Sadman Ahmed **Shanto**

Experimental physicist building superconducting quantum hardware and design automation tools

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Education

University of Southern California (USC)

Los Angeles, CA, USA

Doctor of Philosophy (PhD) in Physics — *2021 – 2027*

- Expected Graduation: *January 2027*

Master of Arts (MA) in Physics — *May 2026*

Texas Tech University (TTU)

Lubbock, TX, USA

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

- Minors: *Computer Science* and *Mathematics*

Employment

Google Quantum AI

Mountain View, CA, USA

Research Intern — *Aug. 2025 – Aug. 2026*

- Contributed to the design, simulation, and tape-out of GQAI's latest flagship superconducting processor, the successor to *Willow*, and served as peer designer on several other processors and test chips.
- Owned core features of the simulation infrastructure behind every chip designed at GQAI: added support for new classes of simulation and built large-scale system simulation automation that did not exist before.
- Helped develop custom FEM solvers with proprietary meshing algorithms and basis functions, which cut the runtime of key simulation and analysis flows by ∼95%.
- Rebuilt EM simulation and quantum analysis workflows from first principles for an ∼88× end-to-end speedup on specific production workloads.
- Co-led the machine learning for chip design effort and took it from research into the production simulation workflows designers use daily.
- Co-developed proprietary layout and automated verification tooling (DRC, LVL, LVS) that made compiling large-scale processor layouts ∼10,000× faster.
- Wrote many simulation and layout skills and tools for Google's internal coding agent, which give it the domain grounding to do these tasks correctly and repeatably without hallucinations.
- Replaced 10+ expert-only manual workflows with automated pipelines that tolerate faults, recover cleanly from failure, and never compute the same result twice; this work has saved $3M+ in compute per month so far.
- Wrote the documentation that brought designers onto the new tooling, which contributed to a ∼3× faster tape-out process.

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

Los Angeles, CA, USA

Graduate Research Assistant — *Jan. 2022 – Present*

- Creator and lead developer of *SQuADDS*, an open-source platform that takes superconducting device design from weeks to minutes. Published in *Quantum* (2024) and used by academic and industrial groups worldwide for simulation, optimization, and fabrication-ready layout generation.
- Created *QCap*, a physics-corrected graph neural network that predicts the full capacitance matrix of any planar superconducting layout from its GDS at Ansys Q3D accuracy (0.177%; MAE 0.016 fF, RMSE 0.025 fF on 4,009 test designs). It reproduces a 9-qubit grid that took Q3D 19.9 h and 228 GB in ∼12 s on a laptop, and predicts a 100-qubit, 781-conductor chip, beyond what Q3D could run on our university's compute, in 3.4 min. Released open source in *SQuADDS* with the models, dataset, browser demo, and hosted API on Hugging Face.
- Leading the development of generalizable foundation ML models for quantum device simulation and design with NVIDIA, Northeastern University, and Fermilab.
- Co-leading, with Lawrence Berkeley National Laboratory, the development of an agent harness that takes a device from design through simulation to tape-out readiness end to end.
- Developed and validated a nanofabrication process for nanobridge-SQUID resonators with 15 nm features that raised functional device yield from under 2% to over 90%.
- Designed, fabricated, and measured nanobridge resonators, offset-charge-sensitive transmons, "trimon" and "dissipator" devices, and custom Josephson parametric amplifiers, plus the PCBs, packages, and cryogenic microwave chain that house and measure them, to study quasiparticle dynamics and improve qubit readout.
- Built a Hidden Markov Model inference pipeline that extracts real-time quasiparticle occupation from I/Q trajectory data, so quasiparticle trapping and release can be modeled directly as they happen.
- Leading Andreev bound state spectroscopy and nanoSQUID quasiparticle-trap experiments to characterize and reduce quasiparticle-induced decoherence in superconducting qubits.
- Led the build of the lab's fully automated design-to-simulation-to-GDS pipeline, running the Ansys and Palace simulation stack on USC's HPC cluster.
- Leading the open-source integration of AWS Quantum's EM solver *Palace* with *Quantum-Metal*, which gives the hardware community scalable cloud-based simulation pipelines.
- Mentored five graduate and six undergraduate researchers through device design, fabrication, and measurement projects.

