undergraduate Research Conference (TTU URC)	*Lubbock, TX, USA*
2018 - 2021	**Organized Lubbock High School Science Competition and QuarkNet Program**, Sigma Pi Sigma and Texas Tech University	*Lubbock, TX, USA*
2020 - Present	**Training and Professional Development Workshops**, WiP, Texas Tech University	*Lubbock, TX, USA*
2018 - Present	**Volunteering for Wheelchair Dodgeball Events**, South Plains Adaptive Recreation Club	*Lubbock, TX, USA*
2018 - 2019	**Trick or Treat: Science Demonstration**, SPS, Texas Tech University	*Lubbock, TX, USA*
2019	**Physics Department Annual Banquet Organizing**, SPS, Texas Tech University	*Lubbock, TX, USA*
2019	**Physics Department Representation at Major and Minor Fair**	*Lubbock, TX, USA*
2019	**Research Carnival Presentation**, APDL, Texas Tech University	*Lubbock, TX, USA*
2019	**College of Arts & Sciences Events**, Student Ambassador, Texas Tech University	*Lubbock, TX, USA*
2017 - 2019	**Multiple Fund Raisers**, SPS, Texas Tech University	*Lubbock, TX, USA*
2018 - 2019	**Multiple Member Social Events**, ALD/PES, Texas Tech University	*Lubbock, TX, USA*
2018 - 2019	**Study Hall Monitoring and Organizing**, ALD/PES, Texas Tech University	*Lubbock, TX, USA*
2017 - 2018	**Volunteering at the Science Spectrum and OMNI Theatre**, SACNAS, Texas Tech University	*Lubbock, TX, USA*
2017 - 2018	**Astronomy Day at the Moody Planetarium**, SPS, Texas Tech University	*Lubbock, TX, USA*
2018	**Fund Raiser at Top Tier Catering**, SACNAS, Texas Tech University	*Lubbock, TX, USA*
2018	**Undergraduate Colloquium Organizing**, SPS, Texas Tech University	*Lubbock, TX, USA*
2018	**Grad Students 2 Undergrad Research Party Organizing**, SACNAS, Texas Tech University	*Lubbock, TX, USA*