

Sadman Ahmed Shanto

BUDDING PHYSICIST · ASPIRING MATHEMATICIAN · ARDENT PROGRAMMER

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Education

Texas Tech University (TTU)

Texas, USA

DUAL BACHELOR OF SCIENCE (Applied Physics AND Mathematics)

2017 – 2021

- Minor: Computer Science
- Applied Physics Concentration: Quantum Computing
- Mathematics Track: Statistics
- CGPA: 3.701

Employment

Advanced Particle Detector Laboratory (APDL)

Lubbock, TX, USA

UNDERGRADUATE RESEARCH ASSISTANT

Nov. 2018 - Present

- Objective: Develop prototype for portable muon telescope capable of 0.5 milliradian resolution imaging capability
- Aided in the mechanical assembly of the phase 1 muon telescope
- Designed custom Winston Cone light collectors for increased optical transmission in the telescope
- Facilitated the design of custom PCB's and helped soldered various components on them
- Implemented a multi-thread sync mechanism in the Data Acquisition System comprised of 40 Arduino's
- Engineered the calibration and installation of 40 SiPM's (Phase 1) and 20 PMT's (Phase 2) on the telescope
- Created Monte Carlo simulations to test experimental data integrity and measure phase 1 telescope efficiency
- Upgraded the simulation software to include custom test cases, theorized designs and phase 2 telescope simulation
- Programmed an automated data analysis program to extract key information from experimental data
- Conducted Monte Carlo studies on the scattering/absorption behaviour of muons and the consequent effects in image quality
- Deployed all software used by the lab on our university's computing cluster
- Trained new undergraduate members in the lab to use Geant4, ROOT, and our custom software base
- Assisted with the tomograph generation algorithm using the muon trajectory data
- Currently, trying to incorporate concepts of image segmentation and ML to enhance final image and improve muon track reconstruction efficiency
- Presently, also working on installing various CRATES for the CAMAC system used for Phase 2 prototype
- Supervisors: Shuichi Kunori, PhD. & Nural Akchurin, PhD.

Department of Industrial, Manufacturing, and Systems Engineering (IMSE), Texas Tech University

Lubbock, TX, USA

TEACHING ASSISTANT, "Introduction to Quantum Information and Computation (QIC)"

Aug. 2020 - Present

- Create and deliver biweekly supplementary lectures for this graduate level introductory quantum computing course
- Prepare weekly computational assignments for the students to improve their knowledge of QIC, qiskit and python
- Help students with their problems during office hours each week
- Grade both computational and theoretical/mathematical assignments for the 25+ students enrolled in the course
- 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 Berkely) 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

- Project 1: Develop a customisable analysis and simulation software for studying various heterogeneous traffic flow of Human Driven (HVs) and Autonomous Vehicles (AVs)
- Project 2: Design and Test out various AV models for efficient shared lane mobility in multi-lane networks using a novel approach based on the Nagel-Schreckenberg Cellular Automaton Model
- Project 3: Incorporate Reinforcement Learning functionality to the simulation and analysis software (incomplete - Covid19)
- Interpreted and analyzed the results of various experiments led by Dr. Li and reported work in poster presentations
- A comprehensive journal paper is in works presently
- Supervisor: Jia Li, PhD.

TECHniques Center

Lubbock, TX, USA

STEM PEER TUTOR

Jan. 2018 - Jun. 2019

- Provided course-specific tutoring to undergraduate students with documented evidence of learning disabilities
- Received Level 2 International Tutor Certification from College Reading & Learning Association (CRLA)
- Documented over 670 hours of student tutoring while maintaining federal confidentiality guidelines
- Courses tutored: *Physics I and II, Calculus I and II, Circuits I, Object Oriented Programming, Wind Energy, Linear Algebra, Advanced Calculus, Differential Equations, Combinatorics and Statistics*

Peer Review publications

- 1 HIGH-RESOLUTION MUOGRAPHY USING A PROTOTYPE PORTABLE MUON TELESCOPE 2020
R Perez, SA Shanto, M Moosajee, & S Cano *Journal of Undergraduate Reports in Physics*
- 2 CHALLENGES OF MICROSIMULATION CALIBRATION WITH TRAFFIC WAVES USING AGGREGATE MEASUREMENTS under review
SA Shanto, G Gunter, DB Work, R Ramadan, B Seibold *Transportation Research Board*
- 3 DRIVE LIKE ANTS: DESIGN AUTONOMOUS VEHICLE BEHAVIORS IN HETEROGENEOUS TRAFFIC FLOW in prep.
SA Shanto, J Li
- 4 ANALYSIS OF CLASSICAL OPTIMIZATION ROUTINES USED IN THE PREPARATION OF QUANTUM STATES IN VARIATIONAL QUANTUM EIGENSOLVER CIRCUIT MODELS in prep.
SA Shanto, J. Slocum