Quantum Elements Inc.

Thousand Oaks, CA, USA

Summer Research Intern

May 2025 – Aug. 2025

- Built a production agentic AI framework that runs superconducting quantum experiments end to end: multiple specialized agents calibrate, measure, diagnose, and analyze results without a physicist in the loop.
- Designed the full-stack backend underneath it (custom APIs, scalable databases, and containerized microservices on AWS), which unites the company's ML models, simulators, and instrument control into one system the agents act on through MCP servers.
- Designed the evaluation and tracing layer that made agent behavior measurable: open-ended autonomous runs became tracked metrics and reproducible traces engineers could debug.
- Contributed modular calibration nodes and DAG-based calibration graphs to *QUAlibrate*, Quantum Machines' open-source framework for large-scale QPUs; they cut processor tune-up from hours to minutes.

Advanced Particle Detector Laboratory (APDL), Texas Tech University

Lubbock, TX, USA

Undergraduate Research Assistant

Nov. 2018 – Aug. 2021

- Co-designed and built SiPM- and PMT-based muon telescopes, including custom Winston-cone optics that raised signal collection efficiency from 20% to 78% and an FPGA-based DAQ that cut channel deadtime by 300×.
- Validated the instrument against a full Geant4 Monte Carlo and built ML reconstruction methods (TDC time-of-propagation depth inference, RNN/LSTM hit recovery) that turn 2D detector data into 3D tomographic images.

TechMRT, Texas Tech University & ISIS, Vanderbilt University

Lubbock, TX & Nashville, TN

Undergraduate Research Assistant & Summer Research Intern

Jan. 2019 – Aug. 2020

- Built an open-source simulator for mixed autonomous and human traffic and designed RL-based AV control strategies that revealed emergent herding and platoon formation.
- Built a Ray-parallelized calibration pipeline for microscopic traffic models (10×+ speedup), validated against real-world aggregate measurements and integrated with Berkeley's Flow RL framework.

Publications

1. Shanto, S.A., Das, S., Levenson-Falk, E.M. **QCap: a physics-corrected graph neural network for the capacitance matrix of any planar superconducting device layout** — *2026*
   arXiv:2611.22057
2. Seidel, O., Abouzahr, F., Chakraborty, A., Shanto, S.A., Das, S., Baxter, D., Asaadi, J., Pancotti, N., Yang, H., Khailany, B., Sussman, S., Figueroa-Feliciano, E., Levenson-Falk, E.M., Patti, T.L. **Component-Level Inverse Design of Transmon Qubits Using Neural Networks** — *2026*
   arXiv:2607.20795
3. Tang, Y., Shanto, S.A., Wang, K., Pancotti, N., Nonaka, A., Levenson-Falk, E.M., Yao, Z. **AgentQ: An LLM-Agentic Framework for Time-Domain Superconducting Quantum Chip Simulation** — *2026*
   In Prep.
4. Maurya, V., Kowsari, D., Saurav, K., Shanto, S.A., Vijay, R., Lidar, D.A., Levenson-Falk, E.M. **Universal Hamiltonian control in a planar trimon circuit** — *2026*
   Physical Review Applied
5. Levenson-Falk, E.M., Shanto, S.A. **A Review of Design Concerns in Superconducting Quantum Circuits** — *2025*
   Materials for Quantum Technology
6. 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** — *2024*
   Quantum
7. 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** — *2024*
   PRX Quantum
8. 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** — *2023*
   PRX Quantum
9. Farmer, J.T., Zarassi, A., Shanto, S.A., Hartsell, D., Levenson-Falk, E.M. **Electron-phonon interactions in the Andreev bound states of aluminum nanobridge Josephson junctions** — *2023*
   Physical Review B

