Darshan Gadginmath

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Education

University of California Riverside 2020 - present
Ph.D. in *Mechanical Engineering* Riverside, CA

Visvesaraya Technological University 2014 - 2018
Bachelor of Engineering in *Electrical and Electronics Engineering* Bengaluru, India

Experience

Research Intern Sep 2024 - Dec 2024
Honda Research Institute - US San Jose, CA

- Developed an active inverse reinforcement learning framework to infer human intentions in collaborative environments using information maximization (under review at IROS '25)
- Created a comprehensive simulation environment in MetaDrive with diverse human driving models to evaluate human-robot interaction strategies and trajectory planning algorithms

Graduate Student Researcher Oct 2020 - present
University of California, Riverside Riverside, CA

- Designed dynamics-aware diffusion models that incorporate physical constraints for more effective planning in nonlinear control tasks
- Designed a probability density transport algorithm for nonlinear systems using nonlinear diffusion models and demonstrated safe robotic planning in cluttered environments
- Developed a novel data-driven predictive controller for nonlinear systems based on feedback linearization using the Koopman operator

Teaching Assistant Jan 2022 - March 2022
University of California, Riverside Riverside, CA

- Robotic planning and kinematics (ME145): graph-based search algorithms, motion planning
- Security and reliable control systems (ME223): fault diagnosis and tolerance, attack detection

Research Assistant Jun 2018 - Aug 2020
Indian Institute of Science Bengaluru, India

- Developed a provably safe and data-guided trajectory planner for autonomous vehicles at intersections.
- Implemented a distributed control algorithm on a team of m3pi ground robots for coverage control.

Publications

Journal articles

[1] C. De Persis, **D. Gadginmath**, F. Pasqualetti, and P. Tesi. "Feedback Linearization through the Lens of Data". In: *IEEE Transactions on Automatic Control (under review)* (2025).

[2] K. Elamvazhuthi, **D. Gadginmath**, and F. Pasqualetti. "Score Matching Diffusion Based Feedback Control and Planning of Nonlinear Systems". In: *IEEE Transactions on Automatic Control (under review)* (2025).

[3] M. Sung, **D. Gadginmath**, F. Nawaz, D. Isele, and S. Bae. "Neural-Network Guided Interactive Motion Planning for Autonomous Driving". In: *IEEE Transactions on Intelligent Vehicles (under review)* (2025).

[4] **D. Gadginmath**, V. Krishnan, and F. Pasqualetti. "Data-driven feedback linearization using the Koopman generator". In: *IEEE Transactions on Automatic Control* 69.12 (2024), pp. 8844–8851.

Conference proceedings

[1] **D. Gadginmath**, F. Nawaz, M. Sung, D. Isele, S. Bae, F. Pasqualetti, and J. D'sa. "Active probing with multimodal predictors for motion planning". In: *IROS, Hangzhou, China (under review)* (2025).

[2] **D. Gadginmath** and F. Pasqualetti. "Dynamics-aware Diffusion Models for Planning and Control". In: *Conference on Decision and Control, Rio De Janeiro, Brazil (under review)* (2025).

[3] **D. Gadginmath**, S. Tripathi, and F. Pasqualetti. "Fusing Multiple Algorithms for Heterogeneous Online Learning". In: *American Control Conference (ACC), Denver, CO (To appear)* (2025).

[4] F. Nawaz, M. Sung, **D. Gadginmath**, J. D'sa, D. Isele, S. Bae, et al. "Graph-based Path Planning with Dynamic Obstacle Avoidance for Autonomous Parking". In: *Intelligent Vehicles Symposium, Cluj-Napoca, Romania (to appear)* (2025).

[5] K. Elamvazhuthi, **D. Gadginmath**, and F. Pasqualetti. "Denoising Diffusion-Based Control of Nonlinear Systems". In: *63rd IEEE Conference on Decision and Control (CDC), Milan Italy* (2024).

[6] C. De Persis, **D. Gadginmath**, F. Pasqualetti, and P. Tesi. "Data-Driven Feedback Linearization with Complete Dictionaries". In: *62nd IEEE Conference on Decision and Control (CDC)*. IEEE. 2023.

[7] **D. Gadginmath**, V. Krishnan, and F. Pasqualetti. "Direct vs indirect methods for behavior-based attack detection". In: *2022 IEEE 61st Conference on Decision and Control (CDC)*. IEEE. 2022, pp. 7090–7096.

[8] **D. Gadginmath** and P. Tallapragada. "Data-guided distributed intersection management for connected and automated vehicles". In: *2022 American Control Conference (ACC)*. IEEE. 2022, pp. 767–774.

Technical skills

Preferred languages and ML tools: Python, PyTorch, Jax, C++, Matlab, CasADi

Simulations tools: MetaDrive, MuJoCo, ROS

Research expertise: Diffusion models, Motion planning, Nonlinear control theory, Optimization

Talks

Probabilistic Perspective for Interpretable AI — Los Angeles
Cyber-Physical Systems Symposium, University of Southern California — September, 2024

Probabilistic Methods for Control and Optimization — Riverside, CA
Summer lecture series, UC Riverside — June, 2024

Denoising Diffusion Models for Nonlinear Control — Los Angeles, CA
Southern California Control Workshop, UCLA — April, 2024