LIZZY CODA

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RESEARCH INTERESTS

My research interests are broadly in statistics and machine learning, and more specifically include dimensionality reduction, clustering, and computational methods for analyzing complex, high-dimensional data. I am interested in problems that span theory, computation, and applications. My recent work has focused on understanding the geometric structure of high-dimensional data and developing efficient and scalable algorithms for large datasets, including applications to biological data.

EDUCATION

University of California, San Diego — La Jolla, CA *Sept. 2022–Present*
Ph.D. in Mathematics with Specialization in Statistics *Expected June 2027*
M.S. in Statistics *March 2026*

Advisor: Ery-Arias Castro
Research Interests: Clustering, Manifold Learning, Dimensionality Reduction, Computational Statistics

University of California, Berkeley — Berkeley, CA *Aug. 2016–May 2020*
B.A. in Applied Mathematics and Physics

PROFESSIONAL EXPERIENCE

Institute for Defense Analyses, Center for Communications Research — La Jolla, CA *Summer 2026*
Adjunct Research Staff Member

Participated in summer research program.

Pacific Northwest National Laboratory — Seattle, WA
Data Scientist (Full-Time) *Aug. 2020–Sept. 2022*
Data Scientist (Part-Time) *Summers 2023 & 2024*

Worked on methods to produce safer and more robust deep learning models, with applications in computer vision, materials science, molecular property prediction, and radio-frequency data.

PAPERS

E. Coda and E. Arias-Castro. *Theoretical foundations of spherical ordinal multidimensional scaling.* Preprint, arXiv:2609.07852, 2026.

E. Coda, E. Arias-Castro, and G. Mishne. *Cluster and then embed: a modular approach for visualization.* Preprint, arXiv:2509.03373, 2025.

E. Arias-Castro and **E. Coda**. *An axiomatic definition of hierarchical clustering.* Journal of Machine Learning Research, 2025.

H. Kvinge, **E. Coda**, E. Yeats, D. Brown, J. Buckheit, S. Scullen, B. Kennedy, L. Truong, W. Kay, C. Joslyn, T. Emerson, M. Henry, and J. Emanuello. *Probing the limits of mathematical world models in LLMs.* ICML 2025 Workshop on Assessing World Models, 2025.

E. Arias-Castro, **E. Coda**, and W. Qiao. *Graph Max Shift: A hill-climbing method for graph clustering.* Preprint, arXiv:2411.18794, 2024.

E. Coda, B. Clymer, C. DeSmet, Y. Watkins, and M. Girard. *Universal Fourier attack for time series.* IEEE Open Journal of Signal Processing, 2024.

C. Tipton, **E. Coda**, D. Brown, A. Bittner, J. Lee, G. Jorgenson, T. Emerson, and H. Kvinge. *Haldane Bundles: A dataset for learning to predict the Chern number of line bundles on the torus.* Proceedings of the 2nd NeurIPS Workshop on Symmetry and Geometry in Neural Representations, PMLR, 2024.

T. Yin, G. Panapitiya, **E. Coda**, and E. Saldanha. *Evaluating uncertainty-based active learning for accelerating the generalization of molecular property prediction.* Journal of Cheminformatics, 2023.

E. Coda, G. Panapitiya, and E. Saldanha. *Impacts of data and models on unsupervised pretraining to support molecular property prediction.* NeurIPS Workshop on AI for Accelerated Materials Design, 2023.

M. Setzler, **E. Coda**, J. Rounds, M. Vann, and M. Girard. *Deep learning for spectral filling in radio frequency applications.* Sensor Signal Processing for Defense Conference, 2022.

E. Coda, N. Courts, L. Truong, C. Wight, W. Choi, C. Godfrey, T. Emerson, K. Kappagantula, and H. Kvinge. *Fiber Bundle Morphisms as a framework for modeling many-to-many maps.* Proceedings of Topological, Algebraic, and Geometric Learning Workshops 2022, PMLR, 2022.

L. Truong, W. Choi, C. Wight, **E. Coda**, T. Emerson, K. Kappagantula, and H. Kvinge. *Differential property prediction: A machine learning approach to experimental design in advanced manufacturing.* AAAI AI for Design and Manufacturing Workshop, 2022.

