

Pratik Chaudhari

September 22, 2024

Work Address

200 S 33rd St,
Moore Building 201,
University of Pennsylvania,
Philadelphia, PA. 19104.
Email: pratikac@seas.upenn.edu
Website: <https://pratikac.github.io>

APPOINTMENTS

University of Pennsylvania, Philadelphia, PA

Assistant Professor of Electrical and Systems Engineering (ESE) (Aug 2019-); Assistant Professor of Computer and Information Sciences (CIS) (Aug 2019-); Core faculty of the General Robotics, Automation, Sensing and Perception (GRASP) Laboratory, Applied Mathematics and Computational Sciences (AMCS) graduate group, the Penn Institute for Computational Science (PICS), Center for AI-enabled Systems: Safe, Explainable, and Trustworthy (ASSET), and Center For AI And Data Science For Integrated Diagnostics (AI2D).

Amazon Web Services, Palo Alto, CA

Visiting Academic (March 2021-)

Amazon Web Services and California Institute of Technology, Pasadena, CA

Senior Applied Scientist at AWS (Oct 2018 - Aug 2019); Post-doctoral scholar in Computing and Mathematical Sciences (CMS) at Caltech (Oct 2018 - Aug 2019)

NuTonomy Inc. (now Hyundai-Aptiv Motional), Cambridge, MA

Principal Autonomous Vehicle Engineer (2014-2016)

Singapore-MIT Alliance for Research and Technology (SMART) Urban Mobility

Visiting Researcher (2011-2013)

EDUCATION

University of California, Los Angeles, CA

PhD in Computer Science (2018)

Advisor: Stefano Soatto

Thesis: A picture of the energy landscape of deep neural networks

Committee: Arash Amini (UCLA), Stanley Osher (UCLA), Fei Sha (USC), Ameet Talwalkar (CMU)

Massachusetts Institute of Technology, Cambridge, MA

Engineer (2014) and Master's (2012) degrees in Aeronautics and Astronautics

Advisor: Emilio Frazzoli, Laboratory of Information and Decision Systems (LIDS)

Theses: Algorithms for autonomous urban navigation with formal specifications (2014),

Sampling-based algorithms for state estimation (2012)

Indian Institute of Technology Bombay, India

B. Tech in Aerospace Engineering (2006-2010)

Advisors: Hemendra Arya, Bhartendu Seth

Thesis: Design and stabilization of a one legged hopping robot (2010)

AWARDS

2022 Best Paper at the workshop on “Out of Distribution Generalization in Computer Vision” at ECCV

2022 Intel Rising Star Faculty Award

2022 National Science Foundation CAREER Award

2021 NeurIPS Outstanding Reviewer Award

2020 Amazon Web Services Machine Learning Research Award (AWS MLRA)

2018 Northrop Grumman Outstanding PhD research award

2014 Balu and Mohini Balakrishnan fellowship, UCLA

2013 Most societally beneficial video at International Joint Conference of Artificial Intelligence (IJCAI)

2010 Patricia and David Voss Foundation fellowship, MIT

2010 Institute Silver medal for academic performance

2010 Aeronautical Society of India award

RESEARCH GRANTS

2024 - 27 5G Enabled Real-Time Digital Twins of Dynamic Construction Sites (NSF; \$500K; PI)

2023 - 24 The Internet of Things for Precision Agriculture (NSF ERC; ~\$113K; PI Cherie Kagan ESE)

2023 - 28 AI Institute for Artificial and Natural Intelligence (ARNI) (NSF, Lead Columbia University; ~\$200K for 23-25)

2023 - 28 Integrated Quantum-Inspired Photonic Solver (DARPA; ~\$735K; co-PI; PI Firooz Aflatooni ESE)