10 Shanto, S.A., Gunter, G., Work, D.B., Ramadan, R., Seibold, B. **Challenges of Microsimulation Calibration with Traffic Waves using Aggregate Measurements** *2021*
Transportation Research Board Annual Meeting

11 Perez, R., Shanto, S.A., Moosajee, M., Cano, S. **High-Resolution Muography Using a Prototype Portable Muon Telescope** *2020*
Journal of Undergraduate Reports in Physics

Talks & Presentations

Jun. 2026	**Invited Lecture for Quantum Design Workshop @ UCLA**, *"Generalizable Machine Learning Models for Superconducting QPU Design"*	*Los Angeles, CA, USA*
May 2026	**Invited Talk at U of I Quantum Circuit Conference (UIQC 2026)**, *Towards Generalizable Machine Learning Models for Superconducting QPU Design*	*Urbana-Champaign, IL, USA*
Feb. 2026	**Invited Talk at Lawrence Berkeley National Lab**, *Integrating Superconducting Quantum Chip Design into ARTEMIS Solver*	*Online*
Jan. 2026	**Invited Talks at NVIDIA and Fermilab**, *ML for Quantum Chip Design*	*Online*
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, CA, USA*
2025	**Invited Lecture for QEE @ USC**, *Introduction to Quantum Device Design*	*Los Angeles, CA, USA*
2025	**SQuADDS: A validated design database and simulation workflow for superconducting qubit design**, *APS Global Physics Summit*	*Anaheim, CA, USA*
2024	**Invited Lecture for Quantum Device Course @ USC**, *Designing a "fab-ready" chip with SQuADDS*	*Los Angeles, CA, USA*
2024	**Invited Lectures**, *Qiskit Fall Fest 2024 on Superconducting Quantum Hardware Research*	*Online*
2024	**Invited Talk and Poster at Lincoln Labs**, *Introducing SQuADDS; SQUILL User Foundry Meeting*	*Lexington, MA & Online*
2024	**Invited Lectures at Fermilab**, *Qubit Design and ML Summer School*	*Online*
2024	**Going from Hamiltonian to GDS File: An Open Source Package for Generating Qubit Designs**, *APS March Meeting, 2024*	*Minneapolis, MN, USA*
2022 – 2024	**Invited Lectures on "How to be an Effective TA 101"**, *PHYS 593: Practicum in Teaching Physics and Astronomy,* USC	*Los Angeles, CA, USA*
2023	**Quasiparticle Dynamics in Andreev Bound States Part 2: Photon Interactions**, *APS March Meeting, 2023*	*Las Vegas, NV, USA*
2021	**American Physical Society April Meeting**, *Machine Learning in Muon Tomography Talk*	*Online*
2018 – 2021	**Undergraduate Talks & Posters**, *FWSAPS @ Stanford (2019), TSAPS, IOP Quantum 2020 (VQE in the NISQ era), TTU Physics Colloquium, TTU Undergraduate Research Conference (muon tomography, AV modeling, economic impact of quantum computing), ISIS Summer Showcase, TTU departmental poster competitions, SPS/WiP programming workshops*	*Various*

Journal Refereeing

Physical Review A	*American Physical Society*
Physical Review B	*American Physical Society*
Physical Review Applied	*American Physical Society*
Physical Review Letters	*American Physical Society*
PRX Intelligence	*American Physical Society*
PLOS One	*Public Library of Science*

Leadership & Involvement

USC Dornsife Celebration of Scholarship *Los Angeles, CA, USA*
Fundraising Student Representative *2026*

Quantum Device Consortium (QDC) *International*
Board Member *2025 – Present*

`quantum-metal` (formerly `qiskit-metal`) — *Open Source*
Maintainer — *2025 – Present*

Quantum Device Design Workshop (QDW) — *Los Angeles, CA, USA*
Workshop Organizer — *2025 – Present*

