Xianglong Song 宋相龙

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Learn more about me on my homepage: `https://song-xianglong.github.io`

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Education

- **Faculty of Physics, LMU Munich** — Munich, Germany
  Master student — *Oct. 2025 - Now*

- **School of Physics, Nankai University** — Tianjin, China
  Undergraduate; GPA 3.61/4 (1.9 in German standard), Ranking 8%. — *Sept. 2021 - Jun. 2025*

Selected Research Experience

- **Thesis: Searches for BSM physics at future colliders.** [hep-ph] — Tianjin, China
  Supervisor: Prof. Lorenzo Calibbi, @ Nankai University — *Dec. 2024 - May. 2025*
  - Wrote a UFO model file for Axion-Like Particle (ALP) interaction with the Standard Model and developed the theory part of the production and decay of ALP.
  - Generated signal and background events for CEPC simulation, studied the $e^+e^- \to Z \to a\gamma$, $a \to b\bar{b}$ decay mode with MadGraph and related software, which not only fully exploited the CEPC' s outstanding b-tagging performance but also represented the first dedicated study of this decay channel.
  - Set appropriate cuts on the observables to efficiently separate the signal and background events, and derived limitations on ALP parameter space which can be studied on CEPC.

- **$t\bar{t}H + tH$ $\mathcal{CP}$ analysis on ATLAS.** [hep-ex] `[GitHub]` — California, USA
  Supervisor: Prof. Caterina Vernieri & Dr. Brendon Bullard, @ SLAC — *Jul. 2024 - Jun. 2025*
  - 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.

- **From LHAASO multi-wavelength data to electron distribution.** [astro-ph] `[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, **Second Prize** – 2024
Global Nankai Scholarship (**One of the Highest** Scholarships for Students in Nankai) – 2024

Technical Skills

Language: C++, Wolfram, Python, LaTeX, Matlab, Bash.
Software & Programming: ROOT, FastJet, MadGraph, Pythia, Pytorch.

Teaching Assistant

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

Extracurricular Activity

I was 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.