Seminars, Poster Presentations & Conference Talks

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| 2020 | Gulf Coast Undergraduate Research Symposium, Rice University , <i>registered</i>
Quantum 2020 (Institute Of Physics) Virtual Conference , <i>registered</i>
Physics Departmental Colloquium , <i>invited</i>
Summer Showcase! at the Institute for Software Integrated Systems
International Symposium on Transportation Data and Modeling (ISTDM) , <i>postponed</i>
TTU Undergraduate Research Conference , <i>Muon Tomography Talk</i>
TTU Undergraduate Research Conference , <i>Autonomous Vehicle Model Poster</i> | <i>Houston, USA</i>
<i>Virtual</i>
<i>Lubbock, USA</i>
<i>Tennessee, USA</i>
<i>Michigan, USA</i>
<i>Virtual Conference</i>
<i>Virtual Conference</i> |
| 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
International Conference for Physics Students 2019, University of Köln | <i>Stanford, USA</i>
<i>Lubbock, USA</i>
<i>Lubbock, USA</i>
<i>Köln, Germany</i> |
| 2018 | Undergraduate Colloquium: Programming Principles , <i>SPS TTU</i> | <i>Lubbock, USA</i> |

Projects

Senior Capstone Project: Quantum Optimization and Search Algorithms

Lubbock, TX, USA

RESEARCH PROJECT

Apr. 2020 – Present

- Conducting research work done under the supervision of Dr. Ismael Regis de-Farias in collaboration with National Laboratory of Scientific Computing (LNCC) of Brazil
- Currently studying the relation between of variational quantum circuits and quantum walk algorithms to derive a robust and efficient Quantum Optimization regime

Setting Up Kim Lab and FDTD Analysis of Silicon Carbide (SiC) Permittivity

Lubbock, TX, USA

RESEARCH PROJECT

Nov. 2019 – Apr. 2020

- Collaborated with University of Texas, Rio Grande Valley to conduct experiments and record the permeability value of SiC
- Verified the recorded data by simulating a 2D FDTD implementation of the experimental condition
- Volunteered in setting up Kim lab for Infrared optics & polarimetry for novel quantum system and nanostructures
- Supervisor: Myoung-Hwan Kim, PhD.

Geometric Optics: Modelling Scalar Irradiance of light sources under water

Lubbock, TX, USA

RESEARCH PROJECT

Aug. 2018 – May. 2019

- Assisted Masud (Math PhD candidate) with his thesis by accepting to take on one of his problems as my project
- problem description and project relevance
- Created a mathematical model for the downwards scalar irradiance of light from first principles
- Discovered that the derived model is exponentially more accurate than the traditional model of Lambert-Beer at optical densities greater than 0.4 in the context of water bodies.

Comprehensive GUI Client Facing Health Care System Software

Lubbock, TX, USA

ACADEMIC PROJECT: Software Engineering 1

Sept. 2020 – Present

- Developed the static model for the healthcare system
- Documented the interaction model that depicts objects participating in each use case and the sequence of interactions among the objects
- Designed database tables to store information about appointments, patient charts, payments, and reports in the healthcare system.
- Implemented the program in JAVA using XXX libraries

Design and Implementation of AI used in Bang! The Dice Game

Lubbock, TX, USA

ACADEMIC PROJECT: Object Oriented Programming

Apr. 2020 – May 2020

- Utilized ideas of Probabilistic State Vectors and Unitary Evolutions from Quantum Mechanics to model AI behavior for Bang! the Dice Game
- Implemented concepts Markov Decision Processes (MDP) to simulate AI gameplay with a Human user
- Documented, debugged and conducted various test cases to ensure AI reliability and robustness

Dynamics of a laser propelled nanocraft on a fly by mission to Proxima Centauri B

Lubbock, TX, USA

PHYSICS COMPETITION PROJECT

Nov. 2018

- Modelled the design and trajectory needed for a light sail propelled nanocraft to the nearest star system Alpha Centauri in order to perform a flyby of Proxima Centauri b subject to various constraints defined by the University Physics Competition Committee
- Co-authored a research paper addressing the problem under 48 hours as per the guidelines of the competition
- Won the Silver Medal for our efforts

