XIAO (ANTHONY) HONG

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EDUCATION

Washington University in St. Louis   St. Louis, United States
B.S. in Economics & Computer Science; Double Major in Mathematics   *Aug 2021 – May 2025*

- **Overall GPA**: 3.98/4.00; **Major GPA**: 3.99/4.00
- **Selected Honors**: Brian Blank Award, Dean's List, Freiwald Scholar, Tau Beta Pi Engineering Honor Society invitation (Upper 8th of McKelvey School of Engineering)
- **Selected Courses**: Math5045 Algebraic Topology (A); Math5046 Differential Topology (A); Math5031 Algebra I (A+); Math5022 Complex Analysis II (A-); Math547 Theory of Polytopes (A+); Math560 Compact Lie Group (in progress); CSE543T Algorithms of Nonlinear Optimization (A); Math5440 High-dimensional Probability (A+); Math586 Network Statistics (A); Math350 Dynamical System and Chaos (A).

PUBLICATIONS

1. **Xiao Hong**. (2020, December). "Study of Intergenerational Mobility and Urbanization Based on OLS Method and Ordered Probit Model." *2020 International Conference on Management Science Informatization and Economic Innovation and Development (MSIEID 2020).* IEEE, 10.1109/MSIEID52046.2020.00092
2. **Xiao Hong**, (Accepted). "The 2-Sheeted, 3-Sheeted, and Universal Coverings of Corresponding 2-Oriented Graph of Rank-2 Free Group." *MathStat Conference: Focusing on Mathematics and Statistics (FMS 2024).* Dean & Francis.

RESEARCH EXPERIENCES

Freiwald Scholars Program, Washington University in St. Louis   St. Louis, United States
Independent study supervised by Prof. Renato Feres   *Feb 2023 – Dec 2023*
Curvature of Cayley Graphs of Abelian and Nilpotent Groups

- Developed efficient algorithms for computation of the Ollivier-Ricci curvature of Cayley graphs of abelian and nilpotent groups, leveraging symmetries of Cayley graphs.
- Studied Wasserstein distance of point measures evolving along geodesics of complete Riemannian manifolds.
- Presented at the Midstates Consortium for Math and Science 23 at the University of Chicago and the WashU SP24 Undergraduate Research Symposium.

Summer Geometry Initiative, Massachusetts Institute of Technology   Remote
Group projects   *Jul 2024 – Aug 2024*
Deforming Mesh (Dr. Nickolas Sharp)

- Computed and compared the Gromov-Hausdorff distance, Hausdorff distance, and Chamfer distance as shape dissimilarity measures.

Signed Distance Functions (Prof. Oded Stein and Prof. Silvia Sellán)

- Designed and reconstructed signed distance functions (SDFs) using the marching squares algorithm.
- Proved characterization theorem of SDF on plane by the Eikonal equation and closest point condition.

Fitting Inconsistent Input with Noise Regularization (Prof. Amir Vaxman)

- Used shallow neural networks and adversarial modules to reconstruct surfaces from Poisson disc samples, visualized using Polyscope.

Winding Numbers Vectorization (Prof. Edward Chien)

- Computed winding numbers as harmonic functions on torus and its universal cover via C++ and CMake.
- Utilized intrinsic triangulations to resolve color region disconnections on the mesh and optimized edge lengths in the feature space embedding.

Imperial College London   Remote
Group project supervised by Prof. Jeroen Lamb   *Aug 2024 – Sep 2024*
Multifractals

- Reviewed theorems on the Hausdorff dimension of the α-level set of the local dimension of self-similar measures.
- Led teammates to write a report that interpreted and visualized $f(\alpha)$ and $\tau(q)$ plots of multifractals in financial market data using Matplotlib.

Washington University in St. Louis   St. Louis, United States
Undergraduate thesis supervised by Prof. Xiang Tang   *Feb 2024 – Present*
Symplectic and Toric Manifolds

- Took notes on symplectic reductions, flag manifolds, and Delzant's classification by working through exercises in Ana Cannas da Silva's *Lectures on Symplectic Geometry* and *Symplectic Toric Manifolds*.
- Currently writing a report on the Atiyah-Guillemin-Sternberg theorem on connectedness and convexity properties for the moment map of $\mathbb{T}^n$-action on compact symplectic manifolds.
- Aiming to study two generalizations: actions on the four-dimensional log-symplectic manifolds and actions by the semisimple Lie groups.

California Institute of Technology — Remote
Group project supervised by Prof. Thomas Hutchcroft — *Nov 2024 – Present*
Universality Phenomena in Phase Transitions
- Aiming to investigate critical behavior in phase transitions using Euclidean and hierarchical models with long-range interactions through numerical experiments.

COURSE PROJECTS

Hex & Brouwer Paper Report (Math4181 Topology II) — *Mar 2022*
- Corrected a numerical error in David Gale's "The Game of Hex and The Brouwer Fixed-Point Theorem."

Split Spoils: Solution to the Stolen Necklace Problem (Math4181 Topology II) — *May 2022*
- Solved the two-dimensional Necklace division problem using the Borsuk-Ulam Theorem.

A Note on Characterizations of Archetypal Riemann Surfaces (Math497 Topics in Group Theory) — *May 2023*
- Reviewed the isometry groups, automorphism groups, and curvature properties of the three Riemann surfaces classified in the uniformization theorem.

Brion's Theorem and Khovanskii-Pukhlikov Theorem (Math547 Theory of Polytopes) — *May 2024*
- Presented Brion's theorem and demonstrated the application of the Todd operator to volume perturbation of unimodular polytopes.

WORK EXPERIENCE

Department of Mathematics, Washington University in St. Louis — St. Louis, United States
Teaching Assistant, Math5046 Differential Topology, Prof. Rachel Roberts — *Jan 2024 – May 2024*
- Conducted weekly office hours to support students and graded assignments to ensure academic progress.

Grader, Math4111 Introduction to Analysis, Prof. Ari Stern — *Aug 2022 – Dec 2022*
Grader, Math4171 Topology I, Prof. Xiang Tang — *Aug 2023 – Dec 2023*
Grader, Math5051 Measure Theory and Functional Analysis I, Prof. Henri Martikainen — *Aug 2024 – Dec 2024*

TALKS AND SEMINARS

University of Chicago — Chicago, United States
Speaker at Midstates Consortium for Math and Science 23 — *Nov 2023*
- Presented work on curvature of Cayley graphs of abelian and nilpotent groups, focusing on algorithmic efficiency and geometric interpretations.

Washington University in St. Louis — St. Louis, United States
- Reading Group SP23: Algebraic Geometry.
- Reading Group FL23: Representation Theory.
- WashU SP24 Undergraduate Research Symposium.
- Speaker at Online Early Career Morning Sessions held by Prof. Henri Martikainen.
- UNC Undergraduate Analysis and PDE Online Seminar FL22-SP23.
- Convention on Stan Programming and Bayesian Modeling 23 Workshop.
- WUSTL Metamorphic Architecture Workshop 2019.

ADDITIONAL INFORMATION

Computer and Language Skills
- Software skills: Python, LaTeX, Java, MATLAB, Adobe Illustrator, Octave, R, Stata.
- Languages: Fluent in Chinese and English.

Interests
- Classical Music, Chinese Calligraphy, Printmaking, Travelling, Tennis & Table Tennis.