David Xia

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Research Interests

Current interests include AI for science, agentic scientific design, multifidelity optimization, and learning from noisy, biased, or incomplete evaluations. Broader interests include empirical reinforcement learning and language model agents.

Education

University of Illinois Urbana-Champaign Aug 2023 - May 2027 (expected)
B.S. in Computer Science; B.S. in Mathematics; B.S. in Statistics
Champaign, Illinois · GPA 3.99 / 4.00

Publications & Papers Under Review

Designing and benchmarking agentic optimizers
First author · title withheld during double-blind review
Under review at ICLR 2027.

RSK linear operators and the Vershik-Kerov-Logan-Shepp curve
Duy Phan, **David Xia**
Authors in alphabetical order, as is standard in mathematics
Published in Electronic Journal of Combinatorics, 33(3), #P3.17, 2026. [Journal] [arXiv]

EveGuard: Defeating Vibration-based Side-Channel Eavesdropping with Audio Adversarial Perturbations
Jung-Woo Chang, Ke Sun, **David Xia**, Xinyu Zhang, Farinaz Koushanfar
Published at IEEE Symposium on Security and Privacy 2025. [IEEE] [arXiv]

Workshop Papers & Manuscripts

Frozen Policy Iteration for MDPs with Stochastic Transitions under Linear Q^π Realizability
David Xia, Ruizhong Qiu, Hanghang Tong
Manuscript, 2026. [PDF]

Predictability in Major League Sports: Betting Odds versus Mathematical Models
David Xia, AJ Hildebrand
Mathematics and Sports (MAS) Journal, 2026. Recommended for acceptance modulo minor revisions. [PDF]

Revitalizing Local Democracy: A Human-Centered Audit of LLMs in City Council Journalism
David Xia, Chris Maury
HEAL Workshop at CHI 2026. [PDF]

Research Experience

Northwestern University May 2026 - present
Advised by Prof. Zhaoran Wang

- Developed and evaluated language model agents as black-box optimizers, studying how they propose solutions, interpret evaluation results, and revise their search strategies.
- First author of a paper under review at ICLR 2027. Project details withheld during double-blind review.

iDEA-iSAIL Lab Feb 2026 - present

Advised by Prof. Hanghang Tong

- Studied sample-efficient exploration and function approximation in reinforcement learning, focusing on Markov decision processes with linearly representable policy values.
- Developed a manuscript extending Frozen Policy Iteration to stochastic transitions under linear Q^π realizability, with a sample-complexity guarantee under an additional coverage assumption.
- Currently investigating an algorithm for deterministic MDPs with improved sample-complexity guarantees, while extending the analysis to broader settings.

Illinois Geometry Lab Jan 2024 - May 2026

Advised by Prof. AJ Hildebrand

- Led a study of sports predictability, comparing betting odds, Elo ratings, polls, and statistical models. Presented at Rose-Hulman in 2024 and the Joint Mathematics Meetings in 2025.
- Paper recommended for acceptance modulo minor revisions at Mathematics and Sports (MAS).

Illinois Combinatorics Lab for Undergraduate Experience (ICLUE) Aug 2024 - May 2026

Advised by Prof. Alexander Yong

- Proved asymptotic probability bounds for Schensted insertion and RSK linear operators using the Vershik-Kerov-Logan-Shepp limit shape curve. Published in the *Electronic Journal of Combinatorics* in 2026.

Carnegie Mellon University, HCII May 2025 - Feb 2026

Advised by Prof. Jeff Bigham

- Built an LLM pipeline for city council reporting, from transcript segmentation to headline generation and topic prioritization.
- Led crowdsourced evaluation of headline quality and topic prioritization. Presented the work at the HEAL workshop at CHI 2026.

University of California San Diego Jun 2023 - Dec 2024

Advised by Prof. Xinyu Zhang

- Implemented EveGuard's domain-translation model for estimating eavesdropped audio, enabling end-to-end training of protective audio perturbations with limited data.
- The resulting system achieved over 97% protection against tested audio classifiers while preserving audio quality. Published at IEEE Security and Privacy 2025.

Teaching

Course Assistant, CS 374, UIUC Spring 2026, Fall 2026

Research Support

2025 CMU HCII REU participant, supported by NSF award 2349558
2025 ICLUE RTG participant, supported by NSF award 1937241

Relevant Coursework

Bold courses are graduate-level.
In progress (Fall 2026): Statistical Reinforcement Learning, Randomized Algorithms
CS: Machine Learning, Deep Learning, Natural Language Processing, Algorithms, Numerical Analysis, Numerical Methods
Math: Honors Real Analysis, **Algebraic Combinatorics**, Abstract Linear Algebra, Combinatorics, Graph Theory, Abstract Algebra, Complex Variables
Stats: Bayesian Analysis

Languages

English: Native
Mandarin Chinese: Fluent, HSK6