

ADWAIT V. DATAR

Postdoctoral Researcher

Hamburg, Germany | Date of birth: 10 July 1991

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RESEARCH PROFILE

My research spans information geometry, control theory, and optimization, with an increasing interest in learning and control of dynamical systems. My current work concerns natural-gradient optimization and Wasserstein-geometric approaches to divergence and regularization. I also investigate how policy architectures affect the performance and robustness of embodied agents whose policies are learned through reinforcement learning, with a longer-term view toward robotic applications.

EXPERIENCE

Postdoctoral Researcher

Institute for Data Science Foundations, TU Hamburg

Jul 2023–Present
Hamburg, Germany

- Develop theory at the interface of information geometry and learning, including natural-gradient optimization and Wasserstein-geometric regularization for learning and control.
- Co-author of work published at *ICML*, *JMLR*, *TMLR*, and *SIAM Journal on Scientific Computing*; teach and supervise across machine learning, information geometry, mathematics for machine learning.

Doctoral Researcher + Postdoctoral Researcher

Institute of Control Systems, TU Hamburg

Nov 2016–Jun 2023
Hamburg, Germany

- Developed modular methods for distributed control of heterogeneous multi-vehicle systems, using robust-control tools and integral quadratic constraints to analyze uncertain cooperative dynamics; doctorate defended in November 2022.
- Coauthor of work published at *IEEE TAC*, *ACC*, *ECC*, and *CDC*;
- Planned and supervised the development of an indoor multi-quadrotor laboratory, coordinating equipment selection, hardware setup, and student contributions; guided the implementation of distributed source-seeking algorithms.
- Contributed technical material and preliminary results to the successful Phase 2 proposal for DFG Priority Programme 1914 on cyber-physical networking.

Research Engineer

Mercedes-Benz R&D India / Daimler R&D

Jul 2012–Aug 2014
Pune, India / Stuttgart, Germany

EDUCATION

Dr. rer. nat. (PhD)

TU Hamburg

Distributed Control of Multi-Vehicle Systems Using Modular Architectures.

Supervisor and first examiner: Prof. Herbert Werner.

Other examiners: Prof. Peter J. Seiler and Prof. Marko Lindner.

2022

Hamburg, Germany

MSc, Mathematical Modelling in Engineering (MathMods)

University of L'Aquila, University of Hamburg, Gdańsk University of Technology

Europe

Joint Erasmus Mundus programme; thesis at the University of Stuttgart.

2016

BE, Mechanical Engineering

University of Pune

2012
Pune, India

TEACHING AND SUPERVISION

- Currently delivering tutorials for **Mathematics for Machine Learning** (winter 2026–27); previously delivered tutorials for **Information Geometry** (summer 2026, 2025), **Machine Learning I** (summer 2025, 2024, 2023) and **Machine Learning II** (winter 2024–25, 2023–24)
- Delivered **Machine Learning II** lectures and theoretical tutorials in winter 2025–26, using materials developed jointly with Nihat Ay and Manfred Eppe in earlier cohorts.
- Delivered tutorials for **Optimal and Robust Control** (2018–2023), **System Identification** (2022, 2019, 2018), and **Control Systems Theory and Design** (2018); produced reusable and recorded teaching material.
- Supervised or co-supervised **20 bachelor's and master's students**, including four ongoing theses, alongside student projects; six supervised projects led to peer-reviewed publications in control theory, data-driven control, and robotics.
- Advised doctoral researchers informally on research questions, proof development, and theoretical analysis, including work leading to joint publications.
- Delivered an industry tutorial on integral quadratic constraints for IAV GmbH.

SELECTED RECENT
RESEARCH OUTPUTS

1. **A. Datar** and N. Ay. “Convergence Properties of Natural Gradient Descent for Minimizing KL Divergence.” *TMLR*, 2025. [\[link\]](#)
2. **A. Datar** and N. Ay. “Wasserstein KL-Divergence for Gaussian Distributions.” *Geometric Science of Information*, 2025, pp. 91-101. [\[link\]](#)
3. **A. Datar** and N. Ay. “Information Geometry for Wasserstein KL Divergence of Gaussian Measures on $\mathbb{R}^n$.” Under review at *Information Geometry*; arXiv:2503.24022, v3, 2026. [\[link\]](#)
4. V. Stein, **A. Datar**, and N. Ay. “Well-Posed KL-Regularized Control via Wasserstein and Kalman-Wasserstein KL Divergences.” *Proceedings of the 43rd International Conference on Machine Learning*, PMLR 306:115711-115746, 2026. [\[link\]](#)
5. C. Datar, **A. Datar**, F. Dietrich, and W. Schilders. “Systematic Construction of Continuous-Time Neural Networks for Linear Dynamical Systems.” *SIAM Journal on Scientific Computing* 47(4), 2025. [\[link\]](#)
6. N. Ay, J. van Oostrum, and **A. Datar**. “On the Natural Gradient of the Evidence Lower Bound.” *JMLR* 26, 2025. [\[link\]](#)
7. **A. Datar**, C. Hespe, and H. Werner. “Robust Performance Analysis of Cooperative Control Dynamics via Integral Quadratic Constraints.” *IEEE Transactions on Automatic Control* 70(1), 2025. [\[link\]](#)

COMMUNICATION
AND OPEN
RESEARCH

- Presented natural-gradient research at [FDIG 2025](#), [University of Tokyo](#), and at TU Hamburg’s [Mathematics of Machine Learning 2025](#) conference.
- Contributed to [WiMAS](#), open-source wireless multi-agent simulation software, and produced [Tutorial recordings](#) and experimental robotics demonstrations.

TOOLS AND
LANGUAGES

Tools: Python, MATLAB, LaTeX.

AI-assisted work: Claude Code and OpenAI Codex to support research and teaching activities.

Languages: English (C1), German (B1), Marathi (native).