Adrian S. Wong

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Education

University of California San Diego:

PhD, *Physics (with specialization in Computational Science)*   Sept 2015 — Dec 2022
- Advisor: Henry D.I. Abarbanel
- Thesis: Predictions of Chaotic Systems with Physical Models and Machine Learning

BS, *Physics (with specialization in Computational Physics)*   Sept 2010 — June 2014

Research Experience

Air Force Research Laboratory:

Research Scientist (Applied Math)   Aug 2021 — Current
- Data-driven attractor reconstruction and analysis of Hall-Effect Thruster data (Python)
- Deploying Reservoir Computing (RC, an RNN) on experimental Hall-Effect Thruster data (Python)
- Mathematical analysis of RC using Nonlinear Dynamics and Contraction/Synchronization
- Researching methods for developing data-driven Digital Twins of physical assets
- Engaged in proposal writing and maintaining research funding
- Managed summer interns and projects

University of California San Diego:

Graduate Researcher - *Physics Department, Abarbanel Group*   Sept 2017 — Dec 2022
- Precision Annealing Monte Carlo - Proposed and developed novel model-based path integral methods for accelerated but reliable data assimilation of chaotic physical systems. (C++/Python)
- Reservoir Computing - Examining the theoretical underpinnings of model-free predictions of chaotic physical systems and its efficacy using the principles of nonlinear dynamics and synchronization. (Python)

Lawrence Livermore National Laboratory:

Intern - High Energy Physics (Iterative Implicit Monte Carlo Code)   Summer 2017
- Parallelized Monte Carlo simulation of radiation transport (C++/MPI)

Intern - Computation (Equations of State and Materials Theory Group)   Summer 2016
- Proposed and developed a convexity-enforcing algorithm to repair 'un-physical' regions of data (Python/C++)
- Adding different numerical-derivative options to open-sourced polynomial fit library (C++)

San Diego Supercomputer Center:

Intern - High Performance Computing (High Performance Geo-Computing Group)   Spring 2017
- Arranged data structures for a peta-FLOP Finite Difference code, targeting the Intel Xeon Phi architecture
- Strongly enforced data locality to minimize cache-misses (C++/OpenMP)

Publications

- **Adrian S Wong**, Robert S Martin, and Daniel Q Eckhardt. Contraction and synchronization in reservoir systems. *Physical Review E*, 2024.
- **Adrian S Wong**, Christine M Greve, and Daniel Q Eckhardt. Time-resolved data-driven surrogates of hall-effect thrusters. *Journal of Electric Propulsion* (in review), 2024.

- Robert S Martin, Christine M Greve, Cesar E Huerta, **Adrian S Wong**, Justin W Koo, and Daniel Q Eckhardt. A robust time-delay selection criterion applied to convergent cross mapping. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 34(9), 2024.
- Cesar Huerta, Christine Greve, and **Adrian S Wong**. Comparison of causality determination techniques in studying hall-effect thrusters. *Journal of Electric Propulsion*, 3(1):23, 2024.
- Alex Tong Lin, **Adrian S Wong**, Robert Martin, Stanley J Osher, and Daniel Eckhardt. Parameter inference of time series by delay embeddings and learning differentiable operators. arXiv preprint arXiv:2203.06269, 2022.
- Jason A Platt, **Adrian S Wong**, Randall Clark, Stephen G Penny, and Henry DI Abarbanel. Robust forecasting using predictive generalized synchronization in reservoir computing. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 31(12), 2021.
- **Adrian S Wong***, Zheng Fang*, Kangbo Hao*, Alexander JA Ty, and Henry DI 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 Dynamical Systems and Control Theory Program Review	2024
Joint AFOSR and ARO Workshop, Data-driven Causal Inference	2024
AFOSR Dynamic Data and Information Processing Program Review	2024
International Electric Propulsion Conference - **Best Paper Award**	2024
AFOSR Dynamical Systems and Control Theory Program Review	2023
AFOSR Dynamic Data and Information Processing Program Review	2023
AFOSR Dynamical Systems and Control Theory Program Review	2022
AFOSR Dynamical Systems and Control Theory Program Review	2022

*AFOSR - Air Force Office of Scientific Research; ARO - Army Research Office

Teaching Experience

University of California San Diego:

Teaching Associate (Physics Department)   Summer 2020
- Designed curricula for an introductory but intensive physics class for 200 students
- Adapted class format to constraints related to COVID-19-induced remote teaching

Teaching Assistant (Physics Department, Mathematics Department)   Sept 2015 — June 2021
- Taught in lower division, upper division, and advanced graduate level classes
- Lead up to 8 junior teaching assistants and organized class activities

Graduate and Undergraduate Projects

Reproduction of AlexNet with Pre-trained Weights (Team, C/C++, OpenMP):	June 2017
Bifurcation Analysis of Inverted Pendulum with Oscillating Pivot (MATLAB):	March 2016
Equation of State Calculations of Non-ideal Gases (Team, C/C++, CUDA):	June 2014
Path Integral Monte Carlo Simulation of Harmonic Oscillator Dynamics (Team, C/C++):	May 2014
Simulation of the Galaxy Collisions (Team, C/C++, OpenACC):	March 2014