

WENJIE WU

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EMPLOYMENT

Postdoctoral scholar

Feb. 2020 - Present

Department of Physics and Astronomy
University of California, Irvine
Irvine, CA, United States

EDUCATION

Wuhan University

Wuhan, China

Ph.D. in Particle Physics

Sept. 2014 - Dec. 2019

Advisor: Prof. Xiang Zhou, Prof. Miao He

Dissertation: Neutrino Oscillation Analysis of the Daya Bay Experiment and Energy Measurement Studies of the JUNO Experiment

Wuhan University

Wuhan, China

B.S. in Physics

Sept. 2010 - Jun. 2014

RESEARCH EXPERIENCE

NOvA

2020 - Present

- Leading the neutrino electron elastic scattering ($\nu - e$) analysis in the NOvA near detector, aiming for an in situ neutrino flux measurement of the NuMI beam in order to reduce the flux uncertainty.
- One of the four primary authors for the analysis of the electron neutrino charged-current (ν_e CC) interaction cross section in the NOvA near detector. With the high-statistics, NOvA is able to perform the first-ever measurement of a double-differential ν_e CC cross section. The results were reported in PRL.

DUNE

2020 - Present

- R&D of the purity monitors for ProtoDUNE Phase-2 running. We improved the purity monitor with longer drift distance in order to reduce the systematic uncertainty.
- Leading the cold electronics tests at UC Irvine. Assembled the test stand and wrote analysis programs for the measurements of non-linearity and lifetime studies of ColdADC at LN₂ temperature.
- Deep-learning-based kinematic reconstruction and energy estimators for DUNE. We developed two CNN-based methods, 2D and 3-D, for the reconstruction of final state particle direction and energy, as well as neutrino energy, which showed considerable improvements comparing to the traditional methods.

Daya Bay

2015 - 2020

- Primary analyzers for the oscillation analysis with the dataset acquired in 1958 days of stable operation. An updated fitter was developed to accommodate the change of the detector configuration. The results of θ_{13} and Δm_{ee}^2 were reported in PRL.
- Important contributions to the background analysis of purified LS of JUNO using one of Daya Bay's detector.

JUNO

2014 - 2020

- Leading the GPU applications to JUNO's reconstruction. A vertex reconstruction algorithm based on GPU was developed, and it showed great speedup comparing to CPU-based reconstruction algorithms.

- Primary developer of a new energy reconstruction algorithm of JUNO. This algorithm was developed within JUNO's official software framework (SNiPER), and the non-uniformity of the detector was able to be controlled within sub-percent level. Results were reported in JINST.
- Responsible for the design and performance test of light concentrators in JUNO. A GEANT4 program was developed to evaluate various designs, a prototype was built to validate simulations, and performance tests in the JUNO detector was completed by simulation.
- Carried out the absolute measurements of Rayleigh scattering length of linear alkylbenzene (LAB, a solvent of liquid scintillator). A modularized and compact equipment was built and calibrated, data analysis tools were implemented.

Intern at IHEP

July 2013, February - May 2014

- Performance test of a plastic scintillator. A test equipment was established, and a data acquisition program was developed using LabVIEW.
- High voltage dividers of several types of PMTs were soldered, and performance tests were carried out.

PROFESSIONAL SERVICE

- Served as the co-convenor of the NOvA reconstruction group that's responsible for all of the software between the detector simulation and the analysis groups. [Jul. 2022 - Present]
- Served as the run coordinator who's responsible for organizing shifts, data-taking and detector safety, and coordinating the work by other working groups (DAQ, DQ, DDT and FD/ND teams). [Dec. 2020 - Jun. 2022]

TECHING EXPERIENCE

Teaching Assistant

School of Physics and Technology, Wuhan University

Wuhan, China

- Particle physics, 2015.
- Physics experiment: detection of cosmic rays, 2014.
- Thermodynamics and Statistical Physics, 2014.

