

Mac Lee, PhD

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Physics PhD; applied ML; statistics & optimization; high-performance computing; author of production open-source libraries (9.5M+ downloads); co-maintainer of large-scale open-source ML frameworks

Education

University of California, San Diego

October 2025

PhD in Physics, Specializing in Physical Oceanography

La Jolla, CA

- Studied ocean models using analytical methods and used Python, Rust and MPI heavily in high performance simulations. Optimized numerical convergence behavior using series acceleration methods.
- Analyzed multiple terabytes of simulation data using statistical methods and regression.
- Presented research at conferences

California State University, Northridge

May 2018

M.S. in Physics with Distinction, Specializing in Condensed Matter Theory

Northridge, CA

- Wrote high performance Python code for large scale numerical simulations. Optimized Hamiltonian generator function to achieve a 20x runtime reduction (reduced from 1 hour to 3 minutes per call). Optimized memory usage using quantum number conservation (over 250x reduction in memory use). Scientific computing on CPU clusters.
- Analyzed data from collaborators and performed visualization using linear regression and Fourier analysis
- Presented research at conferences

Experience

FastVideo

May 2026 – present

Collaborator

- Open-source inference and post-training framework for accelerated video generation; 3.5k+ GitHub stars, adopted/forked by SGLang for multimodal inference, integrated as a backend in NVIDIA Dynamo, and used by Tencent HY-WorldPlay. <https://github.com/hao-ai-lab/FastVideo>
- Co-authored commits to add a native FLUX.2 text-to-image port into FastVideo
- Ongoing work with integrating a reinforcement learning training and inference pipeline into FastVideo

University of California, San Diego

March 2022 – September 2024

Associate / Senior TA / Lab Teaching Assistant Coordinator

La Jolla, CA

- Supervised and trained lab teaching assistants and graders; held office hours; contributed to full curriculum rewrite

Projects

- Project: <https://crates.io/crates/atree>
 - An open-source high performance, arena-based tree structure with node removal written in Rust
 - Published on crates.io, downloaded over 9.5 million times, and used by C2PA, an Adobe backed non-profit organization.
- Project: <https://github.com/macthecadillac/spike-train-autoencoder>
 - Spike-Train Autoencoder - Spiking Neural Network for Image Encoding
 - A proof-of-concept image autoencoder using leaky integrate-and-fire (LIF) neuron layers, exploring how spiking neural networks can serve as biologically-grounded feature encoders
 - Encoder, decoder, and adapter trained on the STL-10 dataset with embeddings aligned to OpenAI CLIP representations
- Project: <https://github.com/macthecadillac/TFNet>
 - A reimplement of Turbulent Flow Net, a neural network that predicts PDE solutions, using PyTorch

Selected Publications

- M. Lee and S. G. Llewellyn Smith, "SQG point vortex dynamics with order Rossby corrections", *Eur. J. Mech. B Fluids* 118, 204467 (2026).
- M. Lee and S. G. Llewellyn Smith, "Stability of SQG Kolmogorov Flow", *Dyn. Atmos. Oceans*, 101680 (2026).
- M. Lee, T. R. Look, S. P. Lim, and D. N. Sheng, "Many-body localization in spin chain systems with quasiperiodic fields", *Phys. Rev. B* 96, 075146 (2017).

Awards, Grants and Honors

- 2024 Office of Naval Research Grant (University of California, San Diego)
- 2018 Mack I. Johnson Research Award for Outstanding Graduate Student in the College of Science and Mathematics (California State University, Northridge)
- 2018 C. Y. Liang Outstanding Graduate Student Award (California State University, Northridge)