Honors & Awards

2017 – 2021	Texas Tech University Presidential Scholarship , TTU	Lubbock, TX, USA
2020	C.C. Schmidt and Alma K. Schmidt Award in Physics , Physics Department, TTU	Lubbock, TX, USA
2018-2019	Bucy Undergraduate Scholarship Physics Award , Physics Department, TTU	Lubbock, TX, USA
2018-2019	Raiders Who Rock: Pursuit of Excellence Award , Engagement and Transition, TTU	Lubbock, TX, USA
2019	Outstanding Student Presenter , TSAPS	Texas, USA
2019	Best Poster Presenter , Department of Physics and Astronomy, TTU	Lubbock, TX, USA
2019	Honorable Mention: Best Undergraduate Poster Presenter , FWSAPS, Stanford University	Stanford, CA, USA
2019	TrUE Undergraduate Scholar Project Fund , Center for Transformative Undergraduate Experiences	Lubbock, TX, USA
2019	TrUE Travel Funds Award , Center for Transformative Undergraduate Experiences	Lubbock, TX, USA
2018	Silver Medal , University Physics Competition (UPhysC)	International
2017	Gangapadhya 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

Sigma Pi Sigma Physics Honor Society

MEMBER

North America

2020-Present

American Physical Society (APS)

MEMBER

North America

2019-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

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 (professional), Urdu (intermediate)

Programming

Python, C++, C, JAVA, Mathematica, Matlab, R, Julia, Bash, T_EX, Dart, Swift

Operating System

MAC OS, Linux, Raspbian, Windows 10

Data Analysis

Numpy, Scipy, SymPy, Matplotlib, Pandas, StatsModels, Seaborn, BeautifulSoup

Machine Learning

Tensorflow, Keras, SciKit Learn, Pytorch, Open AI Gym

Quantum Computing

Qiskit, PyQuil, PennyLane, Microsoft QDK, Forest SDK

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

Management

Git, Yarn/NPM, Apache

Web

HTML5, CSS, JS (React), nodeJS

Training

Summer schools

Sept. 2020	Summer School on Machine Learning and Big Data with Quantum Computing (SMBQ) , University of Porto & Polytechnic Institute of Porto	<i>Virtual</i>
Jun. - Aug. 2020	Lunch and Learn Lecture Series , Cyber-Physical Systems Virtual Organisation (CPS VO)	<i>Tennessee, USA</i>
Jul. 2020	Qiskit Global Summer School , IBM	<i>International</i>

Workshops

In Process	ALD Leads Certified: Leadership Program , Alpha Lambda Delta Honor Society	<i>Virtual</i>
Sept. 2020	Introduction to Parallel Computing , TTU High Performance Computing Center (HPCC)	<i>Texas, USA</i>
Sept. 2020	Basic Programming for Quantum Machine Learning , National Institute for Theoretical Physics	<i>Virtual</i>
Virtual	A Progress Report from the Wolfram Physics Frontier , Neural Engineering Research Venture (NERV)	
Jul. 2020	Cybersecurity Basics Training , TTU	<i>Texas, USA</i>
Jun. 2020		
Nov. 2019	Career in Physics Workshop , Stanford University	<i>California, USA</i>
Oct. 2020	Customer Discovery and the Business Model Canvas for STEM innovations , TTU Innovation Hub	<i>Texas, USA</i>
Oct. 2018	Red Raider Startup Program , TTU Innovation Hub	<i>Texas, USA</i>

Hackathons

Mar. 2020	Hacklahoma 2020 , Major League Hacking (MLH)	<i>Oklahoma, USA</i>
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Outreach & Community Service

2018 - Present	Volunteering for Wheelchair Dodgeball Events , South Plains Adaptive Recreation Club	<i>Lubbock, TX, USA</i>
2018-2019	Trick or Treat: Science Demonstration , SPS	<i>Lubbock, TX, USA</i>
2019	Physics Department Annual Banquet Organizing , SPS	<i>Lubbock, TX, USA</i>
2019	Physics Department Representation at Major and Minor Fair	<i>Lubbock, TX, USA</i>
2019	Research Carnival Presentation , APDL	<i>Lubbock, TX, USA</i>
2019	College of Arts & Sciences Events , Student Ambassador	<i>Lubbock, TX, USA</i>
2017 - 2019	Multiple Fund Raisers , SPS	<i>Lubbock, TX, USA</i>
2018-2019	Study Hall Monitoring and Organizing , ALD/PES	<i>Lubbock, TX, USA</i>
2017 - 2018	Volunteering at the Science Spectrum and OMNI Theatre , SACNAS	<i>Lubbock, TX, USA</i>
2017 - 2018	Astronomy Day at the Moody Planetarium , SPS	<i>Lubbock, TX, USA</i>
2018	Fund Raiser at Top Tier Catering , SACNAS	<i>Lubbock, TX, USA</i>
2018	Undergraduate Colloquium Organizing , SPS	<i>Lubbock, TX, USA</i>
2018	Grad Students 2 Undergrad Research Party Organizing , SACNAS	<i>Lubbock, TX, USA</i>