

CHANG CHENG¹

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RESEARCH INTERESTS

Elementary Particle Physics, Cosmology, Phenomenology, Quantum Field Theory, Machine Learning (ML) for Fundamental Physics, Physics of ML Theory.

EDUCATION

Stanford University

Physics PhD

California, USA

Sep 2026 – June 2031

Imperial College London

Master of Science, Physics with Extended Research

London, UK

Sep 2024 – June 2026

- Grade: 88%. Rank: 2/73.
- Dissertation: "A 12d Origin of the Type IIB String Theory?" advised by Arkady Tseytlin.

Colorado College

Bachelor of Arts, Math and Computer Science

Colorado, USA

Aug 2019 – May 2023

- GPA 3.98/4.0. Phi Beta Kappa, Dean's List $\times$ 4.
- Math capstone (thesis): "Lattice-based Post-Quantum Cryptography" advised by Stefan Erickson. CS capstone (team software project): "3 Dimensional Mesh Learning" advised by Cory Scott.
- Cochair, Society for Industrial and Applied Mathematics (SIAM); Founding Member, International Student Advisory Board.

University Liggett School

Grades 9 – 12

Michigan, USA

Sep 2015 – June 2019

- Grosse Pointe French Prize (2018, 2019), Catholic League Basketball All Academic award, Special Graduate Award, George Thanasas Award.
- Varsity athlete in basketball, American football, and lacrosse.

Education gap (May 2023–Sep 2024): After earning my BA, I spent a year self-studying physics in my hometown of Suzhou, China. During that time, I scored 920/990 on the Physics GRE in Nov 2023. I then enrolled in the MSc in Physics at Imperial in Sep 2024.

RESEARCH EXPERIENCE

String Theory (Master's Thesis)

Supervisor: Prof. Arkady Tseytlin FRS

Imperial College London, UK

May 2025 – June 2026

- Conducted a theoretical research project reviewing the mathematical consistency of a potential 12-dimensional framework underlying 10-dimensional string theory, analyzing how key structures such as duality symmetries and brane solutions could emerge from a higher-dimensional origin.
- Synthesized evidence from supergravity and brane configurations to assess the viability of this higher-dimensional framework, identifying open questions and outlining directions for further mathematical exploration. See arXiv:[2512.10746](https://arxiv.org/abs/2512.10746).

¹Also went by "Davidson Cheng" until Dec 2025.

Supersymmetry

Supervisor: Prof. Arkady Tseytlin FRS, Grade: Distinction

Imperial College London, UK

Oct 2024 – Jan 2025

- Self-study project with formal supervision to explore supersymmetric gauge theories in 10, 6, 4 dimensions, supersymmetric QED, non-renormalization theorems, and Kaluza-Klein reductions.
- Expository paper “Supersymmetric Gauge Theories in Various Dimensions” available upon request.

Representation Learning

Supervisor: Prof. Cory B. Scott, GitHub: [dcheng728/ML-HKS](#)

Colorado College, USA

Feb – Apr 2023

- Developed a contrastive neural network with adversarial training to robustly extract features on point cloud.
- Achieved comparable performance to benchmark with significantly less computation.

Differentiable Economics (REU-CAAR program)

Supervisor: Prof. John P. Dickerson (now CEO, Mozilla.ai)

University of Maryland, USA

June – Aug 2022

- Proposed an auction system that allows designing auctions where bidders have little incentive to lie, making the outcome fair and reliable
- Collaborated on a real-time matching algorithm that ensures fairness when pairing two groups (e.g., drivers and riders), with results published at [AAAI 2023](#).

Theoretical Economics

Independent research without supervision

Colorado College, USA

Dec 2021 – Apr 2022

- Proved a new result on equilibria in infinitely repeated games; wrote a single-author paper accepted for presentation at the International Conference on Game Theory, Stony Brook, USA (an academic conference with 280+ presentations and attended by two Nobel laureates in Economics).
- Received travel grant from Colorado College after paper acceptance.

Biomedical Engineering

Supervisor: Prof. Yu Wang

Beihang University, Beijing, China

June – Aug 2018, Dec 2019 – Jan 2020, Oct 2020 – Jul 2021

- Collaborated informally² on projects in prosthetic/robotic hands and surgical robotics during school vacations, and while enrolled full-time at Colorado College and taking classes remotely due to COVID-19, to explore interests in engineering.
- Coauthored 8 peer-reviewed papers and 2 patents, with contributions spanning hardware and software development and data analysis; served as first author on one paper and one patent.

WORK EXPERIENCE

Member of Technical Staff

Part-time

Callosum, London, UK

May 2026 – Sep 2026

- Conducted research on scalable oversight, an area of AI safety.
- Studied language model self-verification capabilities, developed a framework that separates verification capability from acceptance bias.

Grader

Part-time

Colorado College, Colorado, USA

Nov 2021 – May 2023

²In one paper and one preprint, Beihang University is listed as an affiliation (along with Colorado College) to reflect physical presence at the time, not to indicate formal employment, enrollment, or contract.

- Courses graded: CP115 Computational Thinking (two units), CP274 Software Design, CP275 Computer Organization, MA117 Intro. Probability and Statistics, MA129 Calculus II, MA251 Number Theory.

Peer Intern

Part-time

Colorado College, Colorado, USA

Nov 2019 – Aug 2022

- Greeted students and visitors at the front desk, directed them to the career center professionals and resources, and answered phone calls.

Business Analyst Intern

Internship

EqualOcean, Shanghai, China

Apr 2020 – Jul 2020

- Facilitated analysts on business analysis articles and reports on the electric cars industry.

HONORS AND AWARDS

Sophie Germain Award

Colorado College

2023

Awarded to a Math graduate who demonstrates unusual commitment to the community and passion for the field. A plaque listing historical winners hangs in the department entrance.

