Kaiyuan Shi

+1(805)259-7414 ⋄ Los Angeles, CA
skyshi@g.ucla.edu

EDUCATION

B.S. in Physics, University of California, Los Angeles — Sep 2020 – Mar 2022
Major GPA: 3.96/4.00, Cumulative GPA: 3.87/4.00

B.S. in Physics, University of California, Santa Barbara — Sep 2018 – Jun 2020
Transferred to UCLA

RESEARCH EXPERIENCE

QCD Theory Group — Los Angeles, US

1. Azimuthal correlation of isolated photon-hadron production in proton-proton and proton-nucleus collisions. (Supervisor: Prof. Zhongbo Kang) — June 2021 – Present

- Provide a good description of the experimental data of isolated photon hadron production at mid-rapidity in $\sqrt{s} = 200$ GeV pp collision at RHIC. Both the gluon saturation effect in Color Glass Condensate (CGC) framework and the Sudakov effect from soft gluon radiation are considered.
- Predict the experimental results of isolated photon-hadron production at forward and backward rapidity in high energy pp and pA collisions at LHCb within the same framework.
- Find the uncertainty introduced to the theoretical prediction of $pA \to \gamma h^{\pm}$ and $pp \to \gamma h^{\pm}$ cross sections. Including gluon dipole models, non-perturbative Sudakov effects, and parton distribution functions.

2. High energy observables within the CGC effective field theory. (Supervisor: Prof. Zhongbo Kang) — Oct 2021 – Present

- Explain the width and suppression of the away-side peak in neutral pion pair production at forward-rapidity in $\sqrt{s} = 200$ GeV pA collision at RHIC. Both the running coupling Balitsky-Kovchegov (rcBK) evolution of TMD gluon distributions and the Sudakov effect are considered.
- Provide prediction on the performance of Electron-Ion Collider related to di-hadron production.
- Fit the saturation scale Q_s in the CGC framework to compensate for the rcBK evolution of TMD dipole distributions. Both regular fits by including spatial dependencies and machine learning methods are used.

Dingyu Shao's Research Group, Fudan University — Shanghai, China

Azimuthal correlation of isolated $\gamma h^{\pm}$ production in pp and pA collisions. (Supervisor: Prof. Dingyu Shao) — Aug 2022 – Present

- Calculations on the theoretical predictions of photon-hadron cross sections are performed on the cluster at Fudan University.
- Work with engineers at Fudan University on the maintenance of cluster of the research group.

PandaX, Shanghai Jiao Tong University — Shanghai, China

1. Performance of the next generation 30-ton level PandaX experiment related to $0\nu\beta\beta$. (Supervisor: Prof. Xun Chen and Prof. Jianglai Liu) — Sep 2020 – Feb 2022

- Differentiate double beta decay events from gamma backgrounds in liquid xenon time projection chambers based on optics simulation.

- **Optics simulation:** Generate passage and energy deposition information of photons travelling in xenon-136 using Geant4. Initial kinematics of double beta decay events are generated by DECAY0 event generator.
- A time-of-flight cut is found and implemented to effectively separate Cerenkov photons from scintillation light.
- **Deep learning (convolutional neural network)**: *a.* Perform regression analysis on the initial kinematics of single recoiling electrons and DBD events. *b. (also with OpenCV)* Find possible models to distinguish the location pattern of Cerenkov photons generated by DBD events. A 95% differentiation accuracy is achieved with back-to-back DBD events and a 74% accuracy is obtained with DBD events considering the angular correlation of electrons.

2. Performance of photomultipliers under low temperature. (Supervisor: Prof. Jianglai Liu) March 2021 – May 2021

- Measured the dark count rate and afterpulse of PMTs under high voltage and approximately -90°C in ethanol cooling system.
- Learned basic vacuum technologies (residual gas analyser, sniffer, molecular pump) and electronics.

Arisaka Lab at UCLA (Biophysics Group) Los Angeles, US

Visual perception of 2 dimensional shape in time by log-scaling (Supervisor: Prof. Katsushi Arisaka) Dec 2020 – June 2021

- Conducted PsychoPy experiments using face images and written characters. Analyzed the data with MATLAB. Found the increase in visual recognition time of 2D objects is proportional to the scaling factor of the objects in log scale.
- Presented the results during the undergraduate research week of UCLA in May 2021.
- Paper is currently under peer review, https:doi.org/10.1101/2022.03.01.482004.

SKILLS

Programming Languages

Familiar with: C++, Python, LaTeX, UNIX command line

Have experience with: MATLAB, Mathematica

Toolkits: DECAY0, Geant4, LHAPDF, ROOT, TensorFlow (Keras), OpenCV

Human Languages

Fluent: English and Mandarin.