

Sadman Ahmed Shanto

EXPERIMENTAL PHYSICIST BUILDING SUPERCONDUCTING QUANTUM HARDWARE AND DESIGN AUTOMATION TOOLS

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Education

UNIVERSITY OF SOUTHERN CALIFORNIA (USC)

DOCTOR OF PHILOSOPHY (PHD) IN PHYSICS

Los Angeles, CA

2021 – 2026

TEXAS TECH UNIVERSITY (TTU)

BACHELOR OF SCIENCE (BSc) IN APPLIED PHYSICS

- Minors: *Computer Science* and *Mathematics*

Lubbock, TX

2017 – 2021

Employment

Levenson-Falk Lab (LFL), University of Southern California

Los Angeles, CA, USA

GRADUATE RESEARCH ASSISTANT

Jan. 2022 – Present

- Lead developer of *SQuADDs*, an open-source platform for quantum device design, simulation, and fabrication-readiness; accelerated design iteration from weeks to minutes and adopted across multiple labs.
- Developed and validated custom high-yield fabrication processes for nanobridge-SQUID resonators (15 nm features), increasing functional device yield from <2% to >90%.
- Designed and fabricated superconducting circuits including nanobridge-based resonators, offset-charge-sensitive transmons, and custom Josephson parametric amplifiers for probing quasiparticle dynamics and enhancing qubit readout.
- Engineered full-stack experimental systems, including cryogenic infrastructure (Oxford Instruments, BlueFors), filtering and microwave chains, CPW PCB design, mounting, and advanced packaging techniques.
- Built automated measurement infrastructure using QUA, Labber, and AlazarTech acquisition systems; integrated parametric sweeps and custom calibration routines across multiple platforms.
- Created a highly accurate Hidden Markov Model (HMM)-based inference pipeline to extract real-time quasiparticle occupation states from I/Q trajectory data, enabling detailed dynamic modeling of QP trapping and release.
- Leading experiments on Andreev bound state spectroscopy and nanoSQUID-based QP traps to investigate and mitigate quasiparticle-induced decoherence in superconducting qubits.
- Extended SQuADDs to support interpretable ML workflows using Kolmogorov-Arnold Networks (KANs) to learn mapping between device geometry and target Hamiltonians.
- Mentored undergraduate researchers, master's students, and junior PhD students on quantum circuit design, measurement automation, and fabrication processes.

Advanced Particle Detector Laboratory (APDL), Texas Tech University

Lubbock, TX, USA

UNDERGRADUATE RESEARCH ASSISTANT

Nov. 2018 – Aug. 2021

- Led end-to-end design of optical system upgrades for muon telescopes; developed custom Winston cones that improved signal efficiency from 20% to 78%.
- Co-designed and assembled both SiPM- and PMT-based muon telescopes; machined 50+ scintillator bars; engineered calibration and installation of 40 SiPMs and 44 PMTs.
- Built DAQ systems using Arduino, CAMAC crates, and custom PCBs with wireless synchronization; implemented multithreaded sync and FPGA logic to reduce channel deadtime by 300x.
- Wrote real-time data acquisition and analysis software, converting raw readout into muon flux maps; deployed automated pipelines on the university HPC, with cloud-style report generation.
- Built and validated full Geant4-based Monte Carlo simulation of the experimental system, including physics modeling of photon scattering and muon interactions.
- Actively involved in multiple data-taking campaigns, including first experimental run; maintained 24/7 operations and emergency response support.
- Developed a custom ML architecture that uses TDC-based photon time-of-propagation measurements to infer depth information, enabling 3D tomographic reconstruction from 2D detector plane data.
- Implemented RNN/LSTM models to recover missing hit data, improving data efficiency and significantly enhancing image resolution from sparse muon events.
- Presented work at national conferences, winning multiple awards for technical talks and posters on detector design and reconstruction algorithms.
- Co-authored peer-reviewed publications on the initial prototype
- Supervisors: Shuichi Kunori, PhD. & Nural Akchurin, PhD.

