Anastasios N. Angelopoulos

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Education

University of California, Berkeley — Ph.D., Electrical Engineering & Computer Science
GPA: 4.00, Advisors: Michael I. Jordan, Jitendra Malik — 2019–Current

Stanford University — B.S., Electrical Engineering
GPA: 4.05 Advisors: Stephen Boyd, Gordon Wetzstein — 2016–2019

Employment

Google DeepMind — Student Researcher
Foundational Research team. Automatic large language model evaluations. — 2024–Current

USC Keck School of Medicine — Researcher
Research in ophthalmological technology. — 2019–2022

Research Summary

My research has been almost entirely devoted to a single question:

How can we build *trustworthy* systems from powerful but *untrustworthy* AI algorithms?

To address this question, I have been developing new statistical methods that anticipate and mitigate AI model failures without assumptions on the model structure. I develop formally grounded methods that provide end-to-end statistical guarantees, like Conformal Prediction [30, 22, 14, 13, 13, 20]), Prediction-Powered Inference [15, 16]), and human-preference-based evaluation [8, 7]. These methods have been applied at the national scale in several industries, including automotive collision routing, power plant automation, and frontier AI evaluations. I also maintain strong interests in imaging [22, 24, 10, 31] and healthcare [4, 23, 35].

Books

[1] **A. N. Angelopoulos**, R. F. Barber, and S. Bates. *Theoretical Foundations of Conformal Prediction*. In contract (to appear). Cambridge University Press, 2025.

[13] **A. N. Angelopoulos** and S. Bates. *Conformal Prediction: A Gentle Introduction*. Delft, Netherlands: Now Publishers, Inc., 2023.

Selected Publications

Conformal Decision Theory provides a new class of algorithms for safe decision-making under arbitrary distribution shifts. The key advance is a generalization of conformal prediction beyond prediction sets.

> J. Lekeufack*, **A. N. Angelopoulos***, A. Bajcsy*, M. I. Jordan**, J. Malik**. "Conformal Decision Theory: Safe Autonomous Decisions Without Distributions". In: International Conference on Robotics and Automation (2023). (Project website: https://conformal-decision.github.io.)

Conformal Risk Control extends conformal prediction to control any bounded, monotone risk, not just coverage.

> **A. N. Angelopoulos**, S. Bates, A. Fisch, L. Lei, and T. Schuster. "Conformal Risk Control". In: International Conference on Learning Representations (2024). Spotlight paper (top 5%).

Prediction-Powered Inference is a framework for performing valid statistical inference when an experimental dataset is supplemented with predictions from a machine-learning system. This gives a formal mathematical grounding to the use of AI-generated data in science.

> **A. N. Angelopoulos***, S. Bates*, C. Fannjiang*, M. I. Jordan*, T. Zrnic*. "Prediction-Powered Inference". In: Science 382.6671 (Nov. 2023), pp. 669-674.

Scholarships and Awards

1.	Leon O. Chua Department Award (UC Berkeley)	2024
2.	Sequoia Open-Source Software Fellowship	2024
3.	Alexey Chervonenkis Best Paper Award	2023
4.	Outstanding Graduate Student Instructor Award (Top 10%)	2023
5.	NSF Graduate Research Fellowship	2021–2024
6.	Berkeley Fellowship	2019–2021
7.	Frederick Emmons Terman Award (Top 5% of Engineering Undergraduates at Stanford)	2019
8.	Stanford University induction into Tau Beta Pi and Phi Beta Kappa	2019
9.	Stanford University Departmental Distinction in Electrical Engineering	2019
10.	US National Debate Champion, Member of US National Debate Team	2013–2016

Service

1. **Tutor** for Berkeley Underground Scholars program, 2023 and 2024. This program is building a prison-to-university pipeline and supports formerly incarcerated and justice-impacted students at UC Berkeley.
2. **Organizer** of NeurIPS Workshop on Statistical Frontiers in LLMs and Foundation Models 2024
3. **Organizer** of ICML Workshop on Distribution-Free Uncertainty Quantification 2021 and 2022
4. **Reviewer** for Annals of Statistics, Biometrika, Foundations and Trends in Machine Learning, Harvard Data Science Review, ICRA, ICML, ISMAR, JRSS-B, JMLR, L4DC, Machine Learning, Nature Methods, NeurIPS, NeurIPS ethics review, PLOS One, Scientific Reports, SIGGRAPH, and SIGGRAPH Asia
5. **Best Reviewer** for ICML 2024, **Top Reviewer** for NeurIPS 2022
6. **Program Committee** member for COPA 2023 and UAI 2023
7. **Mentor** for BAIR undergraduate mentoring program 2022 and 2023
8. **Organizer** of the International Seminar on Distribution-Free Statistics

Publications

[2] **A. N. Angelopoulos**, S. Bates, A. Fisch, L. Lei, and T. Schuster. "Conformal Risk Control". In: *International Conference on Learning Representations* (2024). Spotlight paper (top 5%).

