

# 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 8<sup>th</sup> 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", Accepted, *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 Graph 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 on Midstates Consortium for Math and Science 23 at University of Chicago and WashU SP24 Undergraduate Research Symposium.

### Summer Geometry Initiative, Massachusetts Institute of Technology

Remote

Mentored 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 the theorem of characterization of SDF on plane by 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 by 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, optimizing 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 Hausdorff dimension of  $\alpha$ -level set of the local dimension of self-similar measures.
- Interpreted and visualized  $f(\alpha)$  and  $\tau(q)$  plots of multifractals in financial market data by Matplotlib.

### Washington University in St. Louis

St. Louis, United States

Undergraduate thesis supervised by Prof. [Xiang Tang](#)

Feb 2024 – Present

#### Symplectic and Toric Manifolds

- Wrote 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*.

- Aiming to investigate the moment map in information geometry, connecting estimation to dual structures and optimization insights through Barbaresco’s generalization of Koszul-Souriau models.

## California Institute of Technology

Group project supervised by Prof. [Thomas Hutchcroft](#)

Remote

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 & Bouwer Paper Report (Math4181 Topology II)

Mar 2022

- Corrected an equivalence proof in David Gale’s “The Game of Hex and The Brouwer Fixed-Point Theorem.”

### Split Spoils: Solution to Stolen Necklace Problem Via Borsuk-Ulam Theorem (Math4181 Topology II)

May 2022

- Solved the 2-dimensional Necklace division problem using the Borsuk-Ulam Theorem.

### A Note on Characterizations of Archetypal Riemann Surfaces (Math497 Topics in Group Theory)

May 2023

- Summarized the isometry groups, automorphism groups, and curvatures of the three Riemann surfaces in the uniformization theorem.

### Image Classification Using Wasserstein Distance from Monge-Kantorovich Solvers (CSE543 Algorithms of Nonlinear Optimization)

Dec 2023

- Surveyed algorithms of gradient descent and numerical PDE for Monge problems in image classification.

### Brion’s Theorem and Khovanskii-Pukhlikov Theorem (Math547 Theory of Polytopes)

May 2024

- Presented Brion’s theorem and applied 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

- Held weekly office hours; graded weekly assignments.

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 graph of abelian and nilpotent groups.

### 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.
- Bilingual: Chinese & English.

### Interests

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