

Qiyu Yan 严启宇

yanqiyu17@mails.ucas.ac.cn | Chinese Citizen | [ORCID: 0009-0005-0796-5539](#)

Education

Tsung-Dao Lee Institute Visiting Fellow	2026/07 – Expected 2026/09 Shanghai, China
University of Warwick Visiting Ph.D. Student in Physics Supervisor: Prof. Xianguo Lu	2023/06 – 2024/05, 2025/08 - 2026/05 Coventry, UK
University of Chinese Academy of Sciences Ph.D. in Physics Supervisor: Prof. Xianguo Lu (Warwick), Prof. Yangheng Zheng	2021/09 - 2026/06 Beijing, China
University of Chinese Academy of Sciences B.Sc. in Physics • Core Course GPA: 3.88/4.0	2017/09 – 2021/06 Beijing, China Link to thesis

Projects

Understanding the impact of nuclear effects on proton decay searches with the GiBUU model Supervisor: Prof. Xianguo Lu	2025 – 2026
- I used the GiBUU framework to reevaluate the proton decay search sensitivity for the $p \rightarrow e^+ \pi^0$ channel in water Cherenkov detectors like Hyper-Kamiokande, incorporating realistic event reconstruction performance. - The study examines how different initial-state and medium effects affecting πN or NN scattering, such as short-range correlations and Δ-resonance broadening, affect the signal efficiency and background rates, providing insights into the overall uncertainty in proton decay sensitivity. - Demonstrated that GiBUU provides a self-consistent framework for modeling nuclear effects in both signal and background, enabling future consideration of correlated systematic uncertainties essential for an unbiased proton lifetime extraction. - The resulting sensitivity estimate for Hyper-Kamiokande is consistent with previous studies at the $\sim 10\%$ level, validating the framework for next-generation searches.	
Understanding neutrino pion production with the GiBUU model Supervisor: Prof. Xianguo Lu	2024 – 2025
- I performed a comprehensive study of neutrino-induced pion production using the GiBUU model, comparing its predictions with data from MINERvA, MicroBooNE, and T2K experiments. - Identified tension between GiBUU predictions and experimental data, particularly in the treatment of 2π background contributions and Δ-resonance broadening effects, showing the complicated nature of in-medium effects.	
PROFESSOR2-Based ReWeight for GENIE Supervisor: Prof. Xianguo Lu, Prof. Constantinos Andreopoulos	2023 – Present
- I build the tool to perform parameterization of predicted differential cross-section with interpolation framework PROFESSOR2 for hadronization and FSI parameters in GENIE neutrino event generator. - This tool enables the reweighting of these parameters, which were previously considered unweightable but represent significant sources of model uncertainty in meson-production and DIS regions.	
The Ghent Hybrid Model in NuWro	2023 – 2024

Supervisor: Prof. Xianguo Lu

- I implemented the Ghent Hybrid Model for single-pion production in NuWro neutrino event generator, the new model provides an improved description of resonance contributions and related backgrounds in several GeV hadronic invariant mass region.
- The new model is benchmarked with MINERvA, MicroBooNE and T2K data, showing significant improvement in describing the data.

B.Sc. Thesis: Physics Sensitivity Study with GeV Neutrinos in JUNO

2020 – 2021

Supervisor: Dr. Xianguo Lu (Oxford), Prof. Yangheng Zheng

- I studied the sensitivity of Jiangmen Underground Neutrino Observatory (JUNO) to neutrino mass ordering problem using atmospheric neutrinos.
- The study includes the following steps:
 - Calculate the atmospheric neutrino event rate using flux from Honda et al. and GENIE neutrino event generator, and oscillation probability from the oscillation calculation tool PROB3.
 - For the predicted final state, the energy deposit is simulated using GEANT4, with a mock detector geometry of JUNO, to estimate the energy resolution.
 - Using the estimated energy resolution and angular resolution, calculate the sensitivity of JUNO to neutrino mass ordering problem.
- The main contributions of my thesis are:
 - Contribute a full chain of sensitivity study of JUNO to neutrino mass ordering problem using atmospheric neutrinos.
 - Framework contributes to the future atmospheric neutrino studies in JUNO.

Summer Project: GEANT4 Based Simulation of Time Projection Chamber

2020/07 - 2020/09

Supervisor: Dr. Xianguo Lu (Oxford)

- I studied the behavior of different particles going through a Time Projection Chamber (TPC) detector using GEANT4 simulation toolkit.
- The study includes the following steps:
 - Use GEANT4 to simulate the behavior of different particles (electron, muon, proton, pion, alpha) going through a TPC detector.
 - Record the energy deposit dE/dx and track length for different particles.
 - Analyze the Bragg peak behavior and the dependence on the energy deposit of track length for different particles.
- The main contributions of my project are:
 - Provide a detailed study of the behavior of different particles going through a TPC detector using GEANT4 simulation toolkit.
 - Observed different Bragg peak behavior from different particles, which may be used to conduct particle identification in TPC detector.
 - Observed the dependence on the energy deposit of track length, which may be used to conduct energy measurement in TPC detector.