- 2022 - 27 Imaging the Functional Response of the Lung to Bronchoscopic Lung Volume Reduction (NIH; ~\$145K; Senior Investigator; PI Rahim Rizi Radiology)
- 2022 - 26 MoDL: Occam's Razor in Deep and Physical Learning (NSF; \$1.2M; PI)
- 2022 - 27 Foundations of Small Data (NSF CAREER; \$549K; PI)
- 2022 - 26 Robotics, Science and Technology for Forestry (NSF NRI/USDA; \$1M; PI)
- 2022 - 25 An Information Geometric Understanding of Deep Learning (ONR; \$406K; PI)

Gifts and Internal Grants

- 2024 AI2D: Center For AI And Data Science For Integrated Diagnostics (\$150K; PI)
- 2022 Bridging the disparities in diagnostic models of neurological disorders (AWS credits; \$81K; PI)
- 2022 The Geometry of Learnable Tasks (Amazon; \$135K; PI)
- 2022 Calibrated Machine Learning Methods for Mobile Health Interventions (ASSET Center Penn; \$100K; co-PI; PI Ian Barnett Biostatistics)
- 2022 Principles of Neuromorphic Representation Learning (Intel Rising Star faculty award; \$50K; PI)
- 2021 Precise Diagnostics and Interpretable Treatment for Clinical Neuroscience (AWS credits; \$46K; PI)
- 2021 An Information Geometric Understanding of Deep Learning (Amazon; \$70K; PI)
- 2021 Addressing the Heterogeneity in Medical Data to Provide Accurate and Personalized Predictions (Center for Undergraduate Research and Fellowships CURF Penn; \$8K; PI)
- 2020 Offline and Off-Policy Reinforcement Learning (Amazon Machine Learning Research Award; \$135K; PI)
- 2020 Rapid Autonomous Navigation in Complex Unstructured Environments (General Electric Research; \$25K; PI)

SERVICE

Community

- 2024 Area Chair, International Conference of Learning and Representations (ICLR)
- 2023 Organized the "New Frontiers in Learning, Control, and Dynamical Systems" workshop at ICML
- 2022- Area Chair, Asian Conference of Machine Learning (ACML)
- 2022 Organizer of the Winter School on "Quantitative Systems Biology" at the International Center for Theoretical Physics (ICTP) in Trieste, Italy
- 2020 Organized the "Deep Learning through Information Geometry" workshop at NeurIPS
- 2020 Program committee of Learning for Dynamics and Control (L4DC)
- 2019 Organized the North-East Robotics Colloquium (NERC) at the University of Pennsylvania

Department and University

- 2022 Organizer of the Electrical and Systems Engineering Colloquium Series
- 2020- Organizer of the "GRASP on Robotics" Seminar Series

2021-22 Graduate Admissions Committee, Electrical and Systems Engineering, Penn
2019 Graduate Admissions Committee, Electrical and Systems Engineering, Penn
2016 Graduate Admissions Committee, Computer Science, UCLA

Proposal Review Panels

National Science Foundation, Army Research Office, Swiss National Science Foundation, European Research Council

Referee

Machine Learning, Optimization, Computer Vision Conference on Learning Theory (COLT), International Conference on Artificial Intelligence and Statistics (AISTATS), International Conference on Machine Learning (ICML), Neural Information Processing Systems (NeurIPS), International Conference on Computer Vision (ICCV), Transactions of Pattern Analysis and Machine Intelligence (PAMI), Neural Information and Processing Systems (NeurIPS), Uncertainty in Artificial Intelligence (UAI), International Conference of Learning and Representations (ICLR), Journal of Selected Topics in Signal Processing (J-STSP), Applied and Computational Harmonic Analysis (ACHA), Journal of Machine Learning Research (JMLR), Transactions of Machine Learning Research (TMLR), International Joint Conferences on Artificial Intelligence (IJCAI), MDPI Entropy, Optimization Methods and Software, Neural Networks, SIAM Journal of Imaging Sciences, Nature Machine Intelligence, Proceedings of the National Academy of Sciences (PNAS), Science