Quantum Computing Science Association (QCSA) — *Los Angeles, CA, USA*
Board Member — *2025 – Present*

Quantum Engineering Ethics (QEE) — *Los Angeles, CA, USA*
Advisor — *2025 – 2026*

Summer of Quantum in LA — *Los Angeles, CA, USA*
Lead Organizer — *2025 – Present*

SQuADDS — *Open Source*
Creator and Maintainer — *2024 – Present*

Graduate Association of Students in Physics — *Los Angeles, CA, USA*
President — *2022 – 2025*

Dornsife Graduate Students Association — *Los Angeles, CA, USA*
Director — *2023 – 2025*

Graduate Students Government — *Los Angeles, CA, USA*
Senator — *2023 – 2025*

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*

Texas Tech University — *Lubbock, TX, USA*
Undergraduate Leadership — *2017 – 2021*

- SPS Public Relations Officer, Officer in Charge of *The Quark* newsletter, and founder of the SPS Undergraduate Colloquium Series; College of Arts & Sciences Student Ambassador; Red Raider Orientation Crew Leader.
- NSF I-Corps Entrepreneurial Lead (2019); McLane Political Economy Scholar, Free Market Institute (2018–2019); Team Mentor, PrivaC virtual hackathon (2020).

Honors & Awards

2026	**Selected Member, USC Dornsife Impact and Advancement Leaders (DIAL)**, *Dornsife Office of Advancement, USC*	*Los Angeles, CA, USA*
2026	**Peer Recognition Award (×2)**, *Google Quantum AI*	*Santa Barbara, CA, USA*
2025	**Peer Recognition Award**, *Google Quantum AI*	*Mountain View, CA, USA*
2025	**Best Presenter Award**, *Dornsife Industry Days*	*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 & Dean's Honor List**	*Lubbock, TX, USA*
2019 – 2021	**Presentation Awards**, *Best Talk & Best Virtual Presentation in Economic Impact, TTU URC (2021); Second Place Best Undergraduate Presenter (2020) & Best Poster Presenter (2019), TTU Physics; Outstanding Student Presenter, TSAPS (2019); Honorable Mention, Best Undergraduate Poster, FWSAPS @ Stanford (2019)*	
2017 – 2020	**Physics Department Scholarships**, *C.C. & Alma K. Schmidt Award (2020); Bucy Undergraduate Scholarship (2018–2019); Gangapadhaya and Glen Mann Scholarships (2017), TTU*	*Lubbock, TX, USA*
2019 – 2020	**TrUE Project Fund (2019, 2020) & Travel Funds Award (2019)**, *Center for Transformative Undergraduate Experiences, TTU*	*Lubbock, TX, USA*
2019 – 2020	**Certifications**, *IBM Qiskit Quantum Excellence (2020); CRLA Tutor, Level II (2019)*	*International*
2018 – 2019	**Raiders Who Rock: Pursuit of Excellence Award**, *Office of Engagement and Transition, TTU*	*Lubbock, TX, USA*
2018	**Silver Medal**, *University Physics Competition (UPhysC)*	*International*

