# Sunil Madhow

San Diego, CA | smadhow@ucsd.edu | 805-729-7120 | linkedin.com/in/sunil-madhow

github.com/SunilMadhow

## Interests and Goals

To solve realistic learning tasks, good algorithms must constantly re-evaluate which data are relevant to the prediction problem *at hand*. For example, in non-parametric estimation problems, it is typically necessary to adaptively resize the context window around each feature to attain optimal performance. The unifying goal of my work so far is to figure out how to deal with data that move in exotic and unpredictable ways. More generally, I am interested in developing practical algorithms that adapt to the statistical quirks of real world data and ultimately meet the acid test of successful deployment in industry.

## Education

**University of California, San Diego**, PhD @ Halıcıoğlu Data Science Institute 2024-

**University of California, Santa Barbara**, MS in Computer Science 2022-23

- GPA: 3.96/4.0

**University of California, Santa Barbara**, BS in Computer Science 2019-22

- GPA (Major GPA): 3.93(3.98)/4.0

**Selected Coursework:** Online Learning, Mathematical Deep Learning, High-Dimensional Statistics, Mathematical Statistics, Numerical Linear Algebra, Real Analysis, Complex Analysis, Advanced Linear Algebra, Formal Logic, Stochastic Processes, Game Theory, Control Theory, Information Theory, Randomized Algorithms, Spectral Graph Theory, Post-Quantum Cryptography, Advanced Operating Systems, Statistical Learning Theory, Machine Learning

## Experience

**Staff Asscociate Researcher**, UC Santa Barbara 2023-24

- Developed **AKORNs**, a performant, parameter-free algorithm for non-parametric regression. See project description below.

**Web Development Intern**, GLEN World 2021

- Javascript + React development for GLEN World, a non-profit educational platform designed to increase global literacy.
- Implemented various front-end features in interactive learning games.

## Papers/Projects

**Offline Reinforcement Learning with Adaptively Collected Data** arxiv.org/abs/2306.1406

- Derived bounds on sample complexity for offline policy learning and evaluation, including minimax optimal bounds.
- Key question: how to deal with an offline dataset where distribution can drift arbitrarily?
- Project served as Master's Defense in 2023.
- Published in *Learning for Dynamics and Control Conference 2025*.

**AKORNs: Adaptive Knots generated Online for RegressioN splines**

github.com/SunilMadhow/AKORN

- Designed provably optimal *online* prediction algorithm for sequences coming from higher-order TV class.
- Proposed AKORNs: a reduction of knot selection online change-point detection, leading to the first explicit knot selection algorithm with provable guarantees.
- AKORNs is parameter-free, meaning it is one of the only algorithms for non-parametric regression that attains optimal rates without oracle tuning of a hyperparameter.
- AKORNs competes with SOTA (Trend Filtering) in empirical experiments

- Paper submitted for publication in 2025

## Papers

S. Madhow, D. Qiao, M. Yin, and Y.-X. Wang. Rates for offline reinforcement learning with adaptively collected data. In *Learning for Dynamics and Control*, 2025. Previously appeared in NeurIPS Workshop for Offline RL
S. Madhow, D. Baby, and Y.-X. Wang. Akorn: Adaptive knots generated online for regression splines. In *ICML*, 2025

## Programming Languages

**Languages:** Python (pytorch, numpy, pandas, sklearn), C, C++, OCaml, Java, Javascript, React