

Shouzhuo Yang

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EDUCATION

Swarthmore College

B.A. Physics and Mathematics; GPA: 3.97/4.00

PA, USA

Sep 2019 – May 2023

Massachusetts Institute of Technology

Department of Nuclear Science and Engineering; GPA: 5.0/5.0

MA, USA

Aug 2024 – Current

COURSES AND SKILLS

Advanced Physics Coursework: General Relativity, Quantum Field Theory, Quantum Information Science, Cosmological Physics, Condensed Matter Physics, Liquid Crystal, The Interstellar Medium

Advanced Mathematics Coursework: Differential Geometry, Complex Analysis, Modern Algebra, Analytical Number Theory, Stochastic Processes and Numerical Methods, Knot Theory

Languages: C/C++, Java, Python, MATLAB, The Wolfram Language

Technologies: Git, slurm, PyTorch, TensorFlow, L^AT_EX, Dedalus

PUBLICATIONS

[1] Ji, S., **Yang, S.**, Dominguez, W., Bester, C. Using Physics Simulations to Find Targeting Strategies in Competitive Bowling. *AIP Advances* 15, 045222 (2025)

[2] **Yang, S.**, Li, X., & Yoshida, N. (2023). Three-Dimensional Reconstruction of Weak-Lensing Mass Maps with a Sparsity Prior. II. Weighing Triaxial Cluster Halos. arXiv: 2312.00309 [Submitted to *The Astrophysical Journal*]

[3] **Yang, S.**, Zhang, B., Murdock, S. R., & Collings, P. J. (2022). Orientational order of dyes in a lyotropic chromonic liquid crystal. *Soft Matter*, 18(38), 7415-7421.

[4] **Yang, S.**, & Collings, P. J. (2020). The Genetic Algorithm: Using Biology to Compute Liquid Crystal Director Configurations. *Crystals*, 10(11), 1041.

[5] Ahmed, N., Ball, W., Buckminster, E., Rivkin, E., Torrance, D., Viscusi, J., ... & **Yang, S.** (2021). Domains of Convergence for Polyhedral Packings. arXiv preprint arXiv:2109.01289.

[6] Wang Y., Lin F., **Yang S.**, Cai P. and Igarashi S., “Efficiency Optimization of Wirelss Power Transfer System with Traction Motor Load for Modern Tram,” 2018 IEEE PELS Workshop on Emerging Technologies: Wireless Power Transfer (Wow)

RESEARCH EXPERIENCE

Shear Estimation with Flexion

Carnegie Mellon University

Research Assistant, Advisor: Dr. Xiangchong Li and Prof. Rachel Mandelbaum

Aug 2023 – Jan 2024

- Performing image simulations, using perturbation methods to solve for flexion distortion of galaxy profiles and constraining the form of flexion’s contribution to the additive and multiplicative bias in shear estimation using spin number.
- Contributing non-affine transformation methods in public repositories BatSim and FPFS.

Machine Learning and Solar Neutrino Background in JUNO

Institute of High Energy Physics

Research Assistant, Advisor: Prof. Liangjian Wen

July 2023 – Present

- Using machine learning algorithms to suppress Solar Neutrino background in the $0\nu\beta\beta$ experiment in JUNO second phase.
- Implemented $0\nu\beta\beta$ and anisotropic solar neutrino generator in the JUNO offline simulation software.
- Experimenting a combination of attention mechanism and spherically invariant neural network to distinguish between solar and $0\nu\beta\beta$ signal.

3-D Cosmological Mass Map Reconstruction with Sparsity Prior

The University of Tokyo

Research Assistant, Advisor: Naoki Yoshida

Oct 2022 – May 2024

- Constructed a 3-D reconstruction algorithm to locate and weigh dark matter halo to constrain cosmological parameters.

- Implemented a parallelized lensing simulation program for different triaxial halo models (e.g., Navarro-Frenk-White Halos).
- Reached 90% detection accuracy with 5% detection mass bias for the medium mass halo with Year 1 Hyper-Suprime-Cam noise.

Genetic Algorithm to Compute Liquid Crystal Director

Swarthmore College

Research Assistant, Advisor: Peter Collings

Dec 2019 – May 2021

- Applied genetic algorithms to calculate liquid crystal director alignment by minimizing liquid crystal free energy, which includes elastic, electric, and surface free energies.
- Calculated the director alignment for Frederiks Transition, 90 Degree twisted cell, Escaped Radial Cell, and Twisted Nematic cell, before verifying solutions with Euler-Lagrange equations.
- Published the research findings in the journal *Crystals*.

Orientational Order of Dyes in Lyotropic Liquid Crystal

Swarthmore College

Research Assistant, Advisor: Peter Collings

Sep 2022 – May 2023

- Studied the physical interactions between liquid crystal molecules under mixture.
- Measured the changes in the absorption spectrum and the indices of refraction of dye molecules mixed with crystal disodium cromoglycate (DSCG).
- Showed that the alignment of the dye molecules correlates with the interaction between the dye molecules and the stacked DSCG molecules.
- Published the research findings in the journal *Soft Matter*.

Computational Plasma Research

Swarthmore College

Research Assistant, Advisor: Michael Brown

June 2020 – May 2023

- Investigated the merging of Taylor states plasma to determine whether it is suitable for inertial-magnetic confinement fusion.
- Simulated ion trajectory in the Harris Sheet, an approximation of magnetic reconnection layer, with the Boris algorithm.
- Simulated the merging of Taylor states with a resistive Magnetohydrodynamic regime under the Dedalus Framework.

AWARDS AND GRANTS

Phi Beta Kappa

2023

Membership

The McWilliams Center for Cosmology Seed Grant

2022

\$4975, 250 kSU

Swarthmore College Honors Fellowship

2022

\$5200

Peer Assistance Certificate

2021

For recognition of outstanding teaching assistant performance

The Carl Grossman Summer Opportunity Fund

2021

\$4800

Swarthmore College Summer Research Fellowship

2020

\$4800

TEACHING EXPERIENCE

Swarthmore College

Teaching Assistant for PHYS 005: Spacetime and Quanta

Fall 2020, 2021

Grader for MATH 067: Introduction to Modern Algebra

Spring 2020

Grader for MATH 035: Several-Variable Calculus with Theory

Spring 2020

Chester Children's Chorus

SAT Math Tutor

Fall 2020

LEADERSHIP AND OTHER ACTIVITIES

Swarthmore College

Student Hiring Committee, Department of Physics and Astronomy

Fall 2022

Student Hiring Committee, Department of Mathematics and Statistics

Spring 2020

American Physical Society, Division of Plasma Physics

62nd Annual Meeting Poster Presentation

Nov 2020

63rd Annual Meeting Poster Presentation

Nov 2021

LANGUAGE AND SKILLS

Languages: Chinese/Mandarin (Native), English (Proficient), Japanese (Proficient)

Computer Skills: Proficient in Java Script, Python, C++, Matlab, Mathematica. | Competent in C, Fortran