

ALAN SALCEDO GOMEZ

Department of Physics
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RESEARCH PROFILE

Physics Ph.D. candidate and Distinguished University Fellow at The Ohio State University working on the Askaryan Radio Array (ARA). My research advances ultra-high-energy (UHE) neutrino searches through improved simulations, analysis tools, and studies of polarization and ice birefringence for neutrino directional reconstruction.

EDUCATION

Ph.D. in Physics, The Ohio State University, Columbus, OH, USA 2026 (Expected)
Advisor: Prof. Amy Connolly GPA: 3.97

M.S. in Physics, The Ohio State University, Columbus, OH, USA 2022

B.Sc. in Physics and Math (Hons.), University of Texas at El Paso, El Paso, TX 12/2019
Advisor: Prof. Rajendra Zope GPA: 4.0
Hons. Thesis: *Assessment of Fermi-Löwdin Orbitals on Self-Interaction Corrected Density Functional Theory with the Regularized SCAN Functional Approximation*

RESEARCH APPOINTMENTS

Distinguished University Fellow (DUF), OSU 2025–2026, 2020–2021
Graduate Research Assistant, OSU 2022–2025
Undergraduate Research Assistant, UTEP 2019–2020, 2016–2017
U. Tennessee Physics Summer Research Program, Oak Ridge National Laboratory 2018
MIT Summer Research Program, MIT Center for Theoretical Physics 2017

HONORS AND AWARDS

\$1,700 DUF Stipend Supplement, OSU Physics Dept. 2025
\$2,000 Research Award, OSU Physics Dept. 2021
State Youth Award for Academic Accomplishments, State of Chihuahua 2020
City Youth Award for Academic Accomplishments, City of Juarez 2020
Academic and Research Excellence Award, UTEP Physics Dept. 2019
Academic and Research Excellence Award, UTEP Mathematics Dept. 2019
College of Science Banner Bearer, UTEP Winter Commencement 2019
CEU Travel Award, APS Division of Nuclear Physics 2018
SURPASS Scholarship, UTEP Campus Office of University Research Initiatives 2016
State Youth Award for Community Service, State of Chihuahua 2014

SELECTED PUBLICATIONS

3. **Salcedo-Gomez, A.**, Flaherty, J., Connolly, A., for the ARA Collaboration (2024). Effects of Biaxial Birefringence on Polarization Reconstruction for the Askaryan Radio Array, *PoS ARENA 2024 009*.
2. Ali, S. *et al.* for the ARA Collaboration (**incl. Salcedo-Gomez, A.**) (2024). Modeling the refractive index profile $n(z)$ of polar ice for UHE neutrino experiments. arXiv:2406.00857.

1. Yamamoto, Y., **Salcedo, A.**, Diaz, C., Alam, S., Baruah, T., Zope, R. (2020). Assessing the effect of regularization on SCAN and self-interaction corrected SCAN meta-GGA, *Phys. Chem. Chem. Phys.*, DOI: 10.1039/d0cp02717k.

RESEARCH EXPERIENCE

The Ohio State University, Columbus, OH, USA
Ph.D. Student

August 2020 – Present

- Led major upgrades to AraSim, the simulation framework for the full-array, full-lifetime UHE neutrino diffuse flux search with ARA, projected to set the strongest limit from a radio detector.
- Implemented simulation of neutrino secondaries, stochastic losses, and multi-station coincidences, boosting confidence in the limit by $1.9\times$.
- Added support for data-driven cable delays, electronics response, and antenna trigger masking—contributing to a $1.65\times$ improvement in the diffuse flux limit; also implemented biaxial birefringence and antenna cross-polarization modeling for signal reconstruction studies.
- Built ARA’s large-scale simulation submission framework and contributed to standardizing the data analysis pipeline.
- Lead analyst for ARA Station 3, responsible for data cleaning and calculating analysis variables.
- Studying polarization angle reconstruction in calibration data to constrain biaxial birefringence models and enable the first point-source search using directional reconstruction.
- Served as ARA Operations Co-Lead (2023–2025), managing detector monitoring, coordinating IceCube Deep Pulser runs, and assisting deployment preparations (2024) as main deployment alternate.
- Tested and delivered ATRI Rev 5 DAQ systems, participated in DAQ training at UW–Madison.

University of Texas at El Paso, El Paso, TX, USA
Undergraduate Research Assistant, FLOSIC Collaboration

Jan 2019 – Dec 2019

- Studied self-interaction correction in density functional theory (DFT) using the regularized SCAN (rSCAN) functional and Fermi–Löwdin Orbitals.
- Evaluated performance of SCAN and rSCAN on atomic energies, ionization potentials, electron affinities, reaction barriers, and dissociation energies.

SCIENTIFIC TALKS & POSTERS

Invited Talks

2. Wisconsin IceCube Particle Astrophysics Center, Journal Club, Madison WI 8/2024
1. Wisconsin IceCube Particle Astrophysics Center, Group Meeting, Madison WI 4/2024

Contributed Talks

6. APS Global Physics Summit, Anaheim CA 3/2025
5. TeV Particle Astrophysics (TeVPA), Chicago IL 8/2024
4. Acoustic and Radio EeV Neutrino Detection Activities (ARENA), Chicago IL 6/2024
3. APS April Meeting, Sacramento CA 4/2024
2. APS April Meeting, Minneapolis MN 4/2023
1. APS March Meeting, Denver CO (Online) 3/2020

LEADERSHIP AND SERVICE

Scientific Leadership

ARA Operations Coordinator 2023-2025

University and Departmental Service

MIT Summer Research Program, Application Review Committee (Physics Dept.) 2020–2025

OSU Physics Climate & Diversity Committee 2023–2024

SCHOOLS AND WORKSHOPS

Summer School in Theoretical Physics, Utrecht University 8/2018

Fission Experiments and Theoretical Advances, Los Alamos National Laboratory 9/2017

Nuclear Science Summer School, NSCL / Michigan State Univ. 5/2017

TEACHING EXPERIENCE

Ohio State University, Graduate Teaching Assistant

- Recitation / Lab Instructor, PHYS 1201: E&M, Optics, and Quantum Mechanics (Sp/Su 2022) & PHYS 1250: Mechanics, Energy, and Thermodynamics (F 2021)

Instituto Tesla de Ciudad Juarez, High School Lecturer

- *Special Topics in Physics II* – Calculus-based survey of mechanical waves, E&M fields, and Quantum Mechanics (Sp 2020)

UTEP, Undergraduate Teaching Assistant

- *Laboratory Instructor*, PHYS 2420: Intro. to Mechanics (Sp 2020)
- *Grader*, Analytical Mechanics I and Electromagnetics I (F 2019)
- *Recitation Instructor*, PHYS 2420: Intro. to Mechanics and PHYS 2421: Intro. to E&M (Physics majors) (Sp 2018 – Sp 2019)
- *Recitation Instructor*, PHYS 2420 (F 2016 – F 2017)

OUTREACH

ASPIRE Workshop for High School Students, Lead Coordinator 2025, 2024 (Cancelled)

SACNAS, OSU Physics Graduate Student Representative 2024

APS Division of Nuclear Physics CEU, Mentor 2024

OSU Polaris Mentorship Program, Mentor 2023–2024

UTEP SPS, President 2019–2020

UTEP SPS, Secretary 2018–2019

U.S. Consulate in Juarez, Youth Council Founding Member 2014–2016