ALAN SALCEDO GOMEZ

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RESEARCH PROFILE

Postdoctoral CCAPP Affiliate Fellow at OSU working on the ultrahigh energy (UHE) neutrino frontier across ARA, RNO-G, and TAMBO. My interests span detector development, simulations, and data analysis to enable the detection UHE neutrinos and probe fundamental neutrino interactions and extreme astrophysical accelerators across unexplored energy and distance scales.

EDUCATION

Ph.D. in Physics, The Ohio State University, Columbus, OH, USA 8/2026
Advisor: Prof. Amy Connolly GPA: 3.97
Thesis: *First Full-Array Search for Cosmic Ultra-High Energy Neutrinos with the Askaryan Radio Array*

M.S. in Physics, The Ohio State University, Columbus, OH, USA 12/2022

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

CCAPP Affiliate Fellow, OSU 2026–Present
Advisor: Prof. Kaeli Hughes
Distinguished University Fellow (DUF), OSU 2020–2021, 2025–2026
Graduate Research Assistant, OSU 2022–2025
Undergraduate Research Assistant, UTEP 2016–2017, 2019–2020
UT Knoxville Physics Summer Research Program, Oak Ridge National Laboratory 2018
Advisor: Prof. Alfredo Galindo-Uribarri, PROSPECT Collaboration
MIT Summer Research Program, MIT Center for Theoretical Physics 2017
Advisors: Prof. John Negele, Prof. Phiala Shanahan

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 Achievement, Government of Chihuahua 2020
City Youth Award for Academic Achievement, Government 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
SURPASS Scholarship, UTEP Campus Office of Undergraduate Research Initiatives 2016
State Youth Award for Community Service, Government of Chihuahua 2014

SELECTED PUBLICATIONS

11. ARA Collaboration (**incl. Salcedo-Gomez, A.**). Polarization Reconstruction with the Askaryan Radio Array for Directional Searches of Ultrahigh Energy Neutrinos. **(In preparation)**
10. ARA Collaboration (**incl. Salcedo-Gomez, A.**). New Constraints on the Ultrahigh Energy Neutrino Flux from the First Array-Wide Search with the Askaryan Radio Array. arXiv:2611.14350. **(Under review at PRL)**
9. ARA Collaboration (**incl. Salcedo-Gomez, A.**). Analysis Methodology of the Search for Ultrahigh Energy Neutrinos in 10.6 Years of Askaryan Radio Array Data. arXiv:2611.14354. **(Under review at PRD)**
8. ARA Collaboration (**incl. Salcedo-Gomez, A.**). Sensitivity of the As-Built Askaryan Radio Array to Ultra-High Energy Neutrinos. [arXiv:2605.04268]. **(Under review at PRD)**
7. **Salcedo-Gomez A.**, Muzio, M., for the ARA Collaboration (2026). The First Array-Wide Diffuse Flux Search for UHE Neutrinos with the Askaryan Radio Array, *PoS ARENA 2026 005*.
6. ARA Collaboration (**incl. Salcedo-Gomez, A.**) (2026). Observation of In-ice Askaryan Radiation from High-Energy Cosmic Rays, *Phys. Rev. Lett. 136, 151003.* [arXiv:2510.21104]. **(Refereed)**
5. 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 991*.
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 **(Refereed)**
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. **(Refereed)**

RESEARCH EXPERIENCE

The Ohio State University, Columbus, OH, USA 08/2020 – 08/2026
Ph.D. Student

- Co-lead analyst for ARA's flagship full-array, full-livetime UHE neutrino diffuse flux search, spanning data reduction from raw to high level analysis variables, background rejection strategies, high-dimensional cut optimization, and systematic uncertainty calculations in a rare-event, low-SNR environment.
- Developed and maintained ARA's array-wide analysis and simulation frameworks, standardizing workflows for large-scale ($>$ 400 TB) data processing and simulations.
- Expanded modeling of neutrino interactions to include secondaries, stochastic energy losses, and multi-station coincidences, improving the projected UHE neutrino diffuse flux sensitivity by 1.9$\times$.
- Integrated and improved data-driven detector modeling including electronics and antenna response, cable delays, and channel trigger masking, yielding a further 1.65$\times$ projected sensitivity gain.

- Implemented state-of-the-art modeling of biaxial birefringence and antenna cross-polarization responses for signal polarization studies critical for astrophysical point-source searches.
- Leading the first analysis of ARA data constraining biaxial birefringence model parameters to quantify their impact on directional reconstruction for ARA and next-generation detectors.
- Served as ARA Operations Coordinator (2023–2025), managing detector monitoring, performing calibration exercises, and supporting deployment preparations.
- Tested next-generation ARA data acquisition systems for Antarctic deployment, contributing to future detector upgrades.

University of Texas at El Paso, El Paso, TX, USA 01/2019 – 12/2019
Undergraduate Research Assistant, FLOSIC Collaboration

- Studied methods to improve the accuracy of density functional theory (DFT) by correcting electron self-interaction errors using the regularized SCAN (rSCAN) functional and Fermi-Löwdin orbitals.
- Evaluated performance of SCAN and rSCAN energy functionals on atomic energies, ionization potentials, electron affinities, reaction barriers, and dissociation energies.

SCIENTIFIC TALKS & POSTERS

Invited Talks

7. Berkeley Lab, RPM Seminar (Chamberlain Fell. Interview), Berkeley CA (tentative) 12/2026
6. Georgia Institute of Technology, CRA Seminar, Atlanta GA 5/2026
5. Fermilab, Muon Dept. (Mu2e) Committee, Research Associate Job Talk, Batavia IL 5/2026
4. University of Chicago, Vieregg Group Open Seminar (open to KICP), Chicago IL 5/2026
3. Pennsylvania State University, GAPP Seminar, State College PA 5/2026
2. Wisconsin IceCube Particle Astrophysics Center, Journal Club, Madison WI 8/2024
1. Wisconsin IceCube Particle Astrophysics Center, Group-at-Large Meeting, Madison WI 4/2024

Contributed Talks & Posters

9. IceCube Particle Astrophysics Symsposium (IPA), Madison WI 10/2026
8. OSU CCAPP Symposium, Columbus OH (Poster) 9/2025
7. APS Global Physics Summit, Anaheim CA 3/2025
6. OSU CCAPP Symposium, Columbus OH (Poster) 9/2024
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

I have additionally been invited to present publications 8, 9, and 10 at two separate OSU Astroparticle Lunch events and give talks at the 2024 ARA Collaboration Meeting.

LEADERSHIP AND SERVICE

Scientific Leadership

ARA Operations Coordinator 2023-2025

University and Departmental Service

MIT Summer Research Program, Application Review Committee (Physics) 2020–2025
OSU Physics Climate & Diversity Committee 2023–2024

SCHOOLS AND WORKSHOPS

Summer School in Theoretical Physics, Utrecht University 8/2018
PROSPECT Data Analysis Workshop, Yale Wright Laboratory. 6/2018
Fission Experiments and Theoretical Advances, Los Alamos National Laboratory 9/2017
Nuclear Science Summer School, NSCL (now FRIB) / Michigan State University 5/2017

TEACHING EXPERIENCE

OSU, 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

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

MENTORSHIP

Graduate Students: Alexander Machtay (OSU), Jacob Weiler (OSU)
Undergraduate Students: Nicholas King (SJSU)

REFERENCES

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