[3] **A. N. Angelopoulos***, R. F. Barber*, and S. Bates*. "Online conformal prediction with decaying step sizes". In: *International Conference on Machine Learning* (2024).

[4] **A. N. Angelopoulos***, S. R. Pomerantz*, S. Do*, S. Bates, C. P. Bridge, D. C. Elton, M. H. Lev, R. G. Gonzalez, M. I. Jordan, and J. Malik. "Conformal Triage for Medical Imaging AI Deployment". In: *medRxiv* (2024), pp. 2024–02.

[5] V. Blot, **A. N. Angelopoulos**, M. I. Jordan, and N. J. B. Brunel. "Automatically Adaptive Conformal Risk Control". In: *arXiv preprint arXiv:2406.17819* (2024).

[6] R. S. Boger, S. Chithrananda, **A. N. Angelopoulos**, P. H. Yoon, M. I. Jordan, and J. A. Doudna. "Functional protein mining with conformal guarantees". In: *bioRxiv* (2024). In second round of review, Nature Communications.

[7] P. Boyeau, **A. N. Angelopoulos**, N. Yosef, J. Malik, and M. I. Jordan. "AutoEval Done Right: Using Synthetic Data for Model Evaluation". In: *arXiv preprint arXiv:2403.07008* (2024).

[8] W. L. Chiang*, L. Zheng*, Y. Sheng, **A. N. Angelopoulos**, T. Li, D. Li, H. Zhang, B. Zhu, M. Jordan, J. E. Gonzalez, and I. Stoica. "Chatbot arena: An open platform for evaluating LLMs by human preference". In: *International Conference on Machine Learning* (2024).

[9] S. Feldman*, B. S. Einbinder*, S. Bates, **A. N. Angelopoulos**, A. Gendler, and Y. Romano. "Conformal Prediction is Robust to Dispersive Label Noise". In: *Journal of Machine Learning Research* 25 (forthcoming 2024). Conference version appeared at Conformal and Probabilistic Prediction with Applications, 2023.

[10] A. P. S. Kohli*, **A. N. Angelopoulos***, and L. Waller. "Wavefront Randomization Improves Deconvolution". In: *arXiv preprint arXiv:2402.07900* (2024).

[11] D. T. Nguyen*, R. Pathak*, **A. N. Angelopoulos**, S. Bates, and M. I. Jordan. "Data-Adaptive Tradeoffs among Multiple Risks in Distribution-Free Prediction". In: *arXiv preprint arXiv:2403.19605* (2024).

[12] C. T. Ye, J. Han, K. Liu, **A. N. Angelopoulos**, L. Griffith, K. Monakhova, and S. You. "Leveraging uncertainty quantification in adaptive multiphoton microscopy acquisition". In: *Computational Optical Imaging and Artificial Intelligence in Biomedical Sciences*. Vol. 12857. SPIE. 2024, pp. 23–26.

[14] **A. N. Angelopoulos**, E. J. Candès, and R. Tibshirani. "Conformal PID Control for Time Series Prediction". In: *Neural Information Processing Systems*. 2023.

[15] **A. N. Angelopoulos***, S. Bates*, C. Fannjiang*, M. I. Jordan*, and T. Zrnic*. "Prediction-powered inference". In: *Science* 382.6671 (Nov. 2023), pp. 669–674.

[16] **A. N. Angelopoulos***, J. C. Duchi*, and T. Zrnic*. "`PPI++`: Efficient Prediction-Powered Inference". In: *arXiv preprint arXiv:2311.01453* (2023).

[17] **A. N. Angelopoulos***, K. Krauth*, S. Bates, Y. Wang, and M. I. Jordan. "Recommendation Systems with Distribution-Free Reliability Guarantees". In: *Conformal and Probabilistic Prediction with Applications*. Vol. 204. Alexey Chervonenkis Best Paper Award. PMLR, 2023, pp. 175–193.

[18] T. Ding, **A. N. Angelopoulos**, S. Bates, M. I. Jordan, and R. Tibshirani. "Class-Conditional Conformal Prediction with Many Classes". In: *Thirty-seventh Conference on Neural Information Processing Systems*. 2023.

[19] H. Huang*, S. Sharma*, A. Loquercio*, **A. N. Angelopoulos**, K. Goldberg, and J. Malik. "Conformal Policy Learning for Sensorimotor Control Under Distribution Shifts". In: *International Conference on Robotics and Automation* (2023).

