Joshua Steier

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Research Interests

Machine Learning, Epidemiological Modeling, Game Theory, Operations Research, Cybersecurity, Biomedical Informatics

Education

Aug 2020 – Dec 2021 **M.S., Applied Mathematics & Statistics (Computational & Systems Biology)**, *Stony Brook University*

Aug 2018 – May 2020 **M.S., Physics**, *Seton Hall University*
Thesis: *Density Functional Theory Calculations of Al-doped Hafnia for Different Crystal Symmetry Configurations.*
Advisors: Stephen P. Kelty, Mehmet A. Sahiner

Aug 2014 – May 2018 **B.S., Mathematics (Minors: Computer Science, Physics)**, *Seton Hall University*

Selected Coursework

Mathematics	Real Analysis, Linear Algebra, Probability Theory, Numerical Analysis, Optimization, Partial Differential Equations
Machine Learning / Statistics	Statistical Learning, Deep Learning, Reinforcement Learning, Bayesian Inference, Causal Modeling
Physics / Modeling	Quantum Mechanics, Computational Physics, Systems Biology, Dynamical Systems

Publications (Peer-Reviewed / Institutional Reports)

2024 **Steier, J.**, Sytsma, T., Marrone, J.V., Shenk, A., Leonard, G., Grek, L. *Technological and Economic Threats to the U.S. Financial System: An Initial Assessment of Growing Risks*. RAND Corporation.

2024 van Soest, H., Arciniegas Rueda, I., Park, H.M., Spurling, B., Wyatt, A., Fine, H., **Steier, J.**, Lebret, M. *The Use of AI for Improving Energy Security*. RAND Corporation.

2024 Calengor, S., Katragadda, S.P., **Steier, J.** *Adversarial Threats in Climate AI: Navigating Challenges and Crafting Resilience*. Proceedings of the AAAI Symposium Series, 2(1), 46–53. doi:10.1609/aaaiss.v2i1.27648

2024 Robles, N.M., Alhajjar, E., Geneson, J., Moon, A., Adams, C.S., Leuschner, K.J., **Steier, J.** *Using Artificial Intelligence and Quantum Computing to Enhance U.S. Department of Homeland Security Mission Capabilities*. RAND Corporation, PE-A2890-1. Available online.

2023 Miro, M.E., Resetar, S.A., Hyde, K., **Steier, J.**, et al. *Demographic and Geographic Characteristics of Green Stormwater Infrastructure Investments in Five U.S. Cities*. RAND.

2023 Girosi, F., Katragadda, S.P., **Steier, J.**, Vardavas, R. *Using Artificial Intelligence to Generate Synthetic Health Data*. RAND Corporation, WR-A2892-1. Available online.

2022 **Steier, J.**, Hedgewald, E.V., Jacques, A., Hartnett, G., Menthe, L. *Understanding the Limits of Artificial Intelligence for Warfighters: Volume 2*. RAND.

2021 Sahiner, M.A., Vander Valk, R.J., **Steier, J.**, et al. "Identification of structural phases in ferroelectric $HfZrO_2$ by DFT-assisted EXAFS analysis." *Applied Physics Letters* 118, 092903.

2021 Howard, J.; **Steier, J.**; Haldolaarachchige, N.; Hettiarachchilage, K. "Computational Prediction of New Series of Topological Ternary Compounds LaXS." *J* 4(4):577–588.

2020 **Steier, J.** "Density Functional Theory Calculations of Al-doped Hafnia. . . ". Seton Hall University ETDs.

In Review / Under Consideration

2025 **Steier, J.** "Fibers and Gaps in Trailing Zeros of Factorials in Arbitrary Bases." Under review at *Integers*.

2025 **Steier, J.** "Ergodic Deviation–Robust Equilibrium under Mirror-Descent Learning in Finite Games." Under review at *ACM Transactions on Economics and Computation (TEAC)*.

2025 **Steier, J.** "Directed Arborescences and Sandpile Groups in Block-Constant Multigraphs: Enumeration, Algorithms, and Reliability." Under review at *Discrete Applied Mathematics*.

2024 **Steier, J.** "Enumeration of Spanning Trees in Complete Multigraphs and Hypergraphs. . . " Under review at *European Journal of Graph Theory*.

2024 **Steier, J.**, Gordon, D., Hettiarachchilage, K., Haldolaarachchige, N. "Exciting features of electronic band dispersion of IrGa and RhGa. . . " Submitted to *Physica B*.

Other Publications

2024 **Steier, J.** "Robots, drones and AI, oh my: Navigating the new frontier of military medicine" *The Hill*. [https://thehill.com/opinion/technology/4395300-robots-drones-and-ai-oh-my-navigating-the-new-frontier-of-military-medicine/]

2024 **Steier, J., Bakshi, R.** "Progress or peril? The brave new world of self-driving science labs" *The Hill*. [https://thehill.com/opinion/technology/4205109-progress-or-peril-the-brave-new-world-of-self-driving-science-labs/]

2023 **Laufer, A., Shearer, L., Steier, J.** "Bridging tech and humanity: The role of AI foundation models in reducing civilian harm" *The Hill*. [https://thehill.com/opinion/technology/4260162-bridging-tech-and-humanity-the-role-of-ai-foundation-models-in-reducing-civilian-harm/]

2023 **Steier, J., Katragadda, S.P.** "Money, markets and machine learning: Unpacking the risks of adversarial AI" *The Hill*. [https://thehill.com/opinion/finance/4176752-money-markets-and-machine-learning-unpacking-the-risks-of-adversarial-ai/]

Conference Papers & Abstracts (Selected)

2023 **Steier, J.** "Julia through the lens of Policy Analysis: Applications." *JuliaCon*, MIT.