- Built a full-stack calibration pipeline for microscopic traffic models, addressing parameter identifiability and stochastic noise under multi-objective constraints.
- Parallelized simulation-optimization workflows using Ray; achieved 10x+ speedup in sweep-based calibration experiments.
- Designed tools to convert simulation output from the Intelligent Driver Model (IDM) into radar-style datasets for validation against real-world aggregate metrics.
- Contributed to the Flow RL framework, enabling closed-loop learning in calibrated traffic environments; supported end-to-end tuning and evaluation.
- Co-authored a peer-reviewed conference paper on microsimulation calibration using aggregate measurements.
- Supervisors: Daniel Work, PhD. & George Gunter, PhD.

Texas Tech Multidisciplinary Research in Transportation (TechMRT)

- Developed an open-source simulator for heterogeneous AV/HV traffic using an extended Nagel-Schreckenberg CA model; supported both rule-based and learning agents.
- Designed AV control strategies for shared-lane mobility and dynamic lane switching; revealed emergent behaviors like intelligent herding and platoon formation.
- Integrated reinforcement learning for AVs to adapt to local density gradients; demonstrated benefits in flow stability and throughput in multi-lane networks.
- Analyzed macro-scale flow metrics derived from microscopic simulation rules; co-authored a journal paper identifying system-wide effects of AV/HV composition.
- Supervisor: Jia Li, PhD

Core Competencies & Technologies

Quantum Design & Control
Layout & Verification

Simulation & Modeling

ML Tools

Fabrication & Cleanroom

Microwave & Packaging

Cryogenics & Instrumentation

Programming & Data Pipelines

HPC & Cloud

Digital & Embedded Systems

Web Tools & APIs

Databases & Big Data

Version Control & DevOps

Languages

AlazarTech PCIe Digitizer, Cirq, Labber, OPX+, PennyLane, Qiskit, Qiskit Metal, QUA, scqubits, Zurich Instruments
gdsfactory, gds Spy, gplugins, KLayout, kfactory, KQCCircuits, phidl, Siemens nmDRC, SiEPIC-Tools, SQDMetal
Ansys HFSS, Ansys Q3D, AWR Office, COMSOL, Elmer, Keysight ADS, meep, Palace, tidy3d
AutoML, HMMLearn, HuggingFace, Hyperopt, JAX, LightGBM, pyKAN, PyTorch, Ray, Scikit-learn, TensorFlow, TFX
ALD, CMP, Dicing, EBL, FIB, ICP, Lift-off, Metrology, Photolithography, Profilometry, RIE, SEM, Sputtering, STM
Cavity Design, CPW and RF Board Layout, Electroplating, JPA Design, Soldering, Wirebonding
Bluefors, Cryo Filtering, Helium Compressors, Leak Detection, Oxford Instruments, RF Chain Setup, Vacuum Pumps
Bash, C++, Dash, Julia, Lua, MATLAB, Matplotlib, NumPy, Pandas, Plotly, Python, ROOT, Rust, Seaborn, SQL, SymPy
AWS, Azure, Docker, GCP, Kubernetes, OpenMPI, SLURM
Arduino, FPGA Design, KiCad, LTspice, Raspberry Pi, Verilog, Vivado
Django, FastAPI, Flask, GraphQL, HTML/CSS, JavaScript, Node.js, REST, WebSockets
Apache Spark, AWS RDS, Hadoop, MongoDB, PostgreSQL
CI/CD, Git, GitHub, GitLab
Bengali (Native), English (Native), Hindi (Intermediate), Urdu (Intermediate)

Publications

1

LEVENSON-FALK, E.M., SHANTO, S.A. **A REVIEW OF DESIGN CONCERNS IN SUPERCONDUCTING QUANTUM CIRCUITS**
Materials for Quantum Technology (Accepted)

2025

2

SHANTO, S.A., KUO, A., MIYAMOTO, C., ZHANG, H., MAURYA, V., LEVENSON-FALK, E.M. **SQUADDS: A VALIDATED DESIGN DATABASE AND SIMULATION WORKFLOW FOR SUPERCONDUCTING QUBIT DESIGN**
Quantum

