Zeyu (Derek) Zeng

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EDUCATION

Beijing 101 High School **2021.9 - 2024.7**
University of Illinois Urbana-Champaign **2024.8 - present**
(Current) GPA: 3.93 Bachelor of Science Program in Physics, Dual degree in Mathematics
(Current) Technical GPA: 3.91
Courses:
Fall 2024: MATH 423 (Differential Geometry, A), PHYS 225 (Relativity & Math, A), PHYS 211 (University Physics: Mechanics, A), ESL 111 (Introduction to Academic Writing I, A), HK 110 (Contemporary Health, A), ENG 100 (Engineering Orientation, A)
Spring 2025: MATH 416H (Abstract Linear Algebra Honor Session, A+), MATH 441 (Differential Equations, A-), MATH 347H (Introduction to Abstract Mathematics Honor Session, A), PHYS 325 (Classical Mechanics I, A), PHYS 214 (University Physics: Quantum, B+), ESL 112 (Introduction to Academic Writing II, A+), MATH 497 (Individual Study, A+)
Fall 2025: MATH 518 (Differentiable Manifold I, A+), MATH 535 (General Topology, A+), MATH 424 (Honors Real Analysis, A+), PHYS 435 (Electromagnetic Fields I, A-), MATH 492 (Undergraduate Research, S), RST 335 (Leisure and Consumer Culture, A+)
Spring 2026 [1]: MATH 519 (Differentiable Manifold II, MATH 525 (Algebraic Topology I), MATH 500 (Abstract Algebra I), PHYS 486 (Quantum Mechanics I), MATH 492 (Reading Course on Differential Topology and Cobordism)
Fields Institute Shared Graduate Courses: Geometry of Quantum Mechanics (Fall 2025), Mathematics Inspired by Quantum Field Theory (Winter 2025-2026)

RESEARCH EXPERIENCES

Exploring the Teapot Effect: Microscale Investigations and Mechanistic Analysis **2023.4 - 2023.9**

- Research Instructor: Prof. Baoyi Chen
- Studied the formation and the factor of the teapot effect.
- S. -T. Yau High School Science Competition Semifinalist.

Relativistic Corrections to Hadron-Hadron Correlation Function **2023.11 - 2025.6**

- Research Instructor: Prof. Baoyi Chen, Prof. Jiaxing Zhao
- Examine relativistic corrections to scattering phase shifts and correlation functions using the two-body Dirac equation framework.
- See arXiv:2506.19240 [hep-ph]

Undergraduate Research, Schwarzschild-like Metric in Isotropic Coordinates **2025.3 - present**

- Research instructor: Dr. Elena Koptieva
- Derive the coordinate transformation from the canonical form to the isotropic coordinate.
- Develop a general method for transforming Kiselev solutions into isotropic coordinates

Illinois Math Lab Research Project, Arithmetics of Polynomials in Knots Theory **2025.8 - 2025.12**

- Research instructor: Dr. Yi Wang
- Study the Knots theory by the factorization of a polynomial related to the trace field of $-a/b$-Dehn filling.

SUPERVISED READINGS

Differential Topology and Cobordism Theory **Spring 2026**

- Mentor: Prof. Dan Berwick-Evans
- Read the book *Topology from Differentiable Viewpoints* by Milnor and the lecture note *Bordism: Old and New* by Freed.

TALKS and PRESENTATIONS

UIUC Undergraduate Research Symposium, Poster Presenter **2025.4**

- Poster named "Derivation of Conformally Flat Metric for Generalized Schwarzschild-like Solutions".

"The Largest and The Smallest", SJTU Summer School on Physics, Participant **2025.7**

- Delivered the presentation named "Gauge Theory of Shallow Water" with collaborators.
- The presentation is mainly based on Davied Tong's paper arXiv:2209.10574 [hep-th].

[1] The grading is pending.

Final Presentation of Math Inspired by QFT, Winter/Spring 2026 **2026.4**

- The presentation is based on the famous book *J-holomorphic Curves and Symplectic Topology* and Rahul Pandharipande's ICM 2018 lecture note: Cohomological Field Theory Calculations.
- Delivered the presentation named Gromov-Witten Theory and Cohomological Field Theory

HONORS

S. -T. Yau High School Science Award, Semi-Finalist **2023.9**
UIUC James Scholar **2025.2 - present**
Dean's List, Fall 2024, UIUC Grainger College of Engeneering **2025.4**
Ralph O. Simmons Undergraduate Research Scholarship **2025.4**