

Adam Kurth

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RESEARCH INTERESTS

With a strong foundation in mathematics and statistics, my research focuses on developing rigorous theoretical and computational methods. I am particularly interested in conformal inference and Bayesian statistics, with an emphasis on enhancing predictive modeling and uncertainty quantification. Drawing on areas such as knot theory, computational imaging, and causal inference, I seek to contribute innovative statistical methodologies that bridge theory and application.

EDUCATION

Arizona State University

Master of Science, Statistics, 4.0/4.0 – Academic Track
Bachelor of Science, Mathematics (Statistics) – Summa Cum Laude
Minor in Philosophy, 3.85/4.00

Tempe, AZ

Aug. 2023 – Present

Aug. 2021 – Aug. 2024

Scottsdale Community College

General Studies, 3.84/4.00

Scottsdale, AZ

Aug. 2020 – May 2021

East Valley Institute of Technology

Graphic Design

Mesa, AZ

2019-2020

RESEARCH EXPERIENCE

- **School of Mathematical and Statistical Sciences** Tempe, AZ
Research Assistant (as MS student) under [Dr. Eleni Panagiotou](#) *Jan. 2025 – Present*
 - Designing and implementing computational statistical methods for knot-theoretic and topological frameworks to characterize and classify protein structure-function relationships, contributing new theoretical insights into protein structure-function relationships and informing NIH-funded efforts in neurodegenerative disease modeling.
- **UGenome AI** (Remote) Tucson, AZ
Bioinformatics Intern *Nov. 2024 – Jan. 2025*
 - Developed and optimized Python-based bioinformatics pipelines for quantifying DNA and RNA mutant allele frequencies from next-generation sequencing data. Integrated statistical methods for filtering variant calling optimization strategies to enhance accuracy and sensitivity.
- **Decision Theater** Tempe, AZ
Research Aide *Aug. 2024 – Dec. 2024*
 - **[understand_nlp_sentiment_analysis](#)**: Sole researcher on podcast sentiment analysis and the important role of targeted messaging in the 2024 presidential election.
 - Enhanced research in policy initiatives by delivering presentations, drafting briefs, managing databases, executing models, and meticulously preparing materials for publication.
- **NASA Glenn Research Center (GRC)** Cleveland, OH
Internship with [CHP-PRA](#) Team *Jun. 2024 – Aug. 2024*
 - Independently designed and implemented a full NLP pipeline (supervised and unsupervised models) to classify and interpret Mars mission task data. This role provided leadership and intellectual autonomy.
 - Addressed imbalanced multi-label classification challenge by extracting maximum contextual understanding from Mars task descriptions and predicting human system task categories, ensuring comprehensive analysis.
- **Compact X-ray Free Electron Laser (CXFEL)** Tempe, AZ
Research Aide under [Dr. Sabine Botha](#) *Jun. 2024 – Aug. 2024*
 - Developed computational tools for crystallography diffraction analysis at femtosecond timescales, specializing in protein structure determination using Python and MATLAB.

- **cxls.hitfinder**: Developed a deep learning-based CNN for Bragg peak detection and parameter estimation in femtosecond crystallography beam-line data. This tool enhances structure determination accuracy and speeds data processing in X-ray free-electron laser experiments, supporting advanced protein crystallography research.
- **waterbackground.subtraction**: Engineered signal processing algorithm to optimize peak detection in varying flux conditions, improving accuracy of structure determination experiments.

PUBLICATIONS

- Zheng, Y., Reiser, M., & **Kurth, A.** (2). (in preparation). *A Monte Carlo comparison of the efficacy of Mplus, flexMIRT, PROC IRT, ltm, and mirt in IRT models estimation*. Role: Led data collection, simulation design, and comparative analysis.
This study assesses the relative estimation accuracy of leading IRT software packages, informing best practices in psychometric modeling.