SPECIFIC TECHNICAL SKILLS

- Experience and working knowledge of programming in: C++, Python, Linux Shell Script and LabVIEW.
- Experience with ROOT for data analysis and visualization, with GEANT4 for Monte Carlo simulations, and with TMinuit toolkit for optimization problems.
- Experience with GPU programming tools: CUDA and Thrust.
- Experience with large scale data processing (HTCondor).

SELECTED PUBLICATIONS

- NOvA Collaboration et al., *Measurement of the ν_e -Nucleus Charged-Current Double-Differential Cross Section at $\langle E_\nu \rangle = 2.4$ GeV Using NOvA*, Phys. Rev. Lett. 130, 051802 (2023).
- M. Yu, **W. Wu**, Y. Ding, Q. Liu, F. Ren, Z. Zhang, X. Zhou, *A Monte Carlo method for Rayleigh scattering in liquid detectors*, Review of Scientific Instruments 93, 113102 (2022).
- M. Yu, **W. Wu**, N. Peng, T. Yu, Y. Ding, Q. Liu, F. Ren, Z. Zhang, X. Zhou, *Measurements of Rayleigh Ratios in Linear Alkylbenzene*, Review of Scientific Instruments 93, 063106 (2022).
- J. Liu, J. Ott, J. Collado, B. Jargowsky, **W. Wu**, J. Bian & P. Baldi, *Deep-Learning-Based Kinematic Reconstruction for DUNE*, [arXiv:2012.06181 [physics.ins-det]].
- **W. Wu**, G. Zhu, Q. Zhang, X. Zhou, Y. Ding, H. Qiao & J. Cao, *Thermal diffusivity and specific heat capacity of linear alkylbenzene*, Phys. Scr. 94 105701 (2019).

- **W. Wu**, M. He, X. Zhou & H. Qiao, *A new method of energy reconstruction for large spherical liquid scintillator detectors*, J. Inst. 14, P03009 (2019).
- The Daya Bay Collaboration et al, *Measurement of the Electron Antineutrino Oscillation with 1958 Days of Operation at Daya Bay*, Phys. Rev. Lett. 121, 241805 (2018).
- Q. Liu, X. Zhou, W. Huang, Y. Zhang, **W. Wu**, W. Luo, M. Yu, Y. Zheng, L. Zhou, J. Cao & Y. Wang, *Rayleigh scattering and depolarization ratio in linear alkylbenzene*, N.I.M. A 795, 284–287 (2015).

SELECTED TALKS

- *Deep-Learning-Based Kinematic Reconstruction for DUNE*, talk at APS April Meeting 2022 Apr. 11, 2022, Online
- *ProtoDUNE Detector*, talk at NuFact 2021 Sept. 5, 2021, Online
- *Cross-section Measurements in the NOvA Near Detector*, talk at the 54th Annual Users(Virtual) Meeting Aug. 5, 2021, Online.
- *ProtoDUNE Physics and Results*, talk at APS DPF Meeting 2021 Jul. 12, 2021, Online
- *Purity Monitoring for ProtoDUNE-SP*, talk at APS April Meeting 2021 Apr. 19, 2021, Online
- *Purity Monitoring for ProtoDUNE-SP*, talk at CPAD Instrumentation Frontier Workshop Mar. 18, 2021, Online
- *Neutrino energy reconstruction with a regression CNN in the DUNE far detector*, talk at NPML main workshop Jul. 22, 2020, Online
- *Neutrino oscillation studies in JUNO*, talk at NuFact 2019 Aug. 28, 2019, Daegu, South Korea
- *A brief review of recent reactor neutrino experiments*, plenary talk at the 16th FPCP conference Jul. 17, 2018, Hyderabad, India
- *Latest $n\text{Gd}$ oscillation results from Daya Bay*, talk at the 10th CPS-HEP Meeting Jun. 20, 2018, Shanghai, China