Gavin Engelstad

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Education

Northwestern University, PhD in Economics 2025-

Macalester College, BA 2021-2025

Majors: Economics (Honors) and Mathematics (Honors) *Minor:* Computer Science

- *GPA:* 3.92/4.0
- *Coursework:* Macroeconomic Modeling, Open Economy Macroeconomics, Labor Economics, Industrial Organization, Real Analysis, Complex Analysis, Mathematical Modeling, Network Science, Partial Differential Equations, Topology, Causal Inference, Statistical Theory

Economics Thesis: "Cross-Sectional Household Heterogeneity in the Business Cycle"

Methods: HANK Modeling (Sequence Space), Bayesian Estimation (MCMC)

Findings: Net savers are most affected by interest rate changes. Wage changes affect high earners

Mathematics Thesis: "Topological Data Analysis of Knowledge Networks"

Methods: Topological Data Analysis (Persistent Homology), Optimization (Linear Programming)

Findings: New methods to optimize persistent homology cycle representatives with applications to networks. Topological exploration of scientific progress in 143 fields

Research Positions

Macalester College and University of Minnesota
Research Assistant for Dr. Lori Ziegelmeier and Dr. Russell Funk May 2024 – Present

- Researched how scientific knowledge grows using Topological Data Analysis. Created knowledge networks, optimized persistent homology cycles, and compared results to null models with three other undergrads

University of California San Diego
Research Assistant for Dr. Gaurav Khanna July 2024 – August 2025

- Cleaned data and implemented econometric models to identify city wage premiums around the globe

Working Papers

"The Global Value of Cities" (with Aakash Bhalothia, Gaurav Khanna, and Harrison Mitchell)

Methods: Econometric Modeling (AKM, Movers Design), Data Wrangling (Spark)

Findings: Identified city wage premiums around the world. City effects explain a significant portion of post-move salary increases, especially for international movers. The allocation of workers in productive cities/firms explains part of the difference between high and low income countries

Works in Progress

"Topological Data Analysis of Knowledge Networks" (with Tanisha Dodla, Nadezhda Dominguez Salinas, Russell Funk, Frances McConnell, and Lori Ziegelmeier)

Methods: Topological Data Analysis (Persistent Homology), Statistical Modeling

Findings: The topology of a scientific field can meaningfully identify knowledge gaps

"Bounding Chain Optimal Cycle Representatives in Complex Networks" (with Russell Funk, Gregory Henselman-Petrusek, Frances McConnell, and Lori Ziegelmeier)

Methods: Topological Data Analysis (Persistent Homology), Optimization (Linear Programming)

Findings: A novel method to optimize persistent homology cycle representatives within network data

"Distributions of Spaces of Cycle Representatives in Persistent Homology" (with Peter Bubenik, Russell Funk, Dmitriy Morozov, Francis Motta, Jonathan Mousley, Lori Ziegelmeier)

Methods: Topological Data Analysis (Persistent Homology), MCMC Sampling

Findings: A stable cycle representative using a distribution function on simplices

Presentations

Topological Data Visualization Workshop at the University of Iowa 2025

"Tutorial on Cycle Optimization," workshop session

Algebraic Topology: Methods, Computation, & Science Conference at Montana State University 2025

"Bounding Chain Optimal Cycle Representatives in Complex Networks," poster

UG-Quantitative Methods & Macroeconomics at the Midwest Economics Association's 89th Annual Meetings 2025

"Cross-Sectional Household Heterogeneity in Responses to Macroeconomic Shocks," presentation

AMS Special Session on Topological Machine Learning at the Joint Mathematics Meetings 2025

"Topological Insights into the Evolution of Scientific Knowledge," presentation

PME Undergraduate Student Poster Session at the Joint Mathematics Meetings 2025

"A Topological Approach to Understanding the Development of Knowledge Networks," poster (with Frances McConnell)

Academic Summer Showcase Poster Session at Macalester College 2024

"Topological Data Analysis of Knowledge Networks," poster (with Lucia Luo)

Honors and Awards

First-Year Doctoral Studies Fellowship, Northwestern University (2025)
Graduate Research Fellowship Program Semifinalist, National Science Foundation (2025)
Robert L. Bunting Price in Economics, Macalester College Economics Department (2025)
Best Undergraduate Paper Award, Midwest Economics Association's 89th Annual Meetings (2025)
DeWitt Wallace Scholarship, Macalester College (2021)
National Merit Scholarship, National Merit Scholarship Cooperation (2021)

Teaching

Macalester College

– TA for Econ 381: Econometrics (Fall 2023, Spring 2024, Fall 2024)

Skills

Software: Python, LaTeX, R, Java, Stata, Julia, Mathematica