Ze Fan

zfan@wesleyan.edu
http://zfan-math.com

Wesleyan University
Department of Mathematics
265 Church St., Middletown, CT
United States

Education

Wesleyan University, Middletown, CT

May 2026 **Bachelor of Arts**
GPA: 4.10/4.00
Major: Mathematics **Minor:** Economics

Research Experiences

5. Constructive and Stable Cartan–Dieudonné and Applications to Binary Quadratic Forms over Number Fields (joint with Han Li). Submitted, Oct. 2025.
4. The Lubin–Tate Deformation Theorem and the Morava E-theory. Expository, Sept. 2025. (preprint)
3. Stable Regularity Lemmas and their Model-Theoretic Foundations. Expository, Apr. 2025. (preprint)
2. Sparse Vectors of Small Height Avoiding Hyperplanes. Poster, July 2024. (preprint)
1. Disjoint Cycles in Ordinary Multipartite Tournaments and Round-Robin Tournaments. High School, Dec. 2020. (preprint)

Academic Awards

May 2025 **Wesleyan University Rae Shortt Prize**
Awarded to a junior for excellence in mathematics.

May 2024 **Wesleyan University Robertson Prize**
Awarded for excellence in mathematics to a sophomore.

May 2023 **Wesleyan University Sherman Prize-Mathematics**
Awarded for excellence in first-year mathematics.

Dec. 2020 **Award of Excellence, Global Final of S.–T. Yau High School Science Award**
In the mathematics division, nine people are awarded annually, including one Gold Prize, one Silver Prize, three Bronze Prizes, and five Award of Excellence.
Award winning paper: Paper 1.

Talks and Seminars

2. *A Constructive and Stable Cartan–Dieudonné Theorem for Binary Quadratic Forms.* Algebra Seminar, Wesleyan University, Sept. 26, 2025.
1. *Lubin–Tate Theorem and Construction of Morava E-Theory.* Participant Talks, University of Chicago math REU, Aug. 7, 2025. (slides)

Skills and Languages

Programming Languages Python; C/C++; Standard ML; R; Stata; SageMath
Mandarin (primary); English (full professional); French(professional working).

[1] Updated October 3, 2025

Math Courses Taken

- **MATH 509, Model Theory, A+**

  This is a graduate-level course for introduction to model theory. The course covers syntax and semantics of first-order logic, definability, compactness and Löwenheim-Skolem theorems, realizing and omitting types, quantifier elimination and model completeness, countable models of complete theories.

- **MATH 513-514, Analysis I, A and A+**

  This is the first-year graduate course in real and complex analysis. One semester will be devoted to real analysis, covering such topics as Lebesgue measure and integration on the line, abstrac measure spaces and integrals, product measures, decomposition and differentiation of measures, and elementary functional analysis. One semester will be devoted to complex analysis, covering such topics as analytic functions, power series, Mobius transformations, Cauchy's integral theorem and formula in its general form, classification of singularities, residues, argument principle, maximum modulus principle, Schwarz's lemma, and the Riemann mapping theorem.

- **MATH 523-524, Topology I, A+ and A**

  This is the first-year graduate course in point set topology and algebraic topology. The first semester provides an introduction to topological spaces and the fundamental group; topological spaces, continuous maps, metric spaces; product and quotient spaces; compactness, connectedness, and separation axioms; and introduction to homotopy and the fundamental group. The second semester focuses on algebraic topology, concentrating on the fundamental group and homology.

- **MATH 525, Topology II: Low Dimensional Geometries, A**

  This graduate-level course covers the structure of the homogeneous geometries in dimensions two and three. It covers the isometry groups of these spaces, with a focus on the discrete subgroups of the isometry groups together with the corresponding quotient spaces.

- **MATH 543-544, Algebra I, A and A+**

  This is the first-year graduate course in algebra. The first semester covers group theory including Sylow theorems, and basic ring and module theory. The second semester studies commutative algebra, Galois theory, and structure of finitely generated modules over principal-ideal domains.

- **MATH 545, Algebra II: Computational Algebraic Geometry, A**

  This graduate-level course is a combination of several different topics of interest, including dimension theory, algorithms for computing Hilbert series of monomial ideals, and syzygies and free resolutions.

- **MATH 546, Algebra II: Lattices and Sphere Packing, A**

  This graduate course explores the geometry and arithmetic of lattices, with emphasis on applications to sphere packing problems. Topics include Minkowski's foundational results on convex bodies and linear forms, Hermite's constant and related inequalities, and connections to reduction theory. This course also studies classical root systems and their role in dense lattice packings. Additional topics may include Voronoi cells, extreme lattices, and applications to optimization and discrete geometry.

- **MATH 401, Individual Tutorial: Algebraic Geometry, A**

  This graduate-level tutorial provides a rigorous introduction to algebraic geometry through the first thirteen chapters of Vakil's *The Rising Sea*, covering category theory, sheaves, schemes, their morphisms, and geometric notions such as dimension and smoothness. Hartshorne's *Algebraic Geometry* will be used as a supplementary reference.