

SULTAN DANIELS

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EDUCATION

Ph.D. Candidate, University of California, Berkeley, Electrical Engineering and Computer Sciences
Sc.B., Brown University, Computer Engineering, May 2023

RESEARCH EXPERIENCE

UC Berkeley, Berkeley, CA Aug 2023 to Present

Advisors: Anant Sahai and Gireeja Ranade

- Studying emergent capabilities in transformer-based deep learning models like in-context learning, in-weights memorization, and associative recall.
- Developing pretraining interventions that modulate the learning of emergent capabilities.
- Studying the fundamental bounds on the energetic costs of floating-point computation.

Flatiron Institute, New York City, NY June 2026 to Aug 2026

Advisor: Dmitri Chklovskii

- Studying *E. coli* and *C. elegans* chemotaxis through the lens of optimal control.

IBM Research, Yorktown Heights, NY May 2023 to Aug 2023

Mentor: Luis Lastras

- Worked to build a state-of-the-art large language model for question-answering tasks in English, French, Spanish, Portuguese, and German.

California Institute of Technology, Pasadena, CA June 2022 to Aug 2022

Advisors: Victoria Kostina, Oron Sabag

Title: Towards an Optimal Coding Scheme for MIMO Gaussian Channels with Feedback

- Worked to prove the optimality of a coding scheme proposed by Dr. Sabag for MIMO colored Gaussian communication channels with feedback.

PUBLICATIONS AND PREPRINTS

- Daniels, Sultan, Dylan Davis, Gireeja Ranade, and Anant Sahai. “Pretraining with Masked Backstories in a Toy World.” In *ICLR 2026 Workshop on Scientific Methods for Understanding Deep Learning*.
- Daniels, Sultan, Samuel H. D’Ambrosia, Michael R. DeWeese, and Anant Sahai. “The Entropy of Floating-Point Numbers.” arXiv preprint arXiv:2605.11546 (2026).
- Daniels, Sultan, Dylan Davis, Dhruv Gautam, Wentinn Liao, Gireeja Ranade, and Anant Sahai. “Emergence, pretraining loss and associative recall: a toy model.” In *ICML 2025 Workshop on Methods and Opportunities at Small Scale*.
- Daniels, Sultan, Dylan Davis, Dhruv Gautam, Wentinn Liao, Gireeja Ranade, and Anant Sahai. “Different simultaneous mechanisms for in-context recall have distinct learning dynamics.” In *3rd ICML Workshop on High-dimensional Learning Dynamics 2025*.
- Daniels, Sultan, Dylan Davis, Dhruv Gautam, Wentinn Liao, Gireeja Ranade, and Anant Sahai. “Decomposing Prediction Mechanisms for In-Context Recall.” arXiv preprint arXiv:2507.01414 (2025).

SKILLS

Programming Languages: Python, Verilog

Applications: PyTorch Lightning, NVIDIA Nsight Systems, SLURM, MATLAB

Coursework: Scalable AI, Deep Neural Networks, Machine Learning, Optimization Models in Engineering, Information Theory, Random Processes in Systems, Stochastic Calculus, Linear Systems, Randomized Numerical Linear Algebra

TEACHING EXPERIENCE

Deep Neural Networks August 2025 to December 2025

Graduate Student Instructor, UC Berkeley Electrical Engineering and Computer Sciences

- Taught two discussion sections each week covering course topics including modern optimizers (Adam, Muon), CNNs, SSMS, transformers, and generative models for 20-40 students per section.
- Assisted students with framing and scoping their open-ended research-style course projects.
- Maintained and improved course material including Jupyter notebooks and written problems.

Probability and Random Processes January 2025 to June 2025

Graduate Student Instructor, UC Berkeley Electrical Engineering and Computer Sciences

- Taught two discussion sections each week covering basic probability, Markov chains, information theory, and statistics for 10-15 students.
- Developed course material including homework and exam problems.

HONORS AND AWARDS

Hearts to Humanity Eternal Research Grant (2024), Chancellor’s Fellowship, UC Berkeley (2023), EECS Excellence Award, UC Berkeley (2023), Sigma Xi Honor Society (2022), GEM Fellowship (2022), WAVE Fellowship, California Institute of Technology (2022), Brown Undergraduate Teaching & Research Award (2021)

LANGUAGES

English: Native Language, French: Intermediate (CEFR Level B1/B2)