

Xianglong Song 宋相龙

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EDUCATION

- School of Physics, Nankai University** Tianjin, China
Undergraduate; GPA 3.61/4, Ranking 16%. Sept. 2021 - Present

SELECTED RESEARCH EXPERIENCE

- Thesis: Searches for BSM physics at future colliders. (Future)** [hep-ph] Tianjin, China
Supervisor: Prof. Lorenzo Calibbi, @ Nankai University Dec. 2024 - May. 2025
 - Conducting literature review.
- $t\bar{t}H + tH$ \mathcal{CP} analysis on ATLAS. (On-going)** [hep-ex][GitHub] California, USA
Supervisor: Prof. Caterina Vernieri & Dr. Brendon Bullard, @ SLAC Jul. 2024 - Present
 - Reconstructed top quark events with the identification of jet triplets by χ^2 implementation, which served as a baseline.
 - Trained a deep neural network to distinguish reconstruction-level jets which are processed by truth matching with truth-level jets, and compared with the BDT(boosted decision trees) approach.
 - Training a neural network to separate $t\bar{t}H + tH$ signal from background processes and to separate events produced by \mathcal{CP} -even and \mathcal{CP} -odd process simultaneously.
- Quantum tomography with kinematic approach at colliders. (On-going)** [hep-ph] Remote
Supervisor: Prof. Tao Han, @ University of Pittsburgh Sept. 2024 - Present
 - Applied the “kinematic approach” and compared it with the traditional “decay approach” for reconstructing quantum density matrices at colliders.
 - Demonstrated that production kinematics alone can provide sufficient information for quantum tomography, eliminating the dependence on decaying particles, which showed its feasibility and significantly improved statistical precision.
- From LHAASO multi-wavelength data to electron distribution.** [astro-ex][GitHub] Shanghai, China
Supervisor: Prof. Gwenael Giacinti, @ TDLI, Shanghai Jiao Tong University Jan. 2024 - Jan. 2024
 - Used Naima package to calculate LHAASO data and generated the photon spectrum from the Crab Nebula and analyzed the origin of these photons.
 - Fitted the photon spectrum with processes like synchrotron radiation, inverse Compton scattering and Pion decay.
 - Employed exponential cutoff double broken power law to replace the unknown acceleration mechanism.
- SoftDrop isolation on exploring QED splitting function.** [hep-ex][GitHub] Rome, Italy
Supervisor: Prof. Leticia Cunqueiro, @ Sapienza University of Rome Jul. 2023 - Oct. 2023
 - Distinguished photons from quarks and mesons’ decay with the combination of SoftDrop declustering and isolation.
 - Isolated photons from quark-photon emissions, removed soft radiation and background effects.
 - Demonstrated a strong correlation between the momentum sharing in photon isolation and the theoretical expectations from quantum electrodynamics.
- Extrapolate lattice pion DA and test its effect on the $\pi - \gamma$ TFF.** [hep-ph] Tianjin, China
Supervisor: Prof. Lei Chang, @ Nankai University Mar. 2023 - Jul. 2023
 - Constructed self-consistent models for the dressed quark propagator, the Bethe-Salpeter amplitude of the pion, and the electromagnetic quark-photon interaction vertex.
 - Modeled the pion distribution amplitude and its QCD evolution with lattice data and ERBL evolution equations.
 - Reproduced the chiral anomaly in the transition form factor, particularly at $Q^2 = 0$.
 - Addressed discrepancies in experimental data, particularly at high photon momentum transfer.

HONORS AND AWARDS

Nankai Physicists’ Tournament, First Prize	– 2022
Nankai Physics Department Winter Camp, Outstanding Mentor	– 2023
Undergraduate Innovation Research Fellowship (Highest Fellowship for Undergrads in Tianjin, China)	– 2023
Boling Project Undergraduate Research Fellowship (Highest Fellowship for Undergrads in Nankai)	– 2023, 2024
TDLI Astro-Division 2024 Winter Camp, First Prize	– 2024
Global Nankai Scholarship (One of the Highest Scholarships for Students in Nankai)	– 2024

TECHNICAL SKILLS

Language: C++, Wolfram, Python, L^AT_EX, Matlab, Bash.
Software & Programming: ROOT, FASTJET, PYTHIA, Naima, Pytorch.

TEACHING ASSISTANT

Linear Algebra	Nankai University
• <i>Lead TA for the compulsory course Linear Algebra.</i>	<i>Fall. 2022 - Spring. 2023</i>
Nankai Physics Department Winter Camp	Nankai University
• <i>TA in the winter camp held for high school students all around China who are interested in Physics.</i>	<i>Winter. 2023</i>

EXTRACURRICULAR ACTIVITY

I am a member of the badminton team representing the School of Physics at Nankai University. I have held the position of **team leader** during the fall semester of 2022 and the spring semester of 2023.