

# Zoya Vallari

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## Postdoctoral Scholar

Physics, Math & Astronomy Division  
California Institute of Technology  
Pasadena, United States

[2019 - Present]

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## EDUCATION

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### Stony Brook University

PhD Particle Physics

Stony Brook, NY

[2012 - 2018]

### Indian Institute of Technology Bombay

Master of Science (M.Sc), Physics

Mumbai, India

[2010 - 2012]

### St. Stephen's College, Delhi University

Bachelor of Science (B.Sc), Physics Honors

New Delhi, India

[2007 - 2010]

## RESEARCH INTERESTS

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I study the origin and implications of neutrino masses, neutrino properties, weak-sector mixing, and leptonic charge-parity violations, using accelerator neutrino beams at long-baseline experiments. My projects broadly fall into the following categories:

- Analyzing neutrino flavor transformations to determine the mass ordering of neutrinos, test the completeness of the three-flavor paradigm to describe neutrino properties, and to search for charge-parity violation in leptons.
- Advancing the understanding of neutrino-nucleus interactions
- Designing & building the next-generation neutrino detector
- Development & adaptation of high-performance computing in high-energy particle physics

## SELECTED CONFERENCES & SEMINARS

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*Probing fundamental symmetries through precision measurement of the neutrinos* Invited colloquium  
Brookhaven National Laboratory, Brookhaven, US [Upcoming]

*DUNE: Physics, Plans & Progress* Invited plenary talk  
56th Fermilab Users Meeting, Fermilab, US [June, 2023]

*A tale of two experiments: NOvA & T2K* Invited talk  
Neutrino Generators Workshop, Fermilab, US [March, 2023]

*The Path to Precision: Role of the DUNE Near Detectors* Parallel talk  
NuFACT, Salt Lake City, US [August, 2022]

<i>The Modular LArTPC: Design and Prototype for the DUNE ND</i> Snowmass Summer Study, Seattle, US	Parallel talk [July, 2022]
<i>Measuring long-baseline neutrino oscillations with NOvA and T2K</i> 7th Symposium on Neutrinos and Dark Matter in Nuclear Physics, Asheville, US	Invited plenary talk [May, 2022]
<i>Prospects for long-baseline neutrino physics in 2020s</i> APS April, New York City, US	Invited plenary talk [April, 2022]
<i>Neutrino Scattering and oscillation measurements with NOvA data</i> Interdisciplinary Developments in Neutrino Physics, KITP, Santa Barbara, US	Invited plenary talk [March, 2022]
<i>Exploring the neutrino sector with long-baseline experiments</i> Rising Star in Experimental Particle Physics Symposium, Chicago, US	Invited talk [October, 2021]
<i>Neutrino Oscillation Results from the NOvA Experiment</i> XIX International Workshop on Neutrino Telescopes, Padova, Italy	Parallel talk [February, 2021]
<i>Particle Physics Seminars</i>	Invited seminar
University of Wisconsin-Madison, Madison, WI	[(Upcoming) Spring 2024]
Notre Dame University, Notre Dame, IN	[September, 2023]
Neutrino Seminar, Fermilab, IL	[March, 2023]
University of Pittsburgh, Pittsburgh, PA	[February, 2023]
Indiana University, Bloomington, IN	[February, 2023]
Northwestern University, Evanston, IL	[October, 2022]
Lawrence Berkeley National Lab, Berkeley, CA	[April, 2021]
Michigan State University, East Lansing, MI	[February, 2021]

## SELECTED PUBLICATIONS

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Only publications with significant contributions are listed below. A full list of 56 articles published in peer-reviewed journals is available at my iNSPIRE profile.

- *Expanding neutrino oscillation parameter measurements in NOvA using a Bayesian approach*  
M. A. Acero et al (NOvA Collaboration); arXiv:2311.07835  
*Submitted for publication* [(Anticipated) 2024]
- *Performance of a modular ton-scale pixel-readout liquid argon time projection chamber*  
A. Abed Abud et al (DUNE Collaboration); *Under collaboration review* [(Anticipated) 2024]
- *Highly-parallelized simulation of a pixelated LArTPC on a GPU*  
A. Abed Abud et al (DUNE Collaboration); arXiv:2212.09807; JINST 18 P04034 [2023]
- *Improved measurement of neutrino oscillation parameters by the NOvA experiment*  
M. A. Acero et al (NOvA Collaboration); arXiv:2108.08219; Phys. Rev. D 106 3, 032004 [2022]
- *Scintillator ageing of the T2K near detectors from 2010 to 2021*  
K. Abe et al (T2K Collaboration); arXiv:2207.12982; JINST 17 10, P10028 [2022]