CONFERENCES & PRESENTATIONS

- **NASA Human Research Program Investigator's Workshop (IWS)** – Poster, Galveston, TX Jan. 2025
Poster: Developing Natural Language Processing and Supervised Machine Learning Techniques to Classify Mars Tasks, Kurth A., Rehm H., Matar M.
- **NASA CHP-PRA Summer Student Research Discussion** – Presentation, Cleveland, OH Aug. 2024
Presentation: Using Natural Language Processing AI Tools to Analyze Mars Tasks, Kurth A., Rehm H., Matar M.
- **Biodesign Fusion Research Conference** – Poster, Phoenix, AZ Apr. 2024
Poster: Peak Intensity Analysis for Serial Femtosecond Crystallography Experiments at CXLS, Kurth A., Botha, S.
- **BioXFEL Annual Symposium** – Poster, Tempe, AZ Feb. 2024
Poster: Peak Intensity Analysis for Serial Femtosecond Crystallography Experiments at CXLS, Kurth A., Botha, S.

CONFERENCE ABSTRACTS

- Botha, S., Everett, E., Ketwala, G., **Kurth, A.** (1), Verlarde, A., Grant, T. G., Kirian, R. (2024, October). *Data Analysis Tools for the Compact X-ray Light Source and Compact X-ray Free Electron Laser Facilities at ASU*. 18th International Conference for the Crystallization of Biological Macromolecules (**ICCBM**), Tempe, AZ.
Highlighted development of computational techniques for femtosecond crystallography data analysis.
- **Kurth, A.** (1), Rehm, H., & Matar, M. (2025, January). *Developing Natural Language Processing and Supervised Machine Learning Techniques to Classify Mars Tasks*. **NASA Human Research Program Investigator's Workshop**, Galveston, TX.
Conceived and implemented NLP classification models for Mars mission data, contributing to task characterization.
- Matar, M., Rehm, H., & **Kurth, A.** (3) (2025, January). *Large language models and generative AI tools to depict human systems' contribution to spaceflight tasks execution*. **NASA Human Research Program Investigator's Workshop**, Galveston, TX.
Contributed technical insights into efforts at NASA GRC utilizing generative AI for human space flight classification.

ACHIEVEMENTS

- **2024**: Rising Star Nomination NASA GRC, Accelerated Master's Award, John W. Luttrell Children's Network Scholarship, BioXFEL Scholar.
- **2023**: Pediatric Cancer Research Foundation Survivor Scholarship, Coats & Todd Overcoming Disability Scholarship, Ruth Cheatham Foundation, HPFY Beyond Disability Scholarship.
- **2022**: Burress Family Foundation Underdog Scholarship, John W. Luttrell Children's Network Scholarship.
- **2021**: ASU Alumni Legacy Scholarship, President's List.

TECHNICAL SKILLS & INTERESTS

- **Statistics:** Distribution & Inference Theory, causal inference, Statistical Linear Models, regression analysis, analysis of variance (ANOVA), mathematical statistics, deep learning, Natural Language Processing, machine learning.
- **Mathematics:** Real Analysis, Advanced Calculus, numerical analysis, computational imaging, computational linear algebra, geometry, topology (knot theory), and symbolic logic.
- **Programming Languages:** Python, R/RStudio, Bash, Linux/Command Line (CL), MATLAB, Java, \LaTeX .
- **Technical Skills:** PyTorch, Scikit-Learn, Git/GitHub/GitLab, Sphinx/GitPages, and web development.
- **Research Interests:** Biostatistics, causal inference, medical imaging, epidemiology, epistemology, clinical decision-making, information theory, deep/machine learning.
- **Data Visualization:** ggplot2, Matplotlib, Seaborn, Plotly, Tableau
- **Soft Skills:** Public speaker and presenter in technical and non-technical settings.
- **Interests:** Classical literature, philosophical analysis, fitness, meditation.

