

Zachary A. Kraehling

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RESEARCH INTERESTS

Data science, machine learning, network science, anomaly detection, and information theory, with specific interests in structural transitions in complex networks, entropy-based signal detection, and information-theoretic methods applied to large-scale graph data.

EDUCATION

- **Boston University** Boston, MA & Remote
Master of Science in Applied Data Analytics *June 2020 – May 2025*
 - Coursework: Analysis of Algorithms, Machine Learning, Data Mining, Database Management, Data Engineering
- **The Ohio State University** Columbus, OH
Bachelor of Arts in Economics *August 2016 – May 2019*
 - Cum Laude
 - Cofounder and President, Sports Analytics Society

PUBLICATIONS & WORKING PAPERS

Kraehling, Z. A. (under review). Entropy-based Indicators of Critical Transitions in Power-Law Networks Under Progressive Node Removal. *Network Science* (Cambridge University Press). Preprint:
<https://www.researchsquare.com/article/rs-9204974/v3>

- Develops an EWMA-smoothed successive KL divergence signal between adjacent empirical degree distributions to detect structural transitions under targeted and random node removal in power-law networks.
- Validated on the CAIDA AS-level Internet topology dataset; establishes a monotonic decrease result for targeted removal and identifies configuration model baseline inflation attributable to structural churn from hard degree-sequence constraints.

RESEARCH EXPERIENCE

- **Early Exits in College Football** (*working title*)
Research Collaborator, with Prof. Trevon D. Logan (Ohio State University; NBER Research Associate) *2018 – 2019*
 - Collected and assembled player-level panel data spanning multiple years and conferences; performed systematic name-based record matching and cross-year verification to resolve entity linkage across datasets.
 - Estimated probit and linear regression models to analyze player exit and transfer outcomes; results contributed to the empirical core of the project.
 - Primary writing contributor to the introduction, analysis, and conclusion sections of the manuscript.
 - Invited to co-authorship by Prof. Logan (July 2020); findings presented to academic audiences. Project is adjacent to Prof. Logan's player valuation research covered in the *New York Times*.

CONFERENCE PRESENTATIONS

Kraehling, Z. A. and Logan, T. D. [2019]. "Early Exits in College Football." Eastern Economic Association Annual Conference, New York, NY.

PROFESSIONAL EXPERIENCE

- **Fortitude Reinsurance** Nashville, TN
Investment Analytics Associate *August 2023 – Present*
 - Designed and implemented interest rate scenario generation engines using Python, SQL, and AWS for actuarial reserving workflows.
 - Built Streamlit dashboards for spread data validation within externally projected asset cash flow pipelines.
 - Engineered scalable, fully documented and tested Python modules supporting dynamic cash flow projection datasets.

- Delivered analytics pipelines consumed by actuarial and investment teams in quarterly and annual reserving processes.

• Clearwater Analytics

Boise, ID

Client Servicing Analyst

December 2021 – August 2023

- Validated investment datasets against cash flow predictions and third-party custody data to ensure accuracy and reliability of financial reporting.
- Authored standard operating procedures for quarterly investment accounting reporting projects.
- Reconciled transactions and positions of investment portfolios using data from third-party providers, maintaining data integrity across systems.
- Advised insurance clients on GAAP accounting, performance metrics, compliance, and risk reporting.
- Integrated alternative investments, including limited partnerships, into client reporting workflows.

OPEN SOURCE CONTRIBUTIONS

• full-fred

Python · PyPI

Author & Maintainer

github.com/zachary-kraehling/full-fred

- Designed and published a Python library providing a complete interface to the Federal Reserve Bank of St. Louis (FRED) macroeconomic data API.
- Accumulated 220,000+ downloads on PyPI; adopted by academic researchers, quantitative analysts, and software engineers.
- Architected modular, fully tested codebase with automated CI/CD publishing pipelines and comprehensive documentation.

• CVXPY

Python

Contributor

github.com/cvxpy/cvxpy

- Contributed code quality improvements to CVXPY, a widely used Python library for convex optimization modeling.
- Reduced validation code complexity, clarified error messages for end users, and improved maintainability through NumPy API modernization.

• QuantLib

C++

Contributor

github.com/lballabio/QuantLib

- Contributed to a quantitative finance library with 420,000+ lines of C++ code, used globally for derivatives and fixed income modeling.
- Expanded test coverage and implemented default settlement day logic for overnight-indexed swaps.

TECHNICAL SKILLS

• Languages: Python, C++, SQL, Bash

• Technologies: GNU/Linux, PostgreSQL, Git, AWS, Redshift, MongoDB, DBT, Apache Spark, Palantir Foundry, Streamlit

• Quantitative Methods: Statistical modeling, hypothesis testing, time series analysis, machine learning, information-theoretic methods, interest rate modeling, cash flow projection