

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 Quantum
- 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 NANOBIDGE 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 decoherence 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 parameter 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-Poisson 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

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

Leadership & Involvement

Graduate Association of Students in Physics

PRESIDENT

California, USA

2022-Present

Dornsife Graduate Students Association

DIRECTOR

California, USA

2023-Present

Graduate Students Government

SENATOR

California, USA

2023-Present

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

Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS)

VICE PRESIDENT (TTU CHAPTER), RECRUITMENT CHAIR & MEMBER

Lubbock, USA

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, T_EX, 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