PROJECTS

Selected GitHub Projects

Author

- **[cxls_hitfinder](#):** CNN (PyTorch) for Bragg peak detection in femtosecond crystallography (XFEL) data, improving peak identification during valuable beam-time.
- **[waterbackground_subtraction](#):** Novel signal-processing technique for high/low flux diffraction images, enhancing crystallographic peak detection.
- **[understand-astar-search](#):** A* algorithm, illustrating algorithmic efficiency and heuristic design concepts.
- **[understand-marching-cubes](#):** Demonstration of Marching Cubes for 3D medical image reconstruction
- **[understand-liver-segmentation](#):** UMAP feature extraction from DICOM images identifying organ attributes.
- **[understand-neural-networks-numpy](#):** NumPy-only neural network, illustrating ML fundamentals.
- **[understand-jockey-logistic-sim](#):** Logistic regression simulation (horse racing) to clarify model interpretation.
- **[understand-reinforcement-learning](#):** PyTorch-based RL environment (Snake game) exploring model-free RL.
- **[peak_gaussian_filter](#):** Gaussian filtering tool for CXFEL diffraction image preprocessing.
- **[unitcell_repo](#):** Regression analysis (R) on unit cell volume effects in diffraction intensity, controlling for space-group variation.

VOLUNTEERING & COMMUNITY ENGAGEMENT

- **[Starlab ExpertLink 2024](#)** – Talk, Virtual from AZ Oct. 2024
Served as a STEM expert panelist for K–12 students, focusing on sustainability, astronaut health, and NASA research initiatives. Cultivated science communication skills, contributing to early STEM education.
- **[AZBIO: Voice of the Patient](#)** – Talk, Phoenix, AZ Sep. 2024
Delivered a talk to [AZBIO Voice of the Patient](#) discussing personal health experiences in transplantation, discussing the intersection of community engagement, patient advocacy, and public health considerations.
- **ASU News: [Math and stats grad beats the odds...](#)** – Article, Tempe, AZ May 2024
Featured in ASU News discussing resilience, academic achievement in mathematics and statistics, and overcoming health challenges.
- **[APHON AZ: Patient Panel](#)** – Talk, Phoenix, AZ Apr. 2024
Spoke at the Association of Pediatric Hematology/Oncology Nurses annual conference, sharing patient perspectives and insights into healthcare outcomes research.
- **[Donate Life Arizona](#):** Tempe, AZ Sep. 2022 – present
Actively engaged in organ donation advocacy, contributing to community awareness events, educational programs, and outreach campaigns.
 - **[Campus Challenge: ASU Diablo's Club Zero](#):** Aug. 2024
Supported on-campus organ donation advocacy and information dissemination.

- **Speaker's Workshop:** Mar. 2024
Participated in sessions to refine public speaking and community education strategies.
- **Annual Fiesta Bowl Parade**
- **Donate Life AZ 2022 Calendar Feature & Interview**
Interview and featuring in Donate Life AZ annual calendar. Discussing personal story in interview format for community outreach for organ donation.
- **Monthly Volunteer Meetings**
- **Children's Organ Transplant Association:** Remote/Scottsdale, AZ Apr. 2020 – present
Organized fundraising events, including a golf tournament, to support lifelong immunosuppressant medication costs.
 - **2022 COTA Calendar** – Nov. 2022
Promotion and featuring in annual calendar by discussing personal story for community engagement for transplantation awareness.
 - ***The Mulligan* Golf Tournament** – May 2022
Main contributor in planning golf tournament operations, catering and overall planning and organization. This fundraising event was to raise money for my life-long reliance on immunosuppressant medication due to transplantation. All proceeds went to [COTA for Adam K.](#)

REFERENCES

Sally Morton, Mentor
Executive VP Knowledge Enterprise ASU
Phone: 480-965-4087
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Mona Matar, Supervisor & Mentor
Research Mathematician, NASA GRC
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Yi Zheng, P.I., Professor & P.I.
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