

Ziyao (Richard) Cui

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EDUCATION

Duke University

Durham, NC

Bachelor of Science in Computer Science

Expected May 2026

- GPA: 4.0
- Majors: Computer Science (Artificial Intelligence and Machine Learning Concentration), Statistical Science (Data Science Concentration), Economics (Minor)
- Honors: The Phi Beta Kappa Honor Society, Dean's List with Distinction
- Courses: Machine Learning Theory & Algorithm, Real Analysis, Bayesian and Modern Statistics

PUBLICATIONS

- Ziyao Cui. Characteristic Optimal Power Flow in AC Power Networks with High Penetrations of Intermittent Power Sources. 2021 International Conference on Communications, Information System and Computer Engineering (CISCE). May 2021.
10.1109/CISCE52179.2021.9445880

PUBLICATIONS IN PREPARATION

- Data Buyer Privacy with Time Series Data (to be submitted to International Conference on Very Large Data Bases)
 - **Ziyao Cui**, Minxing Zhang, Jian Pei
- Revisiting Broken Windows Theory with Causal Inference (to be submitted to Harvard Data Science Review)
 - **Ziyao Cui**, Erick Jiang, Nicholas Sortisio, Haiyan Wang, Eric Chen, Cynthia Rudin
- Spatio-Temporal Interpolation with Multi-layer Perceptron (to be submitted to ACM Transactions on Spatial Algorithms and Systems)
 - Minxing Zhang, **Ziyao Cui**, Liang Zhao
- Regularized Spectral Biclustering (to be submitted to Conference on Neural Information Processing Systems)
 - **Ziyao Cui**, Chris Kan, Edric Tam

RESEARCH AND PROFESSIONAL EXPERIENCE

Research on Data Buyer Privacy with Time Series

May 2024 – Present

Student Researcher

Durham, NC

- Advisor: Professor Jian Pei, Duke University
- Design and implement an attacker model in Python aimed at attacking the data buyer's true purchase intent in a time series given the buyer's privacy-preserving published purchase intents over the time period.
- Leverage Hidden Markov Model and Reinforcement Learning techniques to extract temporal relationships within data buyer's purchase intents and develop holistic learning by taking into account both preceding and succeeding behaviors of the data buyer.
- Adapt the proposed attacker model to predict a person's precise location given a time series of the person's published region.

Outlier AI

May 2024 - Present

Coding Expert and Reviewer

Remote

- Craft and answer questions in Python and Java related to computer science in order to help train AI models.

- Evaluate and rank code generated by AI models to help cutting-edge generative AI models write better code, and review responses by other analysts.

Shanghai Research Institute of Computing Technology Co.

May 2024 - August 2024

Research Product Development Intern

Remote

- Designed and developed feedback models for health monitoring devices.
- Conducted comprehensive research on health monitoring equipment, analyzing data and refining design strategies.
- Gathered insights from over 80 health monitoring devices across 16 domestic and international companies to optimize model performance and enhance device feedback mechanisms.

Research on Factors of Perceived and Actual Crime

January 2024 – Present

Student Researcher

Durham, NC

- Advisor: Professor Cynthia Rudin, Duke University
- Enrolled in Duke course CS 474: Data Science Competition.
- Presented at the American Statistical Association (ASA) Joint Statistical Meetings in August 2024.
- Awarded Honorable Mention in the 2024 ASA Data Expo Challenge Professional Category.
- Explore machine learning techniques such as DBSCAN and PaCMAP to analyze national and local crime datasets, contributing insights into law enforcement strategies.
- Leverage observational causal inference techniques like Matching After Learning to Stretch (MALTS) to reassess Broken Windows Theory, evaluating its validity in actual crime, perceived crime, and inter-city differences by controlling for a significantly larger set of variables than previous works.
- Conducted in-depth variable importance analysis on a national scale and high-crime urban areas, using geospatial crime data to identify key factors influencing crime rates and perceptions.

Research on Spatio-Temporal Interpolation

November 2023 – Present

Student Researcher

Durham, NC

- Advisors: Professor Liang Zhao, Emory University; Ph.D. Student Minxing Zhang, Duke University
- Develop a framework using a multi-layer perceptron (MLP) in Pytorch with engineered spatio-temporal distance and angle to interpolate targeted index at unknown locations over a time series.
- Design an efficient uncertainty analysis of the MLP approach that takes into account both spatial and temporal aspects.

Research on Regularized Spectral Clustering for Graph Analysis

September 2023 – Present

Student Researcher

Durham, NC

- Advisor: Dr. Edric Tam, Warren Alpert Fellow at Stanford University
- Develop and implement regularized spectral biclustering methods in Python, improving the performance of spectral biclustering algorithms given high noise and missing data and providing theoretical guarantees on the robustness of such an approach.
- Read and learn about spectral clustering and biclustering, and analyze ways to improve efficiency of computation.

Duke Impact Investment Group (Duke Student Organization)

September 2022 – Present

Data Analyst

Durham, NC

- Present solutions and key insights for business problems to clients from startups, including Aquatrax, LandUp, and ClassRanked, using data analysis and data mining.
- Employ machine learning techniques such as k -fold cross-validation and Adaboost in Python to classify degraded vs. non-degraded water meters with existing meter readings.
- Develop data pipelines in SQL and Python that extract US soil data from the USDA website to store and query within Google Cloud Platform, supporting future machine learning model developments.

Duke University Patek Lab

September 2022 – January 2023

Undergraduate Research Assistant

Durham, NC

- Advisors: Professor Sheila Patek, Duke University; Ph.D. Student Sophie Hanson, Duke University
- Collected and analyzed digital high-speed image data that examined biological springs in ultra-fast movements.
- Digitized 5,000+ data points in MATLAB from high-speed kinematics videos to be used for mechanical analysis.

Independent Project on Intermittent Power Sources Efficiency

September 2019 - May 2021

Primary Researcher

Weston, MA

- Designed a novel dispatch control system and optimal power flow model to handle uncertainties and low efficiencies in intermittent power sources, and tested proposed methods using a 118-bus system in MATLAB.
- Published in 2021 International Conference on Communications, Information System and Computer Engineering by IEEE, and achieved 2020 Massachusetts Science and Engineering Fair Region V Third Place.
- Link to publication: <https://ieeexplore.ieee.org/document/9445880>

TEACHING EXPERIENCE

CS 671: Machine Learning Theory & Algorithm (Graduate)

August 2024 – December 2024

Undergraduate Teaching Assistant

Durham, NC

- Plan and lead weekly 50-student discussions of exemplary questions to supplement course material.
- Write and grade homework problems (theory and coding) to assess student understanding on machine learning topics including k-means clustering, boosting, and random forest.
- Host office hours open to 200+ students, assisting with questions from homework and lectures, and answer student questions on Ed discussion forum.
- Meeting weekly with professor and other teaching assistants to discuss course administration issues including verifying homework problems and progress made during discussion sections.

MATH 531: Real Analysis I (Graduate)

January 2025 – Present

Grader

Durham, NC

- Grade and provide feedback to weekly Real Analysis I homework problems for 20+ students.

SKILLS & INTERESTS

Languages: English, Mandarin, Spanish, German

Technical Skills: Python, LaTeX, Java, C, R, SQL, MATLAB, Excel, PowerPoint, Undergraduate Responsible Conduct of Research

Activities: HackDuke, Duke Chronicle, Duke Sports Analytics Club, Carnegie Mellon Sports Analytics Conference

Interests: Photography, Kyokushin Karate, Piano, Skiing, Soccer, Basketball, Boston Celtics

Professional Memberships: American Statistical Association (ASA), Member