- *First Measurement of the Charged Current  $\bar{\nu}_\mu$  Double Differential Cross Section on a Water Target without Pions in the final state*  
K. Abe et al (T2K Collaboration); arXiv:1908.10249; Phys. Rev. D, 102, 012007 [2020]
- *Measurement of the single  $\pi^0$  production rate in neutral current neutrino interactions on water*  
K. Abe et al (T2K Collaboration); arXiv:1704.07467; Phys. Rev. D 97, 032002 [2018]
- *First measurement of the  $\nu_\mu$  charged-current cross section on a water target without pions in the final state*  
K. Abe et al (T2K Collaboration); arXiv:1708.06771; Phys. Rev. D 97, 012001 [2018]

## AWARDS & FELLOWSHIPS

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- Winner of Leona Woods Distinguished Postdoctoral Lectureship award from the Brookhaven National Laboratory Department of Physics. [2023]
- Awarded 20,000 USD from the Universities Research Association's Visiting Scholar Program fellowship to conduct research at Fermilab. [2022]
- Won the Rising Star in Experimental Particle Physics award and was invited to present my work in a symposium held at U. Chicago. [2021]
- Awarded 20,000 USD from the American Association of University Women (AAUW) International Fellowship for academic achievement and commitment towards women and girls. [2017-2018]
- Selected for the Junior Research Fellowship award through the National Eligibility Test conducted by the University Grants Commission, India. (*Declined*) [2012 - 2014]
- Awarded the Institute Silver Medal for outstanding academic achievement in the masters program at Indian Institute of Technology, Bombay. [2012]
- Awarded INSPIRE Scholarship of 80,000 INR yearly to pursue an advanced degree in Natural Sciences by the Department of Science and Technology, India. [2007-2012]

## PROFESSIONAL SERVICE

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- Co-convener of DUNE's ND Prototypes Analysis physics working group. [2023 - Present]
- Co-convener of NOvA's 3-flavor oscillation analysis group. [2022 - Present]
- Co-organized several workshops to formulate and execute near-term analysis targets for DUNE, NOvA and NOvA-T2K collaborations. [ (*various dates*) 2022 - 2023]
- Elected Early Career member of the Executive Committee of the NOvA experiment. [2022 - 2023]
- Co-convener of the NOvA Production group. [2020 - 2021]
- Reviewer for Physical Review D. [2020 - Present]
- Served on the Analysis Review Committee for the NOvA and DUNE experiments. [2019 - Present]
- Session chair at New Perspectives 2020, Fermilab Users' Meeting 2021, NDM 2022, and APS April 2022 conferences. [2020, 2021, 2022]
- Judge for poster presentations at Fermilab Users' Meeting 2020. [2020]
- First elected representative of T2K-Young to represent graduate students and postdocs and their interests in the collaboration. [2016 - 2017]

## TEACHING

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**Science & Society** [Summer 2020]  
Co-developed and taught a month long course for an after-school program for high-school students from underserved communities in Pasadena, California

**Introduction to Particle Physics** [WSE 187] [Spring 2016]  
Designed and taught a course for the Women in Science and Engineering (WISE) honors program at Stony Brook University for undergraduate women. Introduced them to experimental particle physics research with a focus on neutrino physics.

**Astronomy Laboratory** [AST 112] [Fall 2012, 2013 and Spring 2014]  
Teaching Assistant, Stony Brook University

**Classical Physics Laboratory I** [PHY 133] [Spring 2013 and Summer 2013]  
Teaching Assistant, Stony Brook University

## MENTORING

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**Varun R. Raj** (Graduate Student, Caltech) [2019 - Present]  
**Scott Schwartz** (Graduate Student, Caltech) [2023 - Present]  
**Jude McLean** (Undergraduate Student, Caltech) [Summer 2023]  
**Patill T. Daghlian** (Undergraduate Student, Caltech) [Summer 2022]  
**Juan Granieri** (Undergraduate Student, University of Notre Dame) [Summer 2022]  
**Cellie L. Cap** (Undergraduate Student, Caltech) [Summer 2021]

## SCIENCE COMMUNICATION & OUTREACH

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- Mentored undergraduate students as part of Caltech's Freshman Summer Research Institute (program designed to provide academic support to the incoming class of underrepresented students) and WAVE Fellows (program aimed at fostering diversity by increasing the participation of students from historically marginalized identities in STEM). [Summer 2021, 2022]
- Featured in an article on neutrino mass hierarchy in *Symmetry Magazine*. [2021]
- Showcased various science demos at *Taste of Science Festival* in New York City and open science day at Caltech, California. [2019, 2021]
- Featured on the *Story Collider* podcast. [2019]
- Won the first prize and people's choice award at the university-wide 3 Minute Thesis competition for presenting my thesis research to a non-expert audience. [2017]
- Founding member of T2K-DEI that established a forum to discuss gender and equity issues in the T2K experiment. [2017]
- President of Graduate Women in Science and Engineering group at Stony Brook University, leading a team of 10 council members to organize talks, workshops and other events to promote women and other minoritized groups in STEM fields. [2016-2017]
- Student representative of the Diversity Committee of the Department of Physics and Astronomy, Stony Brook University. [2016-2017]