Gavin Engelstad

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EDUCATION

Macalester College, BA   Expected May 2025

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

- *GPA:* 3.90/4.0

- *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*
*Ongoing

Economics Thesis: "Cross-Sectional Household Heterogeneity in Responses to Macroeconomic Shocks"

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 and fast computation of huristics. Topological exploration of scientific progress in 143 fields

RESEARCH POSITIONS

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

- Cleaned data and implemented econometric models to identify city wage premiums around the globe with two grad students and one other undergrad

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

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

"Volume Optimal Cycle Representatives for 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

PROJECTS

"Estimating Fiscal Multipliers: An SVAR Approach" (with Samina Stack)   Fall 2024

Course: Stat 451: Causal Inference (Leslie Mynt)

Methods: Causal Inference (SVAR), Economic Theory (Macroeconomics)

Findings: Blanchard and Perotti-style estimate of the spending-side fiscal multiplier

"A Finite Element Approach to Reaction-Diffusion Systems"   Fall 2024

Course: Math 494: Partial Differential Equations (Will Mitchell)

Methods: Numerical Methods for PDEs (Finite Differences, Finite Elements), Python

Product: Numerical solver for reaction-diffusion PDEs combining finite element and finite difference methods

"Shock Risks and Chokepoint Overreliance"   Spring 2024

    Course: Econ 422: International Trade and Multinational Corporations (Felix Friedt)

    Methods: Causal Inference (Fixed Effects), Input-Output Analysis (Leontief), Network Modeling

    Findings: The Suez Canal directly affected exposed ports. Value chains caused global indirect effects

"Vulnerability of Urban Road Systems"   Spring 2024

    Course: Math 479: Network Science (Andrew Beveridge)

    Methods: Network Analysis (Centrality Analysis), GIS (Geopandas)

    Findings: The Key Bridge collapse caused significant, localized effects on the Baltimore road network

"Non-Representative Agents"   Spring 2024

    Course: Econ 472: Macroeconomic Modeling (Mario Solis-Garcia)

    Methods: DSGE Modeling (New Keynsian), Python

    Findings: Hand-to-mouth households distort TFP, monetary policy, and government spending shocks

"A Simple Model of Wealth Inequality"   Fall 2023

    Course: Math 432: Mathematical Modeling (Will Mitchell)

    Methods: Agent Based Modeling, Model Evaluation (Akaike's Information Criterion)

    Findings: A modified Yard Sale model with fixed transfer amounts replicates the US distribution of wealth

"Introduction to Linear Programming: A Simplex Implementation" (with Caleb Williams)   Fall 2023

    Course: Math 437: Computational Geometry (Lori Ziegelmeier)

    Methods: Optimization (Linear Programming, Simplex Method), Python

    Product: Our own robust Simplex Method implementation applied to network optimization problems

PRESENTATIONS

Undergraduate Paper Session at the Midwest Economics Association's 89th Annual Meetings   2025

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

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

    "Topological Insights into the Evolution of Scientific Knowledge," presentation (upcoming)

PME Undergraduate Student Poster Session at the Joint Mathematics Meetings   2025

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

Academic Summer Showcase Poster Session at Macalester College   2024

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

TEACHING

Macalester College

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

SKILLS

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