2024

3

MAURYA, V., ZHANG, H., KOWSARI, D., KUO, A., HARTSELL, D.M., MIYAMOTO, C., LIU, J., SHANTO, S.A., VLACHOS, E., ZARASSI, A., MURCH, K.W., LEVENSON-FALK, E.M. **ON-DEMAND DRIVEN DISSIPATION FOR CAVITY RESET AND COOLING**
PRX Quantum

2024

4

ELFEKY, B.H., STRICKLAND, W.M., LEE, J., FARMER, J.T., SHANTO, S.A., ZARASSI, A., LANGONE, D., VAVILOV, M.V., LEVENSON-FALK, E.M., SHABANI, J. **QUASIPARTICLE DYNAMICS IN EPITAXIAL AL-INAS PLANAR JOSEPHSON JUNCTIONS**
PRX Quantum

2023

5

FARMER, J.T., ZARASSI, A., SHANTO, S.A., HARTSELL, D., LEVENSON-FALK, E.M. **ELECTRON-PHONON INTERACTIONS IN THE ANDREEV BOUND STATES OF ALUMINUM NANOBIDGE JOSEPHSON JUNCTIONS**
Physical Review B

2023

6	SHANTO, S.A., GUNTER, G., WORK, D.B., RAMADAN, R., SEIBOLD, B. CHALLENGES OF MICROSIMULATION CALIBRATION WITH TRAFFIC WAVES USING AGGREGATE MEASUREMENTS <i>Transportation Research Board Annual Meeting</i>	2021
7	PEREZ, R., SHANTO, S.A., MOOSAJEE, M., CANO, S. HIGH-RESOLUTION MUOGRAPHY USING A PROTOTYPE PORTABLE MUON TELESCOPE <i>Journal of Undergraduate Reports in Physics</i>	2020

Talks & Presentations

May. 2025	Invited Lectures for Quantum Design Workshop @ UCLA , "Learning Inverse Design Maps using ML for Physics Discovery" and "Designing Fabrication-Ready Superconducting Quantum Chips"	Los Angeles, USA
Apr. 2025	Invited Lecture for QEE @ USC , Introduction to Quantum Device Design	Los Angeles, USA
Mar. 2025	SQuADDs: A validated design database and simulation workflow for superconducting qubit design , APS Global Physics Summit	Anaheim, USA
Nov. 2024	Invited Lecture for Quantum Device Course @ USC , Designing a "fab-ready" chip with SQuADDs	Los Angeles, USA
Oct. 2024	Invited Lectures , Qiskit Fall Fest 2024 on Superconducting Quantum Hardware Research	Online
Jul. 2024	Poster and Talk at LINCOLN LABS , SQUILL User Foundry Meeting	Lexington, USA
Jun. 2024	Invited Lectures at FERMILAB , Qubit Design and ML Summer School	Online
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	Online
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 Physics Departmental Colloquium , Dancing in the "Muon" light University Research Conference, TTU , Economic Impact of Quantum Computers SPS and Women In Physics (WiP) Programming Principles , Speaker	Online Lubbock, USA Virtual Lubbock, USA
2020	SPS and Women In Physics (WiP) Introduction to Programming , Speaker Departmental Poster Competition, Department of Physics and Astronomy, TTU Quantum 2020 (Institute Of Physics) Virtual Conference , Analysis of VQE Regimes in NISQ Era Summer Showcase! at the Institute for Software Integrated Systems International Symposium on Transportation Data and Modeling (ISTDM) , Postponed TTU Undergraduate Research Conference , Muon Tomography Talk TTU Undergraduate Research Conference , Autonomous Vehicle Model Poster	Lubbock, USA Lubbock, USA Lubbock, USA Virtual Tennessee, USA Michigan, USA Virtual Conference Virtual Conference
2019	Far West Section of American Physical Society (FWSAPS), STANFORD UNIVERSITY Texas Section of American Physical Society (TSAPS) Departmental Poster Competition, Department of Physics and Astronomy, TTU	Stanford, USA Lubbock, USA Lubbock, USA
2018	Undergraduate Colloquium: Programming Principles , SPS TTU	Lubbock, USA