Robotics, Control International Conference of Robotics and Automation (ICRA), International Conference of Intelligent Robots and Systems (IROS), Robotics and Automation Letters (RA-L), International Conference on Cyber-Physical Systems (ICCPS), Conference on Decision and Control (CDC), International Federation of Automatic Control (IFAC), Transactions on Aerospace and Electronic Systems (TAES), Transactions of Automatic Control (TAC), Control Systems Letters (CSL), Learning for Dynamics & Control Conference (L4DC), International Journal of Robotics Research (IJRR)

INVITED TALKS AND SEMINARS

2024

1. University of Texas Austin ML Seminar (Oct);
2. Georgia Tech ML Center (Oct);
3. RIKEN Center for Advanced Intelligence Project in Tokyo (Feb);
4. Penn Center for Biomedical Image Computing & Analytics (Jan);

2023

1. Johns Hopkins University (Dec);
2. Lehigh University (Oct);
3. University of Delaware (Sept);
4. Visiting the Santa Fe Institute (July);

5. University of Maryland Robotics Center Symposium (May);
6. Robotics Seminar, Stanford University (May);
7. Intel (May);
8. University of California Berkeley (May);
9. Department of Statistics, University of California Los Angeles (May);
10. Autonomy Talks Series, ETH Zurich (April);
11. Invited Symposium Speaker, American Physical Society (March Meeting);
12. Information Theory and Applications (Feb);

2022

1. Institute of Science and Technology (IST) Austria (Dec);
2. “Winter School on Quantitative Systems Biology” at the International Center for Theoretical Physics (ICTP) in Trieste, Italy (Dec);
3. National University of Singapore (Dec);
4. Halicioğlu Data Science Institute, University of California San Diego (Nov);
5. Biomedical Engineering, Rowan University (Oct);
6. Computer Science, North Eastern University (Oct);
7. Institute for Mathematics and its Applications, University of Minnesota (Oct);
8. Computer Science, Boston University (Oct);
9. ASSET Seminar Series, University of Pennsylvania (Sept);
10. Johns Hopkins University MINDS Seminar (Sept);
11. NSF Workshop on Foundations of Machine Learning and Its Applications for Scientific Discovery in Physical and Biological Systems (June);
12. Conference on the Mathematics of Complex Data, KTH (June);
13. MURI on Semantic Information Pursuit, Johns Hopkins University (Apr);
14. European Laboratory for Learning and Intelligent Systems (ELLIS) (Apr);
15. Arizona State University (Apr);
16. University of Southern California (Apr);
17. Brigham Young University (March);
18. University of Delaware (Feb);
19. The College of New Jersey (Jan);
20. Institute of Pure and Applied Mathematics at UCLA (Jan);

2021

1. Banff International Research Station for Mathematical Innovation and Discovery (BIRS) and Casa Matemática Oaxaca (CMO) (Oct);
2. Ottawa University (Sept);
3. Brigham Young University (Feb);
4. Vellore Institute of Technology (March);
5. Max Planck Institute Mathematics in the Sciences and UCLA Joint Seminar Series (May);
6. University of Minnesota Machine Learning Summer Camp for high-school students (July);
7. Penn Rising Scholar Success Academy for high-school students (July);
8. Carnegie Mellon University (July);

9. Attended the Santa Fe Institute Working Group on Dynamics of the Off Equilibrium Brain (July);

2020

1. Conference on Computational and Methodological Statistics (Dec);
2. Workshop on Individual Vehicle Autonomy: Perception and Control at IPAM, UCLA (Oct);
3. Workshop on Equivariance and Data Augmentation (Sept);
4. Joint Structures and Common Foundations of Statistical Physics, Information Geometry and Inference for Learning, Les Houches (July);
5. Flatiron Institute (June);
6. Yahoo Research (May);
7. Optimal transport and applications to machine learning and statistics workshop, MSRI UC Berkeley (Apr);
8. PDE and Inverse Problem Methods in Machine
9. Learning Workshop, IPAM UCLA (Apr);
10. GRASP Seminar Series, Penn (Apr);
11. Electrical Engineering Department, IIT Bombay (Jan);
12. Statistical Physics of Machine Learning, International Center of Theoretical Sciences, ICTS, Bangalore (Jan);