Collaborations and Roles

- GENIE Collaboration 2023 – Present
 - Bug fix for hadronization model AGKYLowW2019 directionality issue ([GENIE-MC/Generator:226](#))
 - Development of PROFESSOR2-based ReWeight tool for hadronization and FSI parameters.
- JUNO Collaboration 2021 – Present
 - GeV v-A high-eNergY MEdium Effect (GANYMEDE) Working Group
 - Generator Task Lead: 2023 – Present

- Development and maintenance of GENIE and NuWRO neutrino event generator interface in JUNO software framework.
- Metropolis-Hastings-based sampling algorithm for NuWRO event generation.
- 3D flux handling for NuWRO event generation.
- Development of automated model comparison and validation framework for GeV neutrino event generators in JUNO.
- Contribute to the atmospheric neutrino simulation production by managing the Monte Carlo production software.
- Collect bug report from user and contribute to the development of different neutrino event generator.
- Proposed the selection of baseline model for atmospheric neutrino interaction analyses in JUNO.
- Proposed the strategy for cross-section-related systematic uncertainty evaluation for atmospheric neutrino analyses in JUNO.
- Provided suggestion to analyses with atmospheric neutrinos induced backgrounds, such as diffuse supernova neutrino background and invisible nucleon decay searches.
- Atmospheric Neutrino Working Group
 - Provided Bayesian estimation of mass ordering sensitivity to complement the frequentist approach.
 - Joined the statistical-only frequentist mass ordering sensitivity study.
 - Contribute to the establishment of common input for atmospheric neutrino flux, cross-section, and oscillation input.
 - Evaluation of the cross-section-related systematic uncertainties for atmospheric neutrino reconstruction tasks (including flavor identification and energy resolution).
- Reactor Neutrino Working Group
 - Development of GPU-accelerated calibration fit framework, used in ^{68}Ge calibration data analysis of Group B.

Conferences

Invited Talk: Qiyu Yan, *Understanding the impact of nuclear effects on proton decay searches with the GiBUU model*, **NOW 2026** [Otranto Italy 2026/09](#)

Invited Talk: Qiyu Yan, *The Ghent Hybrid Model in NuWRO: a new neutrino single-pion production model in the GeV regime*, **15th International Workshop on Neutrino-Nucleus Interactions** [Mainz Germany 2025/10](#)

Talk: Qiyu Yan, *Atmospheric neutrino oscillations in JUNO*, **NuFact 2025 - The 26th International Workshop on Neutrinos from Accelerators** [Liverpool UK 2025/09](#)

Talk: Qiyu Yan, *Understanding neutrino pion production with the GiBUU model*, **NuFact 2025 - The 26th International Workshop on Neutrinos from Accelerators** [Liverpool UK 2025/09](#)

Talk: Qiyu Yan, *Modeling pion production for GeV neutrino experiments*, **The 23rd International Conference on Few-Body Problems in Physics** [Beijing China 2024/09](#)

Poster: Qiyu Yan *et al.*, *Medium effect in Sensitivity of Proton Decay Search*, **15th International Workshop on Neutrino-Nucleus Interactions** [Mainz Germany 2025/10](#)

Poster: Qiyu Yan *et al.* on behalf of GENIE Collaboration, *Professor Based ReWeight for GENIE Generator*, **NEUTRINO2024**. [Milan Italy 2024/06](#)

Poster: Qiyu Yan *et al.* on behalf of GANYMEDE PWG, *Status of the GANYMEDE Working Group for GeV Physics at JUNO*, **NEUTRINO2022**. [Seoul Korea \(online\) 2022/06](#)

Selected Publications (4 selected from 17)

Qiyu Yan, Akira Takenaka, Kai Gallmeister, Xianguo Lu, Ulrich Mosel, Yangheng Zheng, *Understanding the impact of nuclear effects on proton decay searches with the GiBUU model*, [Phys. Rev. D 113, 095039 \[hep-ex/2602.23063\]](#) [[INSPIRE](#)]

Qiyu Yan, Kaile Wen, Kai Gallmeister, Xianguo Lu, Ulrich Mosel, Yangheng Zheng, *Understanding neutrino pion production with the GiBUU model*, [Phys. Rev. D 112, 093007 \[hep-ex/2507.20539\]](#) [[INSPIRE](#)]

Qiyu Yan, Kajetan Niewczas, Alexis Nikolakopoulos, Raúl González-Jiménez, Natalie Jachowicz, Xianguo Lu, Jan Sobczyk, Yangheng Zheng, *The Ghent Hybrid Model in NUWRO: a new neutrino single-pion production model in the GeV regime*, [JHEP 12 \(2024\) 141 \[hep-ph/2405.05212\]](#) [[INSPIRE](#)]

Angel Abusleme *et al.* (JUNO Collaboration), *Initial performance results of the JUNO detector*, [[hep-ex/2511.14590](#)] [[INSPIRE](#)]