Leadership & Involvement

Summer of Quantum in LA LEAD ORGANIZER	Los Angeles, USA 2025-Present
Graduate Association of Students in Physics PRESIDENT	California, USA 2022-2025
Dornsife Graduate Students Association DIRECTOR	California, USA 2023-2025
Graduate Students Government SENATOR	California, USA 2023-2025
American Physical Society (APS) MEMBER AND STUDENT AMBASSADOR (2023-PRESENT)	North America 2019-Present
Sigma Pi Sigma Physics Honor Society MEMBER	North America 2020-Present

PrivaC Female Only Virtual Hackathon

TEAM MENTOR

Bangladesh

2020

National Science Foundation (NSF) Regional Innovation Corporations (I-Corps) Program

ENTREPRENEURIAL LEAD

Texas, USA

2019

Free Market Institute

MCLANE POLITICAL ECONOMY SCHOLAR

Texas, USA

2018 - 2019

College of Arts & Sciences, TTU

STUDENT AMBASSADOR

Lubbock, USA

2018-2019

Society of Physics Students (SPS)

PUBLIC RELATIONS OFFICER (TTU CHAPTER) & MEMBER

Lubbock, USA

2017-2019

The Quark Newsletter, SPS

OFFICER IN CHARGE

Lubbock, USA

2018-2019

Alpha Lambda Delta & Phi Eta Sigma Honor Society (ALD/PES)

SOCIAL COORDINATOR OFFICER (TTU CHAPTER)

Lubbock, USA

2018-2019

Undergraduate Colloquium Series, SPS

INITIATOR AND ORGANIZER

Lubbock, USA

2018

Red Raider Orientation, TTU

ORIENTATION CREW LEADER

Lubbock, USA

2018

Honors & Awards

2025	Best Presenter Award , <i>Dornsife Industry Days</i>	Los Angeles, CA, USA
2022 – 2025	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 , <i>TTU</i>	Lubbock, TX, USA
2021	Best Talk in <i>Economic Impact</i> , <i>Undergraduate Research Conference, TTU</i>	Lubbock, TX, USA
2021	Best Virtual Presentation in <i>Economic Impact</i> , <i>Undergraduate Research Conference, TTU</i>	Lubbock, TX, USA
2020	Certification of Quantum Excellence , <i>IBM Qiskit</i>	International
2020	TrUE Undergraduate Scholar Project Fund , <i>Center for Transformative Undergraduate Experiences, TTU</i>	Lubbock, TX, USA
2020	Second Place for Best Undergraduate Presenter , <i>Department of Physics and Astronomy, TTU</i>	Lubbock, TX, USA
2020	C.C. Schmidt and Alma K. Schmidt Award in Physics , <i>Physics and Astronomy Department, TTU</i>	Lubbock, TX, USA
2018-2019	Bucy Undergraduate Scholarship Physics Award , <i>Physics and Astronomy Department, TTU</i>	Lubbock, TX, USA
2018-2019	Raiders Who Rock: Pursuit of Excellence Award , <i>Office of Engagement and Transition, TTU</i>	Lubbock, TX, USA
2019	Outstanding Student Presenter , <i>Texas Section of APS</i>	Texas, USA
2019	Best Poster Presenter , <i>Department of Physics and Astronomy, TTU</i>	Lubbock, TX, USA
2019	Certified Tutor, Level II , <i>College Readiness and Learning Association (CRLA)</i>	International
2019	Honorable Mention: Best Undergraduate Poster Presenter , <i>Far West Section of APS, Stanford University</i>	Stanford, CA, USA
2019	TrUE Undergraduate Scholar Project Fund , <i>Center for Transformative Undergraduate Experiences, TTU</i>	Lubbock, TX, USA
2019	TrUE Travel Funds Award , <i>Center for Transformative Undergraduate Experiences, TTU</i>	Lubbock, TX, USA
2018	Silver Medal , <i>University Physics Competition (UPhysC)</i>	International
2017	Gangapadhaya Physics Scholarship Award , <i>Department of Physics and Astronomy, TTU</i>	Lubbock, TX, USA
2017	Glen Mann Physics Scholarship Award , <i>Department of Physics and Astronomy, TTU</i>	Lubbock, TX, USA

