

Zachary Tipton

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SUMMARY

Interdisciplinary researcher with graduate degrees in biology and economic analytics, specializing in causal inference, spatial methods, and applied statistical modeling. Experienced in translating complex quantitative methods across domains, research consulting, and engaging with stakeholders. Adept at independent research design and cross-disciplinary collaboration.

TECHNICAL SKILLS

Programming Languages & Tools

- Python, SQL, R, Stata, SPSS

Analytical Methods

- Predictive Modeling: Linear/logistic regression, LASSO/ridge regularization, random forest, gradient boosting, convolutional neural networks
- Causal Inference: Difference-in-differences, propensity score matching, instrumental variables
- Time-Series Analysis & Forecasting: Smoothing methods, Prophet forecasting, piece-wise regressions
- Statistical Testing: Hypothesis testing, OLS, ANOVA, t-tests, chi-square, A/B test design

AI Engineering

- AI systems development using LLM APIs, RAG architectures, and multi-tier document processing
- Multiagent orchestration, verification, and evaluation
- LLM integration and transcription pipeline development

Data Systems & Visualization

- Database Design: SQLite, normalization, indexing, foreign key constraints, data integrity
- ETL Pipelines: API integration, data validation, caching systems, automated workflows
- Business Tools: Tableau Excel, PowerPoint

EDUCATION

Master of Science in Economic Analytics

University of Arkansas, Walton College of Business • Expected May 2026 • GPA: 4.0

Master of Science in Biology

University of Arkansas, Fulbright College of Arts and Sciences • 2023 • GPA: 3.6

Bachelor of Science in Environmental, Soil, and Water Science, Honors Distinction

University of Arkansas, Bumpers College of Agricultural, Food and Life Sciences • 2018 • GPA: 3.6

PROFESSIONAL EXPERIENCE

Research Collaborator

Dr. Christopher Craig, Murray State University • 2025–Present

- Contribute original writing and analysis to manuscript examining climate resources and outdoor recreation economics
- Review and edit technical manuscript sections including econometric methodology (SARIMAX modeling) and theoretical framework development

Marketing and Outreach Graduate Assistant

University of Arkansas Writing Studio • 2025–2026

- Built automated analytics reporting system to analyze appointment records across program metrics, identifying engagement patterns, completion rates, and retention ratios to inform program strategy
- Developed AI-powered chatbot interface enabling supervisor to query appointment data conversationally, reducing manual data analysis time
- Led outreach campaigns coinciding with 24% increase in student engagement through targeted messaging and cross-departmental partnerships

Teacher Naturalist

Ozark Natural Science Center • 2023–2025

- Delivered 200+ environmental education programs to 1,000+ students (grades 5-6) and community members, translating complex ecological concepts into accessible hands-on learning experiences
- Established standardized reporting systems for project tracking and coordination

Graduate Teaching Assistant – Human Physiology

University of Arkansas Biology Department • 2019–2023

- Ranked in top 10% of instructors for eight consecutive semesters based on student evaluation metrics
- Taught scientific communication, data collection methods, and analytical reasoning through semester-long research projects

Information Services Technician & Supervisor

University of Arkansas Information Technology Services • 2014–2019

- Led and trained team of 30+ student employees per semester, developing operational procedures and documentation to improve service efficiency
- Built strong client relationships through effective problem-solving and technical communication with diverse stakeholders

SELECTED PROJECTS

Capstone: Spatial Matching: Convolutional Neural Networks for Causal Evaluation of Wildlife Crossing Structures | Python, Machine Learning, Causal Inference

- Developed novel two-stage spatial matching framework combining propensity score matching (PSM) and convolutional neural networks (CNN) to evaluate causal impact of wildlife crossing structures on vehicle-wildlife collisions in Colorado
- Estimated treatment effects using stacked difference-in-differences log-linear regression with site and pair-year fixed effects, finding wildlife crossings associated with 30-40% reduction in roadkill within 0-2km of crossing structures
- Demonstrated that CNN-based spatial matching identifies more ecologically credible counterfactuals than PSM alone, advancing methodological approach to causal inference in environmental policy evaluation

Arkansas Game and Fish Commission—Capital Investment Analysis | Python, Causal Inference, Consulting

- Conducted causal inference study analyzing relationship between capital investment in river access facilities and visitor utilization patterns across Arkansas river systems
- Provided statistical recommendations on data collection protocols enabling future evidence-based investment decisions for maximizing public access and conservation outcomes
- Delivered final report and methodology to agency leadership for implementation in long-term planning

Multi-Source Economic Recovery Analysis | Python, APIs, Statistical Modeling, Data Visualization

- Integrated 3 government APIs (Bureau of Labor Statistics, Census Bureau, Federal Reserve) to analyze post-pandemic economic recovery across 7 metropolitan areas
- Built automated ETL pipeline using pandas for data transformation, handling different API schemas, and calculating derived metrics including recovery indices and correlation matrices
- Performed time-series analysis, correlation analysis, and regional benchmarking to identify economic recovery patterns and regional disparities

Agricultural Crisis Response Analysis | Python, Statistical Analysis, Geospatial Visualization

- Analyzed \$3.3 billion in USDA Farm Service Agency payments across 722,109 transactions and 104,450 recipients to assess 2020 COVID-19 and trade war impacts on Iowa agriculture
- Engineered features including crisis payment classification and temporal binning to identify that emergency relief peaked in Q3 while traditional payments concentrated in Q4 post-harvest
- Created geospatial visualizations with county-level mapping using proportional pie charts to reveal spatial concentration patterns, identifying Sioux County as receiving 4 of 6 individual payments exceeding \$1 million
- Cleaned and validated large-scale government dataset, resolving data quality issues including missing values, administrative splits, and inconsistent program year coding

PUBLICATIONS

Craig, C.A., Seither, B., & **Tipton, Z.** (in preparation). Climate resources for outdoor recreation and tourism on the Ozark Natural Scenic Riverways. Manuscript in preparation.

Tipton, Z., Hyunseok, J., Young, T., Park, D. (in preparation). Spatial Matching: Convolutional Neural Networks for Causal Evaluation of Wildlife Crossing Structures. Manuscript in preparation.

Tipton, Z. (2023). Patterns in Winter Stonefly Distribution Along a River Continuum and Land-Use Gradient in Northwest Arkansas Streams. Graduate Theses and Dissertations Retrieved from <https://scholarworks.uark.edu/etd/5103>

Feng, T., **Tipton, Z.**, Xia, L., Chang, Y. (2019). Evaluation of CORDEX regional climate models in simulating extreme dry spells in Southwest China. *Frontiers in Earth Science*, 7(294). Doi: 10.3389/feart.2019.00294

Tipton, Z., Wood, L.S., Savin, M., Runkle, B.R. (2018). Soil organic carbon and mineralization rates at the Woolsey Wet Prairie Mitigation site in Fayetteville, Arkansas. *Discovery: The Student Journal of Dale Bumpers College of Agriculture, Food and Life Sciences*, 19(1), 71-80. Undergraduate honors thesis.

CERTIFICATIONS

Google Project Management Professional Certificate, Coursera, January 2025