

# Madison Howard

ASPIRING PHYSICIST + MATHEMATICIAN · TECHNOLOGY ENTHUSIAST · EQUITY ADVOCATOR

1819 Glenna Goodacre Blvd., Lubbock, TX, USA

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## Education

### Texas Tech University (TTU)

Texas, USA

#### BACHELOR OF SCIENCE IN PROFESSIONAL PHYSICS

2018 – 2022

- CGPA: 3.96
- Notable Coursework: *Modern Physics, Error Analysis, Optics, Electricity & Magnetism I and II, Quantum Mechanics I and II, Statistical Thermodynamics, Modern Physics Lab*

### Texas Tech University (TTU)

Texas, USA

#### BACHELOR OF SCIENCE IN MATHEMATICS

2018 – 2022

- CGPA: 4.0
- Notable Coursework: *Linear Algebra, Introduction to Proofs and Reasoning, Mathematical Statistics, Advanced Calculus, Mathematical Methods in Physical Sciences I and II*

## Employment

### Advanced Particle Detector Laboratory (APDL)

Lubbock, TX, USA

#### UNDERGRADUATE RESEARCH ASSISTANT

Jun. 2020- Present

- Objective: Establish a Cyber-Physical Network of Microcontrollers and Thermodynamic Sensors for Real-Time Environmental Monitoring
- Aided in the electrical assembly of the sensor enabled microcontroller by soldering various components
- Deployed all the required tools and software on the Raspberry Pi and configured the OS for a robust code development environment
- Designed and implemented the Data Acquisition System (DAQ) schema for the network through use of the MQTT framework
- Implemented a multi-thread sync mechanism in the DAQ system comprised of 13 Raspberry Pi's
- Engineered the calibration and installation of 12 sensor enabled Raspberry Pi's to record data at a user-defined fidelity
- Conducted Monte Carlo simulation experiments to test sensor data integrity, assess system utility and locate bottlenecks in system design
- Developed an alarm system that notifies the stakeholders of the lab through texts and emails using the SMTP library
- Assisted with the database design and presently working on implementation
- Supervisors: Nural Akchurin, PhD. & Andrew Whitbeck, PhD.

### TECHniques Center

Lubbock, TX, USA

#### STEM PEER TUTOR

Jun. 2020 - Present

- Provided course-specific tutoring to undergraduate students with documented evidence of learning disabilities
- Received Level 1 International Tutor Certification from College Reading & Learning Association (CRLA)
- Documented over 260 hours of student tutoring while maintaining federal confidentiality guidelines
- Courses tutored: *Physics I, II and IV, Calculus III, Solar System Astronomy, Observational Astronomy, Mathematical Methods and Linear Algebra*

### Texas Tech University Student Housing

Lubbock, TX, USA

#### SOCIAL JUSTICE ADVOCATE (SJA)

Oct. 2018 - Jun. 2020

- Conducted workshops in promoting advancement and development of diversity, multiculturalism, social identity, and social justice through training, community development, programming educational interactions, and educational dialogues within five assigned student halls and associations.
- Co-organized bi-annual events with the Office of Diversity and Inclusion to bring awareness to contemporary social justice topics impacting both the local TTU and broader national community
- Collaborated with group members in creation of materials for presentations and workshops
- Led discussions with students about social justice in society on a daily basis
- Performed literature review on the pedagogy of various diversity and inclusion topics

### TexPREP (Prefreshman Engineering Program) Lubbock

Lubbock, TX, USA

#### COURSE INSTRUCTOR

May 2019 - Jul. 2019

- Instructed a "College Readiness" class where I shared resources and mentored juniors and seniors to prepare them for college success
- Assisted with an introductory Robotics course by teaching the LEGO Mindstorms platform
- Taught advanced programming principles - data types, variables, control flow theory, compilers, loops, animation, game design, booleans, discrete numerical analysis - to middle school students on MIT's Scratch IDE
- Administered the after-school tutoring program by leading and training a group of Assistants

## Research Projects

### Green Bank Observatory (GBO) and the Pulsar Search Collaboratory

Lubbock, TX, USA

#### UNDERGRADUATE RESEARCH ASSISTANT

Jul. 2019 – Jan. 2020

- Assisted with the optical and mechanical construction of a mini LIGO prototype
- Performed experiments for laser and mirror calibration in the prototype system
- Completed a training program under Pulsar Search Collaboratory on data analysis of Pulsars and related phenomena
- Conducted various curve fitting and model analysis routines to group data sets (based on pulsar timings) from GBO
- Developed python scripts for multi-threaded batch jobs to be deployed on our High Performance Computing Cluster
- Supervisors: Joseph D. Romano Ph.D. & Nipuni Palliyaguru, Ph.D.