Core Competencies & Technologies

Layout & Verification	KLayout, gdsfactory, gdswell, Quantum-Metal, KQCircuits, Calibre nmDRC
PDKs	John O'Brien Nanofabrication Lab @ USC, Lincoln Lab SQUILL Foundry PDK, SkyWater Foundry PDKs, GlobalFoundry PDKs, Google Quantum AI Foundry PDKs
Quantum Measurements	QUA, OPX+, Labber, Zurich Instruments, AlazarTech PCIe Digitizer, PyVISA
RF & Microwave Simulation	Ansys HFSS Suite, Ansys Lumerical, AWS Palace, scikit-rf, COMSOL, Elmer, AWR Office, Keysight ADS, tidy3d, femwell
Fabrication & Cleanroom	EBL, Photolithography, Lift-off, RIE, ICP, ALD, Sputtering, CMP, FIB, Dicing, SEM, Metrology
Microwave & Packaging	Altium Designer, Ansys SIwave, RF Board Layout, PCB & Package Design, Wirebonding, Electroplating
Cryogenics	BlueFors, Oxford Instruments, RF Chain Setup, Cryo Filtering, Vacuum Pumps, Leak Detection
Programming Languages	Python, C++, Bash, Rust, Julia
HPC & Cloud	SLURM, OpenMPI, Docker, Kubernetes, AWS, GCP
Backend & Databases	FastAPI, REST, PostgreSQL, MongoDB, Apache Spark, Vercel
Version Control & DevOps	Git, Gerrit, GitHub, GitHub Actions, Argo, Bazel
ML	PyTorch, JAX, HuggingFace, Ray, Scikit-learn, pyKAN, HMMLearn, InterpretML, TensorFlow
LLMs	LangChain, Multi-Agent Orchestration (LangGraph), RAG, Fine-tuning (LoRA/PEFT), Evals & Tracing (LangSmith), Tool calling (SKILLS.md, MCP)

Teaching Experience

University of Southern California — *Los Angeles, CA, USA*

Teaching Assistant, *Fundamentals of Physics II: Electricity and Magnetism* — *Aug. 2021 – May 2022*

- Led laboratory sessions for 36 engineering students on circuit implementation, EM field measurements, and RC/LC resonance using oscilloscopes and function generators.

Texas Tech University — *Lubbock, TX, USA*

Teaching Assistant, *Introduction to Quantum Information and Computation* — *Aug. 2020 – Dec. 2020*

- Built Qiskit-based Jupyter notebooks and biweekly computational assignments (teleportation, Grover's algorithm, VQE), and mentored 25+ students on quantum computing projects.

TECHniques Center & TexPREP, Texas Tech University — *Lubbock, TX, USA*

STEM Peer Tutor & Course Instructor — *Jan. 2018 – Jul. 2019*

- Tutored students with learning disabilities in physics, mathematics, circuits, and programming for 670+ hours (CRLA Level II certified), and designed a Scratch programming curriculum for middle-school students.

Outreach & Community Service

2025, 2026	**Delegate, APS Congressional Visits Day**, Promoted APS's mission to Congress	*Washington, DC, USA*
2025, 2026	**Invited Representative, APS Annual Leadership Meeting**	*Washington, DC, USA*
2025 – 2026	**Quantum Engineering Ethics Hackathon Judge**	*Los Angeles, CA, USA*
2025	**Organizer and Canvasser, APS Global Physics Summit**, APS Village programming	*Anaheim, CA, USA*
2024	**Organizer and Speaker, USC Graduate Research Symposium**, GSG; led panels, gave keynote	*Los Angeles, CA, USA*
2024	**Candidate, LA Metro Public Safety Advisory Committee**	*Los Angeles, CA, USA*
2023 – Present	**Reactivated $30,000 Dornsife Umbrella Funds**, DGSA, USC	*Los Angeles, CA, USA*
2023 – Present	**Organized LA Physics Graduate Students Soccer Game**, USC, UCLA, Caltech	*Los Angeles, CA, USA*
2023 – Present	**Organized Annual Departmental Retreat on Catalina Island**, GASP, USC	*Los Angeles, CA, USA*
2023	**Launched "The Dornsife Digest" Newsletter and Organized DGSA Events**, Soccer Tournament, Write-In, GSG Family Day, Picnic Day; DGSA, USC	*Los Angeles, CA, USA*
2022 – Present	**Academic Affairs Committee Member & Fund Reviewer, GSG**, Represented Dornsife RSOs at Senate; led student climate and TA discussions, USC	*Los Angeles, CA, USA*
2022	**Sigma Pi Sigma Congress Poster Judge**, APS, Sigma Pi Sigma	*Online*
2018 – 2021	**Undergraduate Outreach, TTU**, High school science competition, QuarkNet, Sigma Pi Sigma poster sessions, WiP workshops, adaptive sports	*Lubbock, TX, USA*