Finalist, Outstanding Undergraduate Researcher

The Computing Research Association (CRA)

2022

Recognizes undergraduates in North American colleges and universities who show outstanding potential in an area of computing research.

Rawles Prize

Colorado College

Awarded to the winner of an annual math competition.

2020, 2022

Honorable Mention

The Interdisciplinary Contest in Modeling (ICM)

Led team of three in international math modeling contest.

2022

REU-CARR

University of Maryland

Amount: ten-week accommodation, travel, and \$1400

2022

Summer Internship Award

Colorado College

Amount: \$4,000

2022

Conference Presentation Grant

Colorado College

Amount: \$750 available for reimbursement

2022

SIAM Student Travel Award

Society for Industrial and Applied Mathematics (SIAM)

Amount: \$650 available for reimbursement

2022

PUBLICATIONS AND UNPUBLISHED PREPRINTS

List of publications also available on Google Scholar under [Chang Cheng](#).

Physics Papers

- **Chang Cheng**,
"A 12d Origin of Type IIB String Theory: A Review,"
(2025) arXiv:2512.10746 [hep-th].

AI Papers

- Seyed A. Esmaeili, Sharmila Duppala, **Davidson Cheng**, Vedant Nanda, Aravind Srinivasan, and John P. Dickerson, "Rawlsian Fairness in Online Bipartite Matching: Two-sided, Group, and Individual," (2023) *Conference on Artificial Intelligence (AAAI)*.

Biomedical Engineering Papers

- Qing Yang, Siru Feng, Jian Song, **Chang Cheng**, Chengdi Liang, and Yu Wang, "Computer-aided Automatic Planning and Biomechanical Analysis of a Novel Arc Screw for Pelvic Fracture Internal Fixation," (2022) *Computer Methods and Programs in Biomedicine*.
- Yadong Yan, **Chang Cheng**, Mingjun Guan, Jianan Zhang, and Yu Wang, "Texture Identification and Object Recognition Using a Soft Robotic Hand Innervated Bio-inspired Proprioception," (2022) *Machines*.
- Yadong Yan, **Chang Cheng**, Mingjun Guan, Jianan Zhang, and Yu Wang, "The Influence of the Abduction Joints of Four Fingers to Grasp: Experimental and Simulated Verification," (2022) *Applied Sciences*.
- **Chang Cheng**, Yadong Yan, Mingjun Guan, Jianan Zhang, and Yu Wang, "Tactile Sensing with a Tendon-Driven Soft Robotic Finger," (2021) *IEEE International Conference on Control, Mechatronics and Automation (ICCMA)*. Gave remote presentation.
- Yadong Yan, **Chang Cheng**, Mingjun Guan, Jianan Zhang, and Yu Wang, "A Soft Robotic Gripper Based on Bioinspired Fingers," (2021) *International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*.
- Jianan Zhang, Yadong Yan, Haotian Yao, Jiangzhen Guo, **Chang Cheng**, and Yu Wang, "Design and Experimental Verification of Underactuated Prosthetic Hand," (2021) *International Conference on Robotics, Control and Automation Engineering (RCAE)*.
- Qing Yang, Jian Song, **Chang Cheng**, Chao Shi, Chendi Liang, and Yu Wang, "An Internal Arc Fixation Channel and Automatic Planning Algorithm for Pelvic Fracture," (2021) *International Conference on Robotics, Control and Automation Engineering (RCAE)*.
- **Chang Cheng**, Yadong Yan, Mingjun Guan, Jianan Zhang, and Yu Wang, "The Grasps Under Varied Object Orientation Dataset: Relation Between Grasps and Object Orientation," (2021) arXiv:2106.14158 [cs.RO]. Unpublished manuscript.
- Yadong Ya, Yu Wang, Xiangqian Chen, Chao Shi, Jiazheng Yu, and **Chang Cheng**, "A Tendon-Driven Prosthetic Hand using Continuum Structure," (2020) *International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*.

Economics Papers

- **Davidson Cheng**, "Asymmetric Equilibria in Symmetric Multiplayer Prisoners Dilemma Supergames," (2022) arXiv:2205.13772 [econ.TH]. Unpublished manuscript.
- **Davidson Cheng**, "Identification of Direct Socio-Geographical Price Discrimination: An Empirical Study on iPhones," (2022) arXiv:2201.07903 [econ.EM]. Unpublished manuscript.

PRESENTATIONS

- **Davidson Cheng**,
“Asymmetric Equilibria in Symmetric Multiplayer Prisoners Dilemma Supergames,”
(2022) International Conference on Game Theory, Stony Brook, USA.
- **Davidson Cheng**,
“An Impossibility Theorem for Two-Player Two-Dimensional Vector Addition Game,”
(2022) SIAM Annual Meeting, Pittsburgh, USA.
- **Davidson Cheng** and Yingting Zhong,
“An Evolutionary Economic Model for Predicting the Equity of Asteroid Mining,”
(2022) SIAM Front Range Applied Mathematics Student Conference, Denver, USA.

PATENTS

- “A Dexterous Robotic Hand Control Method Based on Multiple Stereo Cameras,”
China Patent Application 2021107623376. Applicant: Beihang University. Inventors: Yu Wang, Yadong Yan, **Chang Cheng**, Mingjun Guan, Jianan Zhang.
- “A Grasp Posture Acquisition Method and System,”
China Patent Application 2021103267461. Applicant: Beihang University. Inventors: Yu Wang, **Chang Cheng**, Yadong Yan, Mingjun Guan, Jianan Zhang.

PERSONAL INTERESTS

Sports: swimming, basketball, and rock climbing.

Reading: physics, nonfiction, economics, and philosophy.