[20] J. Lekeufack*, **A. N. Angelopoulos***, A. Bajcsy*, M. I. Jordan**, and J. Malik**. "Conformal Decision Theory: Safe Autonomous Decisions Without Distributions". In: *International Conference on Robotics and Automation* (2023).

[21] **A. N. Angelopoulos***, S. Bates*, T. Zrnic*, and M. I. Jordan. "Private Prediction Sets". In: *Harvard Data Science Review* (2022).

[22] **A. N. Angelopoulos***, A. P. S. Kohli*, S. Bates, M. I. Jordan, J. Malik, T. Alshaabi, S. Upadhyayula, and Y. Romano. "Image-to-image regression with distribution-free uncertainty quantification and applications in imaging". In: *International Conference on Machine Learning*. 2022, pp. 717–730.

[23] C. Fannjiang, S. Bates, **A. N. Angelopoulos**, J. Listgarten, and M. I. Jordan. "Conformal prediction under feedback covariate shift for biomolecular design". In: *Proceedings of the National Academy of Sciences* 119.43 (2022), e2204569119.

[24] A. P. Kohli*, **A. N. Angelopoulos***, D. McAllister, E. Whang, S. You, K. Yanny, F. M. Gasparoli, and L. Waller. "Ring Deconvolution Microscopy: An Exact Solution for Spatially-Varying Aberration Correction". In: *arXiv preprint arXiv:2206.08928* (2022). In 2nd round of review at Nature Methods.

[25] C. Lu*, **A. N. Angelopoulos***, and S. Pomerantz. "Improving Trustworthiness of AI Disease Severity Rating in Medical Imaging with Ordinal Conformal Prediction Sets". In: *International Conference on Medical Image Computing and Computer-Assisted Intervention*. Springer. 2022, pp. 545–554.

[26] S. Sankaranarayanan, **A. N. Angelopoulos**, S. Bates, Y. Romano, and P. Isola. "Semantic uncertainty intervals for disentangled latent spaces". In: *Neural Information Processing Systems* 36 (2022).

[27] K. Wang, **A. N. Angelopoulos**, A. De Goyeneche, A. P. S. Kohli, E. Shimron, S. Yu, J. Malik, and M. Lustig. "Rigorous Uncertainty Estimation for MRI Reconstruction". In: *Joint Meeting of the International Society for Magnetic Resonance in Medicine* (2022). Oral.

[28] M. A. Werner, **A. N. Angelopoulos**, S. Bates, and M. I. Jordan. "Dynamic Thresholding for Online Distributed Data Selection". In: *arXiv preprint arXiv:2201.10547* (2022).

[29] **A. N. Angelopoulos**, S. Bates, E. J. Candès, M. I. Jordan, and L. Lei. "Learn then Test: Calibrating Predictive Algorithms to Achieve Risk Control". In: *arXiv preprint arXiv:2110.01052* (2021). In second round of review at the Annals of Applied Statistics.

[30] **A. N. Angelopoulos***, S. Bates*, J. Malik, and M. I. Jordan. "Uncertainty Sets for Image Classifiers using Conformal Prediction". In: *International Conference on Learning Representations* (2021). Spotlight oral.

[31] **A. N. Angelopoulos***, J. N. P. Martel*, A. P. S. Kohli, J. Conradt, and G. Wetzstein. "Event-Based, Near-Eye Gaze Tracking Beyond 10,000Hz". In: *IEEE Transactions on Visualization and Computer Graphics* (2021). Oral at IEEEVR conference and TVCG special issue.

[32] S. Bates*, **A. N. Angelopoulos***, L. Lei*, J. Malik, and M. I. Jordan. "Distribution-Free, Risk-Controlling Prediction Sets". In: *Journal of the ACM* 68.8 (Sept. 2021).

[33] **A. N. Angelopoulos**, R. Pathak, R. Varma, and M. I. Jordan. "On Identifying and Mitigating Bias in the Estimation of the COVID-19 Case Fatality Rate". In: *Harvard Data Science Review* (Special Issue 1 2020).

[34] R. Konrad, **A. N. Angelopoulos**, and G. Wetzstein. "Gaze-Contingent Ocular Parallax Rendering for Virtual Reality". In: *ACM Transactions on Graphics (TOG)* 39.2 (2020), pp. 1–12.

[35] **A. N. Angelopoulos**, H. Ameri, D. Mitra, and M. Humayun. "Enhanced Depth Navigation Through Augmented Reality Depth Mapping in Patients with Low Vision". In: *Scientific Reports, Nature Publishing Group* 9.1 (2019), pp. 1–10.