Teaching Experience

University of Southern California

Los Angeles, CA, USA

TEACHING ASSISTANT, *Fundamentals of Physics II: Electricity and Magnetism*

Aug. 2021 - May 2022

- Mentored and led 36 undergraduate engineering students in laboratory sessions
- Covered advanced topics including physical circuit implementation, experimental verification of EM fields, and analysis of RC & LC circuits
- Supervised hands-on experiments with oscilloscopes, function generators, and resonance studies
- Supervising Professor: Gökhan Esirgen, PhD

Texas Tech University

TEACHING ASSISTANT, *Introduction to Quantum Information and Computation*

- Developed and delivered interactive Jupyter notebooks using IBM's Qiskit for quantum information education
- Created bi-weekly computational assignments covering quantum algorithms and circuit implementation
- Mentored 25+ students in quantum computing projects and provided weekly office hours support
- Covered advanced topics including quantum teleportation, Grover's Algorithm, VQE, and Jordan's Algorithm
- Supervising Professor: *Ismael Regis de-Farias*, PhD

Lubbock, TX, USA

Aug. 2020 - Dec. 2020

TECHniques Center

STEM PEER TUTOR

- Provided specialized tutoring to undergraduate students with learning disabilities
- Achieved Level 2 International Tutor Certification from College Reading & Learning Association (CRLA)
- Completed 670+ hours of student tutoring while maintaining federal confidentiality guidelines
- Tutored advanced topics in Physics, Calculus, Circuits, Programming, and Mathematics

Lubbock, TX, USA

Jan. 2018 - May 2019

TexPREP (Prefreshman Engineering Program)

COURSE INSTRUCTOR

- Designed and delivered curriculum on programming fundamentals using MIT's Scratch IDE
- Introduced middle school students to computational thinking and game design principles
- Managed and trained a team of teaching assistants for after-school tutoring program

Lubbock, TX, USA

May 2019 - Jul. 2019

Outreach & Community Service

2025	Delegate, APS Congressional Visits Day , Promoted APS's mission to Congress	Washington, DC, USA
2025	Organizer and Canvasser, APS Global Physics Summit , Helped with programming at the APS Village	Anaheim, CA, USA
2025	Invited Representative, APS Annual Leadership Meeting	Washington, DC, USA
2024	Organizer and Speaker, USC Graduate Research Symposium , Led panels, gave keynote	Los Angeles, CA, USA
2024	Candidate, LA Metro Public Safety Advisory Committee	Los Angeles, CA, USA
2024	Graduate Research Symposium Organizer , GSG Academic Affairs Committee, USC	Los Angeles, CA, USA
2023 - Present	Reactivated \$30,000 Dornsife Umbrella Funds , Dornsife Graduate Student Association (DGSA), USC	Los Angeles, CA, USA
2023 - Present	Organized LA Physics Graduate Students Soccer Game , USC, UCLA, Caltech	LA/Pasadena/Westwood, CA, USA
2023 - Present	Organized Annual Departmental Retreat on Catalina Island , Graduate Association for Students in Physics (GASP), USC	Los Angeles, CA, USA
2023	Dornsife Soccer Tournament Organizing , 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 - Present	Facilitated Discussions on Student Climate and TA Challenges , Graduate Student Government (GSG), USC	Los Angeles, CA, USA
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
2022	Sigma Pi Sigma Congress Poster Judge , APS, Sigma Pi Sigma	Online
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 - 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
2018 - 2019	Trick or Treat: Science Demonstration , SPS, Texas Tech University	Lubbock, TX, USA
2017 - 2018	Astronomy Day at the Moody Planetarium , SPS, Texas Tech University	Lubbock, TX, USA