L. Zhang, E. Moges, J. Kirchner, **E. Coda**, T. Liu, A. Wymore, Z. Xu, and L. Larsen. *CHOSEN: A synthesis of hydrometeorological data from 30 intensively monitored watersheds across the US.* Hydrological Processes, 2021.

PRESENTATIONS

Talk. 9th Annual Workshop on Naval Applications of Machine Learning. *Feb. 2025*

Talk. JMM Session on Mathematical Frontiers of Data Science for National Security. *Jan. 2025*

Talk. AMS Special Session on Topological, Algebraic, and Geometric Methods for Safe, Robust, and Explainable Machine Learning. *Jan. 2025*

Poster. DIMACS Workshop on Modeling Randomness in Neural Network Training: Mathematical, Statistical, and Numerical Guarantees. *June 2024*

Poster. NeurIPS Workshop on AI for Accelerated Materials Design. *Dec. 2023*

Poster. AI/Data Informatics: Computational Model Development, Validation, and Uncertainty Quantification Poster Session, TMS Conference. *March 2023*

Talk (virtual). Sensor Signal Processing for Defence Conference. *Sept. 2022*

Talk (virtual). 6th Workshop on Geometry and Machine Learning, Computational Geometry Week. *June 2022*

Poster (virtual). ICLR Workshop on Geometrical and Topological Representation Learning. *April 2022*

Talk (virtual). University of Washington Pacific Northwest Seminar on Topology, Algebra, and Geometry in Data Science. *April 2022*

Flash talk (virtual). Novel Hypotheses to Advance Hydrological Process Understanding at the Catchment Scale Session, American Geophysical Union (AGU) Conference. *Dec. 2020*

Poster. UC Berkeley Summer Undergraduate Research Conference. *August 2018*

AWARDS

Travel Award for Workshop on Modeling Randomness in Neural Network Training *June 2024*

Sloan Scholar Fellowship *Sept. 2022*

James B. Ax Fellowship *Sept. 2022*

Percy Lionel Davis Award for Excellence in Scholarship in Mathematics *May 2020*

Koret Research Scholarship *June 2020*

Isidore Pomerantz Endowment Award *Nov. 2019*

Quantedge Award for Academic Excellence *Nov. 2019*

Bernard Fries Memorial Scholarship Fund Award *Nov. 2018*

Summer Undergraduate Research Fellowship *May 2018*

Regents and Chancellor's Scholarship *Sept. 2016*

TEACHING

Graduate Teaching Assistant — UC San Diego *Fall 2022–Fall 2026*

Math 11: Calculus-Based Introductory Probability and Statistics — Spring 2023, Winter 2024
Math 18: Linear Algebra — Fall 2022
Math 170A: Introduction to Numerical Analysis — Winter 2025
Math 180A: Introduction to Probability — Fall 2025, Fall 2026
Math 181A: Introduction to Mathematical Statistics — Spring 2026
Math 183: Statistical Methods — Fall 2023, Fall 2024, Spring 2025
Math 185: Introduction to Computational Statistics — Spring 2024, Winter 2026
Math 189: Exploratory Data Analysis and Inference — Winter 2023, Summer 2025
Math 282B: Applied Statistics — Winter 2024, Winter 2025, Winter 2026

Undergraduate Student Instructor — UC Berkeley *Fall 2019–Spring 2020*

Statistics 140: Probability for Data Science — Fall 2019, Spring 2020

Part-Time Instructor — Art of Problem Solving *May 2025–Present*

Led mathematics classes for elementary-aged students, emphasizing inquiry-driven learning and problem-solving skills.

SERVICE

UC San Diego Math Graduate Student Association *Sept. 2023–Present*

Peer Mentor — Fall 2023–Present
Survey Committee — Fall 2024–Present

Association of Women in Mathematics *Sept. 2022–Sept. 2026*

Events Coordinator — AY 2022–23
Secretary — AY 2023–24
Vice President — AY 2023–24
Chapter awarded UC San Diego School of Physical Sciences 2023 EDI Excellence Award

Volunteer — Bay Area Science in Schools *Jan. 2018–May 2020*

Volunteer — Expanding Your Horizons Conference *March 2017; March 2020*

Society of Women in Physical Sciences Coordinator *Aug. 2017–May 2018*

SKILLS

Python (NumPy, SciPy, pandas, scikit-learn, PyTorch); R (tidyverse); Java; CUDA; Git