2019

1. “At the Crossroad of Physics and Machine Learning” workshop at Kavli Institute for Theoretical Physics at UCSB (Jan);
2. “Physics meets Machine Learning” Workshop at Microsoft Research (Apr);
3. Amazon Machine Learning Conference (July);
4. Vanguard (Sept);
5. Computational Neuroscience Initiative Seminar at Penn (Oct);
6. Lecture in course on Mathematics of Deep Learning at Johns Hopkins University (Nov);

2018

1. Data Science Seminar University of Minnesota (Oct);
2. Theory of Deep Learning Workshop & Geometry in Machine Learning Workshop, ICML (July);
3. Towards learning with limited labels: Equivariance, Invariance, and Beyond, ICML (July);
4. SIAM Imaging Sciences Bologna (June);
5. Aptiv/Delphi Advanced Research Division (May);
6. JHU Electrical and Computer Engineering (Apr);
7. Annual Cognitive Science Symposium, UCLA (Apr);
8. Microsoft Research New England (Apr); Mechanical Engineering MIT (Apr);
9. Electrical and Systems Engineering & Computer Science and Information Systems, University of Pennsylvania (Mar);
10. Bio-Medical Engineering, JHU (Mar);
11. Inverse problems in machine learning, Caltech (Feb);

12. New Deep Learning Techniques, Institute of Pure and Applied Mathematics IPAM (Feb);
13. Electrical Engineering Department (UCLA);
14. Aerospace Engineering, Georgia Institute of Technology (Feb);
15. Electrical and Computer Engineering, UCLA (Feb);
16. Computer Science, USC (Feb);
17. Graduation Day Talk at Information Theory and Applications (Feb);
18. University of Cambridge (Jan);

2017

1. Tutorial on Deep Learning, Control and Decision Systems (Dec);
2. Level set seminar, Institute of Pure and Applied Mathematics, IPAM (Nov);
3. Asilomar Conference on Signals and Systems (Oct);
4. Deep learning for Computer Vision, Schloss Dagstuhl Workshop (Sep);
5. Ecole Normale Supérieure, Cachan (May);
6. French Institute for Research in Computer Science and Automation INRIA (May);
7. Human Genetics Foundation, Politecnico di Torino (May)
8. Electrical Engineering and Computer Science, MIT (Mar);
9. Information Theory and Applications (Feb);
10. Computer Science, Stanford University (Feb);
11. Amazon Web Services (Feb);
12. OpenAI (Feb);
13. Level Set Seminar, Institute of Pure and Applied Mathematics, UCLA (Feb);
14. Department of Statistics, UCLA (Jan);

2016

1. Computer Science, New York University (Dec);
2. Lecture in course on Machine Vision, UCLA (Nov);
3. Lecture in course on Advanced Machine Learning Topics, UCLA (Feb);
4. Automatic Control Laboratory, Royal Institute of Technology KTH (Apr 2014);

RESEARCH ADVISING

Post-doctoral Scholars

- 2023 - Yan Sun (with Edgar Dobriban in Wharton and Ian Barnett in Biostatistics)
- 2024 - Daniel Gehrig (with Kostas Daniilidis in CIS)

Doctoral students

- 2019 - Jialin Mao (AMCS; BS NYU Shanghai)
- 2019 - Rahul Ramesh (CIS; BTech, MTech IIT Madras)
- 2020 - Rubing Yang (AMCS; BS Tianjin Univ.)
- 2021 - Christopher Hsu (ESE; MS Penn; BS Villanova)
- 2022 - Fanyang Yu (BE, co-advised with Christos Davatzikos in Radiology; MS UIUC; BS Shanghai Jiao Tong)