2021 **Steier, J.**, et al. "Computational investigation of new topological candidate. . . " *APS March Meeting*, Bulletin of the APS.

2020 **Steier, J.**, et al. "DFT Calculations of Al-doped Hafnia. . . " *APS March Meeting*, Bulletin of the APS.

2019 **Steier, J.**, Lutrell, K., Saccoman, J.T. "Limit Characterizations through spanning trees in multigraphs." *AMS Meetings*.

2017 **Steier, J.**, Zigarelli, A., Giannini, E., Minimair, M. "Crime sequencing: Fighting crime with mathematics and technology." *IEEE MIT URTC*.

Talks & Presentations

2024 **Steier, J.** "Introduction to Neural Ordinary Differential Equations." Invited technical seminar, Booz Allen Hamilton, Arlington, VA.

Research Experience

2021 – 2022 **Research Assistant, The Green Lab**, *Stony Brook University*
Network-based epidemiological modeling; implementations in Python/MATLAB/Julia; HPC workflows.

2020 – 2021 **Laboratory Assistant, Renewable Energy Group**, *Brookhaven National Laboratory*
Deep learning & cybersecurity for energy storage; NLP tooling for malware analysis.

2020 – 2021 **Research Assistant, Biomedical Informatics**, *Stony Brook University*
NLP for prognosis prediction (aortic aneurysm); model compression for slide imaging.

2016 – 2020 **Research, Materials Science, Graph Theory, Applied Mathematics**, *Seton Hall University*
DFT for ferroelectrics/topological materials; algorithms for predicting new materials; senior thesis on spanning trees in multigraphs; statistical modeling for crime sprees (with South Orange PD).

Teaching Experience

Fall 2021 **Instructor, Mathematical Biology**, *Stony Brook University*
Designed/led course (60 students): epidemiology, systems biology, ecology, ODEs; assessments; coordination with TAs.

2021 **TA, Data Analytics & Visualization Bootcamp**, *Vanderbilt University*

2020 **TA, Data Analytics & Visualization Bootcamp**, *Columbia University*

2018 – 2020 **TA, Physics Department**, *Seton Hall University*
Intro physics lab & recitations; mechanics & thermodynamics.

Current Research Projects

2025 **TND–MultiRenewal**. Hierarchical renewal model for influenza/RSV/COVID-19 with (i) cross-virus interference, (ii) test-negative design (TND) observation layer, (iii) regional pooling, and (iv) neural lag-kernel estimation. Uses CDC NREVSS and FluSurv-NET/RESP-NET. *Solo design/implementation (Python/JAX); manuscript in prep. for* PLOS Computational Biology.

2025 **Spectral Deformations in Near-Extremal Kerr Black Holes**. Δ-weighted Wronskian identities giving first-order shifts of superradiant cut strength and zero-damped modes; Whittaker/NHEK inner coefficients; validated Jost-integration protocol. *Draft prepared for submission to* Phys. Rev. D.

Professional Experience (Research-Relevant)

Jan 2024 – Present **Cyber Machine Learning Engineer**, *Booz Allen Hamilton*
APT detection research (literature review + prototype NLP pipeline); Windows event-log anomaly detection (isolation forest, autoencoders).

Jan 2022 – Dec 2023 **Technical Analyst**, *RAND Corporation*
ML for climate/cyber time series; change-point detection & online learning; ML safety; geospatial visualization of climate hazards.

Apr 2021 – Dec 2021 **Laboratory Assistant**, *Brookhaven National Laboratory*
NLP tools for malware analysis; graph algorithms for detection.

Jun 2019 – Jan 2020 **Data Science Intern**, *Barnes & Noble Education*
NLP (sentiment/topic modeling) and reporting in R.

Jun 2017 – Jun 2018 **Honors Intern (Cybersecurity)**, *FBI*
Automation for large-scale IP lookups; malware analysis; network traffic analytics.

Mentorship & Supervision

2025 Mentored five junior researchers in adversarial AI and climate AI projects through Booz Allen Hamilton's AI TXG Incubator Program.

Peer Review Service

2025 Romano, M., Conversano, C., **Steier, J.** (cited), et al. *Stairway to heaven: An emotional journey in Divina Commedia with threshold-based Naïve Bayes classifier*. Machine Learning with Applications, 19, 100613. doi:10.1016/j.mlwa.2024.100613. (Served as paper reviewer; cited for prior related work.)

2025 Reviewer, *Discrete Applied Mathematics* (Elsevier) — manuscript: "A bijection between subgraphs of a cycle and differed Delannoy paths" (Furusaki, Nakano, Saito), August 2025.

2023 Reviewer, *AI4ABM@ICLR 2023* — paper: "Combining search strategies to improve performance in the calibration of economic ABMs." View on OpenReview.

2022 Program Reviewer, *PEARC '22: Practice and Experience in Advanced Research Computing* (ACM) — reviewed submissions in HPC and cyberinfrastructure.

Honors & Awards

2024 Booz Allen Hamilton, Passionate Service Award: Leading a team of data scientists and engineers to create an Extreme Heat toolkit for DoD clients

2023 RAND Corporation, Innovation Award: Bringing MLOps techniques to the RAND Corporation

2018 NASA Summer Student Fellowship, Princeton Plasma Physics Laboratory: global modeling for plasma discharges.

2016 Independent College Fund of New Jersey Research Grant: network analysis of crime sprees (with South Orange PD).

Skills

Programming Python, Julia, MATLAB, SQL, C/C++, FORTRAN

Techniques Deep Learning, Online Learning, Malware Analysis, Numerical Methods, Algorithms, MLOps

Languages

English (Native); German (Intermediate); Italian (Intermediate); Russian (Intermediate)

Citizenship

U.S. Citizen

Clearance

Secret(DoD)

References

Available upon request.