Muyuan He

Research Assistant

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EDUCATION

University of Houston - *PhD in Physics*

August 2019 - December 2025

University of California, Irvine - *Bachelor of Science in Physics*

September 2015 - April 2019

EXPERIENCE

Graduate Research - *Research Assistant*

2019 - PRESENT

- NOvA Experiment, Fermilab:
  - Build atmospheric neutrino analysis pipeline from scratch using CAFAna framework and grid computing (jobsub/HTCondor) for large-scale MC sample generation
  - Migrated Data Driven Trigger from ART v2 to v3 framework for atmospheric neutrino event selection, resolving compatibility issues
  - Conducted NSI sensitivity studies for atmospheric neutrino using OscProb library
  - Automated detector calibration procedure as high-priority service task, optimizing data storage using TTree format to reduce storage requirements by orders of magnitude
- DUNE Experiment, Fermilab:
  - Developed atmospheric neutrino flux systematics infrastructure in MaCH3 framework, implementing error envelope and spline based response functions
  - Performed Bayesian sensitivity analysis for NSI using MaCH3 framework under realistic systematic uncertainties
  - Conducted atmospheric neutrino zenith angle reconstruction validation studies, debugging vertex reconstruction and improving directional accuracy

Undergraduate Research - *Research Assistant*

2017 - 2019

- Neutrino Oscillation Modeling (2018 - 2019)
    - Developed toy model to simulate neutrino oscillation probabilities in matter, exploring sensitivity to δ_{CP} and $sin^2\theta_{23}$
    - Created pseudo experiment using Gaussian smearing on selected parameter space
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- Theoretical Physics (2018)
    - Derived causality and dispersion relations in classical mechanics, electromagnetism, quantum mechanics, seismic waves, and optics

- Super-Kamiokande Detector QC (2017)
    - Performed quality control testing on photomultiplier tubes (PMT)
    - Developed ROOT macros for selecting PMTs suitable for detector installation

Fellowship

- URA Visiting Scholar Program fellowship award for 2025

Presentations

- "Atmospheric Neutrino Analysis in NOvA", New Perspective Conference (talk), 2025 (NOVA Document 66879-v2)
- "NOvA Atmospheric Neutrino Studies", Texas-section APS Meeting (poster), 2025

SKILLS

- Programming Languages: Python, C++, ROOT, bash/shell scripting, FHiCL, YAML
- Analysis Frameworks: CAFAna, LArSoft, ART, MaCH3
- Detector Software: Data Driven Trigger (DDT)
- Oscillation Libraries: OscLib, OscProb
- Distributed Computing: Grid Computing with HTCondor (jobsub), batch job submission and management
- Computing Resources: Fermilab computing infrastructure (FermiGrid, dCache/pnfs storage)
- Version Control: GitHub
- Data Analysis Tools: Mathematica, MATLAB
- Operating Systems: Linux

Professional Development

- Hewlett Packard Enterprise Data Science Institute
  - Introduction to Deep Learning (312)
  - Introduction to Machine Learning (311)
  - Principles of Data Management (261)
  - Scientific Programming with Python (212)

Publication

Causality and Dispersion Relation, American Journal of Physics 87, 279 (2019); https://doi.org/10.1119/1.5092679

Search for cp-Violating Neutrino Nonstandard Interactions with the NOvA Experiment

https://inspirehep.net/literature/2767883

Impact of cross-section uncertainties on supernova neutrino spectral parameter fitting in the Deep Underground Neutrino Experiment https://inspirehep.net/literature/2648777

The Profiled Feldman-Cousins technique for confidence interval construction in the presence of nuisance parameters

https://inspirehep.net/literature/2102110

Improved measurement of neutrino oscillation parameters by the NOvA experiment

https://inspirehep.net/literature/1907127

Measurement of the Double-Differential Muon-neutrino Charged-Current Inclusive Cross Section in the NOvA Near Detector

https://inspirehep.net/literature/1928957

Reconstruction of interactions in the ProtoDUNE-SP detector with Pandora

https://inspirehep.net/literature/2111135

Snowmass Neutrino Frontier: DUNE Physics Summary

https://inspirehep.net/literature/2050110

Highly-parallelized simulation of a pixelated LArTPC on a GPU

https://inspirehep.net/literature/2620145

DUNE Offline Computing Conceptual Design Report

https://inspirehep.net/literature/2171912

Separation of track- and shower-like energy deposits in ProtoDUNE-SP using a convolutional neural network

https://inspirehep.net/literature/2060793

Scintillation light detection in the 6-m drift-length ProtoDUNE Dual Phase liquid argon TPC

https://inspirehep.net/literature/2060213

Measurement of the ve Nucleus Charged-Current Double-Differential Cross Section at Ev = 2.4 GeV using NOvA

https://inspirehep.net/literature/2098257

Searching for solar KDAR with DUNE

https://inspirehep.net/literature/1888063

Monte Carlo method for constructing confidence intervals with unconstrained and constrained nuisance parameters in the NOvA experiment

https://inspirehep.net/literature/1888063

Identification and reconstruction of low-energy electrons in the ProtoDUNE-SP detector

https://inspirehep.net/literature/1888063

The DUNE Far Detector Vertical Drift Technology. Technical Design Report

https://inspirehep.net/literature/1888063

Doping liquid argon with xenon in ProtoDUNE single-phase: effects on scintillation light

https://inspirehep.net/literature/2755125

Performance of a Modular Ton-Scale Pixel-Readout Liquid Argon Time Projection Chamber

https://inspirehep.net/literature/2768001

Supernova pointing capabilities of DUNE

https://inspirehep.net/literature/2809124

First measurement of the total inelastic cross section of positively charged kaons on argon at energies between 5.0 and 7.5 GeV

https://inspirehep.net/literature/2813918

DUNE Phase II: scientific opportunities, detector concepts, technological solutions

https://inspirehep.net/literature/2821221

The track-length extension fitting algorithm for energy measurements of interacting particles in liquid argon TPCs and its performance with ProtoDUNE-SP data

https://inspirehep.net/literature/2839214

The DUNE Phase II Detectors

https://inspirehep.net/literature/2906301

The DUNE Science Program

https://inspirehep.net/literature/2906097

DUNE Software and Computing Research and Development

https://inspirehep.net/literature/2906174

European Contributions to Fermilab Accelerator Upgrades and Facilities for the DUNE Experiment

https://inspirehep.net/literature/2906139

Spatial and temporal evaluation software the liquid argon purity in ProtoDUNE-SP

https://inspirehep.net/literature/2944869

Operation of a Modular 3D-Pixelated Liquid Argon Time-Projection Chamber in a Neutrino Beam

https://inspirehep.net/literature/2968022

Identification of low-energy kaons in the ProtoDUNE-SP detector

https://inspirehep.net/literature/3065819