- 2022 - Rohit Jena (CIS, co-advised with Jim Gee in Radiology; MS CMU; BTech IIT Bombay)
- 2022 - Dexter Ong (CIS, co-advised with Vijay Kumar in MEAM; BE NUS Singapore)
- 2022 - Yifei Shao (CIS, co-advised with Vijay Kumar in MEAM; MS Michigan; BE Cooper Union)
- 2022 - Keshava Katti (ESE, co-advised with Deep Jariwala in ESE; NSF GRFP; BS Penn)
- 2023 - Ke Xu (CIS; BS UC Irvine)
- 2023 - Amrut Nadgir (Physics, co-advised with Vijay Balasubramanian in Physics; NSF GRFP; BS UC Berkeley)
- 2024 - Richeek Das (CIS; BTech IIT Bombay)
- 2024 - Zhaoze Wang (ESE; MS Penn; BS Boston Univ.; co-advised with Vijay Balasubramanian in Physics)
- 2024 - Shreyam Mishra (ESE; BTech IIT Bombay; co-advised with Christos Davatzikos in Radiology)

Doctoral Alumni

- 2019 - 23 Yansong Gao (PhD AMCS; BA Shanghai Jiao Tong; Title: An Information-Geometric Picture of the Space of Tasks; Committee: Kostas Daniilidis, Vijay Balasubramanian, Weijie Su; Now at Tiktok)
- 2019 -2024 Rongguang Wang (ESE, co-advised with Christos Davatzikos in Radiology; MEng. Cornell; BEng Univ. of Nottingham; Title: Fair and Generalizable Machine Learning Models for Neuroimaging; Next to Oracle)

Master's students

- 2022 - 23 Wei-Kai Chang (Scientific Computing → Purdue CS PhD)
- 2022 - 23 Daiwei Chen (ESE → Wisconsin EE PhD)
- 2022 - 23 Haoran Tang (CIS → Purdue CS PhD)
- 2022 - 22 Yingtian Tang (CIS → EPFL Neuroscience PhD)
- 2021 - 22 Megharjun Nanda (Robotics)
- 2022 - 22 William Qian (CIS, Physics, now at Path.AI → Harvard Physics PhD)
- 2020 - 21 Sebastian Peralta (ESE, Physics & Robotics, now at Amazon)
- 2019 - 20 Xiaoyi Chen (CIS & MNT, now at Nuro AI → Nirva Labs)
- 2019 - 20 Christopher Hsu (ESE, co-advised with George J. Pappas, now at Army Research Laboratories → Penn ESE PhD)
- 2019 - 20 Ashish Mehta (Robotics, now at Qualcomm)
- 2019 - 20 Wenbo Zhang (Robotics, co-advised with Kostas Daniilidis, now at Grayscale AI)

Master's Independent Study Wendy Zhu, Jack Swift (Summer 23); Zhifei Shen (Spring 22); Yu Xuan Zhu, Zhijie Qiao (Spring 21); Shiyun Xu (Fall 20); Shuzhan Yang (Spring 20)

Other undergraduate and Master's students whom I have mentored: Beiming Li (→ Penn PhD), Aditya Singh (→ UMich PhD), Shaoting Peng (→ UIUC PhD), Shaoming Zheng (→ Imperial PhD), Harsh Goel (→ USC PhD), Guneet Dhillon (→ Oxford PhD), Haoxiang You (→ Yale PhD), Manav Vora (→ UIUC MS), Lisho Pan (→ Brown PhD), Alexandra Shaw (→ Cambridge MPhil), Shiyun Xu (→ Penn PhD), Saumya Shah (→ Skydio)

Undergraduate theses

- 2023 - Siming He (CS & MNT, Robotics)
 - 2022 - 23 Bill Lu (CS, Robotics)
 - 2022 - 22 William Qian (CIS, Physics, → Path.AI → Harvard Physics PhD)
 - 2020 - 21 Sebastian Peralta (ESE, Physics & Robotics, now at Amazon → Google)
- Reader for Fiona Luo (CS, Robotics; 2025), Justin Qiu (CS; 2025)