## Seminars, Poster Presentations & Conference Talks

2020	<b>SPS and Women In Physics (WiP) Introduction to Programming</b> , <i>speaker</i>	Lubbock, USA
	<b>Departmental Poster Competition, Department of Physics and Astronomy, TTU</b> , <i>oral pres.</i>	Lubbock, USA
2019	<b>R-Rated - a talk on Religion</b> , <i>co-speaker</i>	Lubbock, USA
	<b>Cross The Line - a talk on empathy</b> , <i>co-speaker</i>	Lubbock, USA
	<b>Diversity at the Dinner Table - a talk on Diversity and Inclusion</b> , <i>co-speaker</i>	Lubbock, USA
	<b>Love for a Lifetime - a talk on Relationships</b> , <i>co-speaker</i>	Lubbock, USA
	<b>Tunnel of Awareness</b> , <i>co-organizer</i>	Lubbock, USA
	<b>Undergraduate Colloquium: Programming Principles</b> , <i>co-speaker</i>	Lubbock, USA
2018	<b>Tunnel of Oppression</b> , <i>co-organizer</i>	Lubbock, USA
	<b>Game Over - a talk on Motivation</b> , <i>co-speaker</i>	Lubbock, USA

## Honors & Awards

2018 – 2021	<b>Texas Tech University Presidential Scholarship</b>	Lubbock, TX, USA
2018 – 2021	<b>President's Honor List</b> , TTU	Lubbock, TX, USA
2020	<b>TrUE Undergraduate Scholar Project Fund</b> , Center for Transformative Undergraduate Experiences, TTU	Lubbock, TX, USA
Fall 2020	<b>Certified Tutor, Level I</b> , College Readiness and Learning Association (CRLA)	International
Spring 2020	<b>Dean's Honor List</b> , TTU	Lubbock, TX, USA
2020	<b>Bucy Undergraduate Scholarship Physics Award</b> , Physics and Astronomy Department, TTU	Lubbock, TX, USA
2019	<b>Henry C. Thomas Scholarship Award in Physics</b> , Physics and Astronomy Department, TTU	Lubbock, TX, USA
2019	<b>Raiders Who Rock: Community Service and Leadership Award</b> , Office of Engagement and Transition, TTU	Lubbock, TX, USA
2018	<b>Ready, Set, Teach Scholarship Recipient</b> , Vargas Management	Lubbock, TX, USA

## Leadership & Involvement

### Women in Physics (WiP)

North America

SECRETARY (TTU CHAPTER) & MEMBER

2019-Present

### American Physical Society (APS)

North America

MEMBER

2019-Present

### Society of Physics Students (SPS)

Lubbock, USA

MEMBER

2018-Present

### Association for Women in Mathematics

Lubbock, USA

MEMBER

2018-Present

### Free Market Institute

Texas, USA

MCLANE POLITICAL ECONOMY SCHOLAR

2019 - Present

### Red Raider Orientation, TTU

Lubbock, USA

ORIENTATION CREW LEADER

2019

### STEM Undergraduate Colloquium

Lubbock, USA

ORGANIZING COMMITTEE MEMBER

2019

### The Quark Newsletter, SPS

Lubbock, USA

JUNIOR EDITOR

2019

## Technological Skills and Languages

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<b>Human Spoken Languages</b>	English (native), Spanish (intermediate), Bengali (beginner)
<b>Programming</b>	Python (proficient), C++ and C (competent), Wolfram Language (proficient), Matlab (competent), $\text{\TeX}$ (proficient)
<b>Operating System</b>	Linux (professional), Raspbian (professional), MAC OS (professional), Windows 10 (professional)
<b>Data Analysis</b>	Numpy, Scipy, SymPy, Matplotlib, Ray, Vaex, Modin, Pandas, StatsModels, Seaborn
<b>Machine Learning</b>	Tensorflow, Keras, SciKit Learn
<b>High-Energy/Particle Physics</b>	CERN Geant4, CERN Root, PyROOT
<b>Quantum Computing</b>	Qiskit
<b>Digital Electronics</b>	LTspice, KiCad
<b>Microcontrollers</b>	Arduino, Raspberry Pi
<b>3D Modelling</b>	Inventor, Fusion360
<b>Database</b>	SQLite, MySQL, MariaDB
<b>Management</b>	Git, Apache
<b>Web</b>	HTML5, CSS, JS (React)

## Workshops

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Sept. 2020	<b>Introduction to Parallel Computing</b> , TTU High Performance Computing Center (HPCC)	<i>Texas, USA</i>
Aug. 2020	<b>Introduction to Geant4</b> , Advanced Particle Detector Laboratory	<i>Texas, USA</i>
Aug. 2020	<b>Data Analysis with ROOT and pyROOT</b> , Advanced Particle Detector Laboratory	<i>Texas, USA</i>
Jun. 2020	<b>Cybersecurity Basics Training</b> , Texas Tech University	<i>Texas, USA</i>

## Outreach & Community Service

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2020 - Present	<b>Training and Professional Development Workshops</b> , WiP	<i>Lubbock, TX, USA</i>
2018 - Present	<b>Volunteering for LGBTQIA+ Annual Pride Event</b> , LubbockPRIDE	<i>Lubbock, TX, USA</i>
2018 - Present	<b>Volunteering for Wheelchair Dodgeball Events</b> , South Plains Adaptive Recreation Club	<i>Lubbock, TX, USA</i>
2018-2019	<b>Trick or Treat: Science Demonstration</b> , SPS	<i>Lubbock, TX, USA</i>
2019	<b>Physics Department Annual Banquet Organizing</b> , SPS	<i>Lubbock, TX, USA</i>
2019	<b>Physics Department Representation at Major and Minor Fair</b>	<i>Lubbock, TX, USA</i>
2017 - 2019	<b>Multiple Fund Raisers</b> , SPS	<i>Lubbock, TX, USA</i>
2017 - 2018	<b>Astronomy Day at the Moody Planetarium</b> , SPS	<i>Lubbock, TX, USA</i>
2018	<b>Undergraduate Colloquium Organizing</b> , SPS	<i>Lubbock, TX, USA</i>