ADRIAN WONG

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PROFESSIONAL SUMMARY

Research scientist with a PhD in Computational Physics specializing in time-series modeling of noisy, high-dimensional, and nonlinear systems. Expert in Monte Carlo methods, high-performance computing (C/C++), optimization, and model validation. Proven track record in developing predictive frameworks for complex dynamical systems and seeking to apply this expertise to financial markets.

EDUCATION

UNIVERSITY OF CALIFORNIA SAN DIEGO — **LA JOLLA, CA**

- *Ph.D. Physics, with specialization in Computational Science* — *December 2022*
  - **Thesis:** *Predictions of Chaotic Systems with Physical Models and Machine Learning*
- *B.S. Physics* — *June 2014*

SKILLS & CERTIFICATIONS

- Programming**:** Python (numpy and scipy), C/C++, MPI, OpenMP, MATLAB, Mathematica, UNIX/Bash.
- Quantitative**:** Time-Series Analysis, Stochastic Calculus, Data Structures and Algorithms, Numerical Linear Algebra, Information Theory (Probability and Statistics), Bayesian Inference, Monte Carlo, Mathematical Optimization, Recurrent Neural Networks, Kalman Filters.
- Certifications**:** Upstart-AI in Financial Services, Erdős Institute-Deep Learning, Erdős Institute-Quant Finance (in progress).

PROFESSIONAL EXPERIENCE

AIR FORCE RESEARCH LABORATORY — **EDWARDS AFB, CA**

Research Scientist (Applied Mathematics) — *August 2021 - Present*

- Developed data-driven predictive models for in-space propulsion devices, enabling real-time state estimation and out-of-sample forecasting of system dynamics where traditional simulations are computationally prohibitive.
- Benchmarked emerging data-driven and neural network methods for stochastic and partially observed systems, establishing trade-offs and baseline performance requirements.
- Collaborated with cross-functional teams to bridge the gap between theoretical modeling and real-world experiments, transitioning in-house data assimilation methods from prototype to deployment in experiments.
- Secured $500k+ in competitive research funding by pitching novel model development and data assimilation frameworks that integrate data-driven models into physics-based simulations.

UNIVERSITY OF CALIFORNIA SAN DIEGO — **LA JOLLA, CA**

Graduate Research Assistant (Abarbanel Research Group) — *September 2017 - December 2022*

- Proposed and developed data assimilation methods for complex and chaotic systems, improving state estimation and prediction capabilities in both model-based Bayesian inference and model-free machine learning approaches.
- Deployed Reservoir Computing for time-series forecasting of partially observed systems, optimizing architectural hyperparameters to outperform baseline LSTMs in data-constrained scenarios.
- Developed custom Monte Carlo Markov Chain optimization routines for exploring non-convex loss landscapes, ensuring robust state and parameter estimation while maintaining computational efficiency.

SAN DIEGO SUPERCOMPUTER CENTER — **LA JOLLA, CA**

Intern (High Performance Geo-Computing Laboratory) — *April 2017 – June 2017*

- Optimized petaflop-scale code using space-filling curves on finite difference stencils, improving cache efficiency and achieving significant gains in computational throughput.

LAWRENCE LIVERMORE NATIONAL LABORATORY — **LIVERMORE, CA**

Intern (Computation and High Energy-Density Physics Divisions) — *July 2016 – September 2017*

- Parallelized production-level Monte Carlo simulations using MPI, reducing runtime and enabling high-density sampling for reduced-variance statistical estimates.
- Designed an iterative convexity-enforcing algorithm for multi-source data fusion to guarantee physical constraints are met, ensuring stability of the simulation pipeline.
- Contributed to open-source mathematical libraries by implementing higher-order finite difference stencils, improving accuracy and reducing numerical dissipation of long-term simulations.

PROJECTS

ERDŐS INSTITUTE QUANT FINANCE PROJECT (IN-PROGRESS)

- *Options pricing focus (leaning towards Statistical/Volatility Arbitrage of LNG Markets)* *February 2025 – Current*

ERDŐS INSTITUTE DEEP LEARNING GROUP PROJECT

*Credit Card Fraud Detection (**1st Place**)* [GitHub] *July 2025 – September 2025*

- Built an unsupervised anomaly detection model using autoencoders on large-scale credit card transaction data.
- Achieved higher KPIs – precision (34% vs 20%) and ROC-AUC (0.81 vs 0.77) – than baseline isolation forest and Gaussian Mixture Model, while maintaining modest gains in recall.
- Implemented user identification feature that aggregates user behavior, reducing noise at the transaction level while adding yet another layer of improvement for KPIs.

HIGH-PERFORMANCE COMPUTING CLASS, FINAL PROJECT

Low-Latency AlexNet *April 2017 – June 2017*

- Implemented a pre-trained convolutional neural network (AlexNet) inference in C/C++ with a focus on HPC.
- Leveraged OpenMP SIMD vectorization to achieve <20ms inference times on CPU, optimizing for efficient processing.

PUBLICATIONS

1. **Adrian Wong**, Christine Greve, and Daniel Eckhardt. "Time-resolved data-driven surrogates of hall-effect thrusters". arXiv preprint arXiv:2408.06499, 2024.
2. **Adrian Wong**, Robert Martin, and Daniel Eckhardt. "Contraction and synchronization in reservoir systems". Physical Review E, 2024
3. Robert Martin, Christine Greve, Cesar Huerta, **Adrian Wong**, Justin Koo, and Daniel Eckhardt. "A robust time-delay selection criterion applied to convergent cross mapping". Chaos: An Interdisciplinary Journal of Nonlinear Science, 34(9), 2024.
4. Cesar Huerta, Christine Greve, and **Adrian Wong**. "Comparison of causality determination techniques in studying hall-effect thrusters". Journal of Electric Propulsion, 3(1):23, 2024.
5. Alex Tong Lin, **Adrian Wong**, Robert Martin, Stanley Osher, and Daniel Eckhardt. "Parameter inference of time series by delay embeddings and learning differentiable operators". arXiv preprint arXiv:2203.06269, 2022.
6. Jason Platt, **Adrian Wong**, Randall Clark, Stephen Penny, and Henry Abarbanel. "Robust forecasting using predictive generalized synchronization in reservoir computing". Chaos: An Interdisciplinary Journal of Nonlinear Science, 2021.
7. **Adrian Wong***, Zheng Fang*, Kangbo Hao*, Alexander Ty, and Henry Abarbanel. "Precision annealing Monte Carlo methods for statistical data assimilation and machine learning". Physical Review Research, 2(1):013050, 2020. (*shared first authorship)

PRESENTATIONS

(AFOSR = Air Force Office of Scientific Research, ARO = Army Research Office)

- AFOSR Dynamic Data and Information Processing Program Review (2023-2025)
- AFOSR Dynamical Systems and Control Theory Program Review (2022-2024)
- International Electric Propulsion Conference - **Best Paper Award** (2024)
- Joint AFOSR and ARO Workshop on Data-driven Causal Inference (2024)

INTERESTS

- Cooking, Backpacking, Woodworking, Board Games
- Volunteer: Boy Scouts Adult Leader, Animal Shelter Foster Parent