Shengdu Chai

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Education

- **Fudan University** — Shanghai, China
  Bachelor of Science(Honored) in Physics; — *Sept. 2019 - Present*
  GPA(Overall): *3.69/4.0(Rank: 12/103);*
  GPA(Major): *3.87;*
  Core Courses: *C Programming: A; Classical Mechanics(H): A ; Methods of Mathematical Physics A(H): A ; Thermodynamics and Statistical Physics I: A ; Thermodynamics and Statistical Physics II (graduate-level course): A- ; Quantum Field Theory (graduate-level course): A- ; Quantum Mechanics I: A- ;Gauge Theory(graduate-level course): A;*
  H: honors course in which the most advanced students are placed
- **Peking University** — Beijing, China
  Summer Program in School of physics; — *Aug.2021 – Aug.2021*
  Topics covered: *Particle Physics, Cosmology, Dark Matter and Quantum Field Theory.*
- **University of Chicago** — Chicago, IL, US
  Non-Degree Visiting Students Program — *July 2022 – Sept.2022*
  Supervisor: *Liantao Wang, Professor*

Research Experience

- **Explanation of New CDF W Mass** — University of Chicago
  Research Assistant to Professor Liantao Wang — *July 2022 – Sept.2022*
  - **Aim**: This project aims to explain both the new W mass reported by Fermi Lab and the long existed discrepancy of forward-backward asymmetry by introducing new vector-like quarks
  - **Contribution**: Considering the oblique correction and then did the global fitting to find the reasonable mass of the new particles
- **SMEFT Machine Learning** — Fudan University
  Research Assistant to Associate Professor Jiayin Gu — *Nov.2021 - present*
  - **Aim**: This project aims to apply machine learning techniques to the phenomenological analyses of the Standard Model Effective Field Theory (SMEFT), with a focus on the measurements at future lepton colliders.
  - **Simulation**: With simulations of e+e-→WW from MadGraph5, using machine learning to find the likelihood ratio in terms of the Wilson coefficients of dimension-six operators in this process .
  - **Results**: Machine Learning method performs better than the traditional method like Optimal Observable, which corrects the large bias of model parameters and gives a strong constrain
  - **Future Plans**: Future plans involve the applications of these methods to other processes, such as top-pair productions.
- **Nonlinear Differential Equations and Chaos** — Fudan University
  Course Project with Associate Professor Yang Zhou — *Mar.2021 - Jun.2021*
  - **Aim**: This project aims to learn the relation with nonlinear differential equations and chaos and find a way to describe quantum chaos.
  - **Simulation**: Simulate the Chua's Circuit by Mathematica to generalize the character of Nonlinear Differential Equations and Classical Chaos.
  - **Calculation**: Calculate the Spectral Form Factor of Gaussian unitary ensemble (GUE), one of the ensembles of Random Matrix Theory (RMT) which can be a signature of Quantum Chaos.
  - **Others**: Be familiar with SYK Model.
- **Saxon Bowl** — Fudan University
  Research Assistant to Professor Yongkang Le — *Oct.2019 - Aug.2020*
  - **Aim**: This project aims to find the parameters that determine the time of the sinking of a bowl with a hole in its base.
  - **Simulation**: Build the experimental device and simulating the process of sinking by COMSOL.
  - **Model Building**: The results are obtained by using the Bernoulli equation with losses and solving the differential equations using numerical simulation by Mathematica.

Honors And Awards

- **Fudan University Undergraduate Professional Scholarship** *2021/10*
- **Honors Student in Department of Physics** *2021/10*
- **1st Prize in Fudan University Scholarship for Outstanding Students**(top 4 in the Department) *2021/09*
- **Outstanding Student in Fudan University** *2020/10*
- **1st Prize in Fudan University Scholarship for Outstanding Students**(top 5 in the Department) *2020/09*
- **Outstanding Student in Fudan University** *2020/05*
- **2nd Prize of 2020 Mathematical Contest in Modeling** ,
  a team-oriented competition of math modeling *2020/09*
- **2nd Prize of China Undergraduate Physics Tournament**,a team-oriented physics competition between 60 top universities in China *2020/10*

Skills Summary

- **Programming Skills**: Python (proficient), C/C++, pytorch, Mathematica
- **Computer Skills**: Latex, Machine Learning, COMSOL, Root, MadGraph 5, Delphes