

# ALAN SALCEDO GOMEZ

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## RESEARCH PROFILE

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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, detector operations, and studies of polarization and ice birefringence for neutrino directional reconstruction.

## EDUCATION

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<b>Ph.D. in Physics, The Ohio State University</b> , Columbus, OH, USA	2026 (Expected)
Advisor: Prof. Amy Connolly	GPA: 3.97
<b>M.S. in Physics, The Ohio State University</b> , Columbus, OH, USA	2022
<b>B.Sc. in Physics and Math (Hons.), University of Texas at El Paso</b> , El Paso, TX	12/2019
Advisor: Prof. Rajendra Zope	GPA: 4.0
Hons. Thesis: <i>Assessment of Fermi-Löwdin Orbitals on Self-Interaction Corrected Density Functional Theory with the Regularized SCAN Functional Approximation</i>	

## RESEARCH APPOINTMENTS

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

## HONORS AND AWARDS

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\$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 Undergraduate Research Initiatives	2016
State Youth Award for Community Service, State of Chihuahua	2014

## SELECTED PUBLICATIONS

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6. Bishop, A., **Salcedo-Gomez A.**, Muzio, M., for the ARA Collaboration (2025). High-Fidelity Simulations of the Full Askaryan Radio Array and its Sensitivity to Ultra-High Energy Neutrinos, *PoS ICRC 2025 (Submitted)*.
5. Muzio, M., for the ARA Collaboration (**incl. Salcedo-Gomez, A.**) (2025). First Array-Wide Search for Diffuse UHE Neutrinos with the Askaryan Radio Array, *PoS ICRC 2025 (Submitted)*.

4. ARA Collaboration (incl. **Salcedo-Gomez, A.**) (2025). Askaryan Radio Array: searching for the highest energy neutrinos, *Eur. Phys. J. Spec. Top.*, DOI: 10.1140/epjs/s11734-025-01708-7
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. 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

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

August 2020 – Present

- Co-lead analyst for ARA’s flagship full-array, full-lifetime diffuse flux search, spanning data reduction from raw to high level analysis variables, background rejection strategies, and efficiency estimates in a rare-event, low-SNR environment.
- Developed and maintained ARA’s analysis and simulation framework pipelines, standardizing workflows for large-scale data processing and simulations.
- Expanded neutrino interaction modeling to include secondaries, stochastic energy losses, and multi-station coincidences, improving the projected UHE neutrino diffuse flux sensitivity by  $1.9\times$ .
- Integrated state-of-the-art detector modeling that includes data-driven cable delays, electronics response, and antenna trigger masking, yielding a further  $1.65\times$  sensitivity gain.
- Modeled biaxial birefringence and antenna cross-polarization for signal polarization studies critical for astrophysical point-source searches.
- Led first analysis of ARA data constraining biaxial birefringence model parameters, quantifying impact on directional reconstruction of ARA and next-generation detectors.
- Served as ARA Operations Coordinator (2023–2025), managing detector monitoring, leading calibration exercises, and supporting deployment preparations.
- Tested and evaluated next-generation ARA data acquisition systems for Antarctic deployment, contributing to future detector upgrades.

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

Jan 2019 – Dec 2019

- Studied electron 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

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### Invited Talks

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|------------------------------------------------------------------------------|--------|
| 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

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|-----------------------------------------------------------------------------|--------|
| 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

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### Scientific Leadership

ARA Operations Coordinator	2023-2025
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### University and Departmental Service

MIT Summer Research Program, Application Review Committee (Physics Dept.)	2020 – Present
OSU Physics Climate & Diversity Committee	2023–2024

## SCHOOLS AND WORKSHOPS

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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

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### 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 and PHYS 2421: Intro. to E&M (Physics majors) (Sp. 2018 – Sp. 2019); PHYS 2420 (F. 2016 – F. 2017)

## OUTREACH

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ASPIRE Physics Workshop for High School Students, Lead Coordinator	2025, 2024 (Cancelled)
U.S. Department of State, Study of the U.S. Institutes for Student Leaders, Talk at OSU	2025
¿Qué pasa, Ohio State? Magazine, Article Author	2024
SACNAS, OSU Physics Graduate Student Representative	2024
APS Division of Nuclear Physics CEU, Mentor	2024
OSU Polaris Mentorship Program, Mentor	2023–2024
UTEP Society of Physics Students, President	2019–2020
UTEP Society of Physics Students, Secretary	2018–2019
U.S. Consulate in Juarez, Youth Council Founding Member	2014–2016