Dian Jin

djin38@wisc.edu | dianjin-frederick.github.io | Madison, WI
linkedin.com/in/dian-jin-751992176

Machine learning for intelligent robotics, with emphasis on predictive world models, multimodal foundation models, robot learning, manipulation, and planning.

Education

University of Wisconsin–Madison
Ph.D. in Electrical and Computer Engineering, Minor in Computer Science. Expected May 2028

University of Wisconsin–Madison
Master of Arts in Mathematics. May 2023

Soochow University
Bachelor of Science in Mathematics. June 2022

Publications

Jin, Dian, and Jeremy Coulson. "On the Sensitivity of the Subspace Predictor to Behavioral Perturbations." IEEE Control Systems Letters, 2026.

Jin, Dian, and Jeremy Coulson. "Online Subspace Learning on Flag Manifolds for System Identification." Proceedings of the 8th Annual Learning for Dynamics and Control Conference (L4DC), PMLR 331:2138–2150, 2026.

Wang, Haixin, Xinlong Yang, Jianlong Chang, **Dian Jin**, Jinan Sun, Shikun Zhang, Xiao Luo, and Qi Tian. "Parameter-Efficient Tuning of Large-Scale Multimodal Foundation Model." Advances in Neural Information Processing Systems 36 (2023): 15752–15774.

Selected Research Projects

Predictive World Models and Robot Learning for Manipulation 2026–Present

- Developed a robotic manipulation framework that learns local trajectory representations as structured predictive models of robot behavior, integrating graph-based motion planning, context-aware behavior selection, and constrained predictive control in MuJoCo.
- Increased MuJoCo Reacher task success from 71.5% to 95.6% across 1,000 matched trials versus a rank-matched trajectory-selection baseline, using sub-centimeter average tracking error as the success criterion.
- Reduced median online inference and control computation by 41.5% (59.5 to 34.8 ms) by caching local latent trajectory models and replacing repeated full-dataset searches with efficient context-conditioned model selection.
- Extended the framework to contact-rich MuJoCo Pusher manipulation, learning action priors from offline demonstrations to guide planning and predictive control without online teacher access.

Parameter-Efficient Learning for Multimodal Foundation Models 2021–2023

- Developed a parameter-efficient adaptation framework for large vision–language models using low-rank tensor factorization, reducing trainable parameters by over 99.9% while matching or surpassing full fine-tuning across six multimodal benchmarks.
- Designed context-enhancement and gated query-transformation modules for cross-modal representation alignment, evaluated on image–text retrieval, video–text retrieval, and visual question answering, and achieved state-of-the-art performance among frozen-backbone methods.

Online Learning of Predictive Dynamics Models 2023–2025

- Developed an online learning framework for adapting low-dimensional predictive models of time-varying dynamical systems from streaming trajectory data.
- Formulated model adaptation and complexity selection as optimization over nested latent trajectory subspaces on flag manifolds, enabling simultaneous tracking of multiple model capacities without prior knowledge of system order.
- Reduced mean squared prediction error by 36.4% versus non-adaptive baselines on autoregressive benchmarks by ensembling predictions from learned models of different dimensions.

Selected Research Projects (continued)

Robustness and Error Bounds for Learned Dynamics Models 2025–2026

- Derived explicit prediction-error bounds for learned trajectory models of dynamical systems, establishing local Lipschitz robustness with respect to errors in learned latent behavior subspaces.
- Characterized how observability, geometric representation error, and matrix conditioning determine the sensitivity of downstream predictions to model-estimation errors.
- Reduced median theoretical bound magnitude by 91.2% relative to a prior certificate across 137 simulated systems and 50 noise levels, using exact subspace distances in one-step prediction evaluations.

Technical Skills

Programming Languages: Python, C++, MATLAB, R, Bash, SQL

Machine Learning: PyTorch, scikit-learn, Hugging Face Transformers, FAISS, multimodal learning, representation learning, parameter-efficient fine-tuning

Robotics and World Modeling: Predictive world models, robot learning, manipulation, motion planning, trajectory learning, model predictive control, MuJoCo, Isaac Sim, ROS, Gymnasium

Optimization and Scientific Computing: CVXPY, Pymanopt, NumPy, SciPy, Pandas, convex optimization, optimization on manifolds

Development Tools: Git, Linux, Jupyter, LaTeX

Languages: English, Chinese, Japanese

Teaching and Outreach Experience

Academic Content Creator 2020–Present

Bilibili

- Designed and delivered 60+ online lectures on Bilibili with 100K+ total views on graduate-level mathematics, covering mathematical foundations of machine learning, optimization, and deep learning.
- Developed an open-source, LaTeX-based problem set that enables learners to edit personalized technical exercises.

Teaching Assistant, Introduction to Optimization 2025

University of Wisconsin–Madison

- Supported instruction in convex optimization through student mentoring, technical explanation, and assessment of theoretical assignments.

Volunteer, Engineering Expo 2024

University of Wisconsin–Madison

- Communicated engineering and research concepts to community members with varied technical backgrounds to promote engagement with STEM.

Selected Technical Talks

Online Subspace Learning on Flag Manifolds for Time-Varying Systems. ECE Research Seminar, University of Wisconsin–Madison.

Contraction Theory for Nonlinear Dynamical Systems. ECE Research Seminar, University of Wisconsin–Madison.

Construction of the Wiener Integral and Markov Properties of Brownian Motion. Probability and Analysis Seminar, University of Wisconsin–Madison.

L^2 **Spherical and Ball Averages of Fourier Transforms of Measures.** Analysis Seminar, University of Wisconsin–Madison.