Undergraduate Research Programs

CURF Common Research Grant Siming He (22-23), Bill Lu (23), Emily Paul (21), Kaya Panchanathan (21), Parsa Idehpour (24)

Vagelos Integrated Program in Energy Research (VIPER) Alicia Sun (23), Alan Zhu (23), Yu Cao (22), Suhaila Shankar (22-23), Anirudh Cowlagi (21-22), Andrew Zhu (21), Yitzy Tanner (22-23, Vagelos Molecular Life Sciences, co-advised with Vijay Balasubramanian), Andrew Zhu (21), Adithya Selvakumar (24), Ming Qi (24)

Penn Undergraduate Research Mentoring Program (PURM) Siming He (22), Aalok Patwa (22), Max Wang (22), Evan Si (21)

Google Explore Undergraduate Research Abigail Li (20), Angela Lin (20), Alexandra Shaw (20)

First-year exposure to STEM Brian Lu (22)

NSF Research Experience for undergraduates Yazlin Moujalled (24)

Undergraduate Independent Study Siming He (Spring 22); Andrew Zhu (Spring 21); Nikhil Ramesh, Arun Kirubarajan, Rahul Maganti (Spring 20)

Undergraduate Senior Design

- 2022 - 23 DeepDerma: An Acne Severity Classification and Recommendation System; Rohil Sheth, Andrew Zhu, Colin Hosking, Ryan Tong and Micherice Tao (Best paper at the Andrew Memorial Sage Competition)
- 2021 - 22 BoomBoat: A multi-robot automated oil spill containment solution; Andrew Garrett, Justin Duhamel, Adam Liang, Zachary Goldberg, Jason Freidman (Honorable mention at the SAGE conference, Technology Integration Award)
- 2021 - 22 MAMMO DL: Mammographic Breast Density Estimation using Federated Learning; Aprupa Alahari, Angelina Heyler, Keshava Katti, Ramya Muthukrishnan, Michael Sanborn (Societal Impact Award)
- 2021 - 22 DarkMode: Computer Vision Algorithms for Event-Based Cameras Applied to Autonomous Low-Light Driving; Anish Neervannan, Vinay Senthil, Neil Chitalia, Keshav Vedula, Phil Sieg (Frederick Ketterer Award)
- 2020 - 21 Jazz-O-Matic: Signal processing and ML to generate novel jazz solos; Bhaskar Abhiraman, Samuel Pfrommer, Alex Xu, and Jason Kaufmann, (Judge's Choice Award)
- 2020 - 21 GRASPer: An autonomous drone for cleaning up litter; Kishlaya Sharma, Aditya Hota, Zhifei Shen, Pranav Panganamamula (SAGE conference entry, Frederick Ketterer Award)
- 2019 - 20 Infinity Glove: A unique haptic glove for the gaming industry; Ryan Galvankar, Saurin Patel, Nicholas Parkes, Yonah Mann

2019 - 20 Vitruvian: Personal Training App; Chloe Dietz, Ajmain Hossain, Halil Can Memoglu, Abraham Milhem

Visiting Researchers

2019 - 20 Marco Maggipinto (PhD candidate in Computer Information Sciences, University of Padova)

Doctoral thesis committees

- Ashwin De Silva (BME Johns Hopkins)
- Tom Zhang (CIS)
- Chenyuan Wu (CIS)
- Shiyun Xu (AMCS)
- Xu Liu (MEAM)
- 2024 Zhijian Yang (AMCS; Title: Analyzing Disease Heterogeneity via Weakly-Supervised Deep Learning; Now at GE Healthcare)
- 2024 Seungwon Lee (CIS, Title: Deep Lifelong Learning with Factorized Knowledge Transfer)
- 2023 Sifan Wang (AMCS, Title: Physics-Informed Machine Learning: Theory, Algorithms and Applications; Now at Meta)
- 2023 Ian Miller (ESE, Title: A Robot's Search for Meaning: Semantics as a Common Representation for Heterogeneous Robot State Estimation and Collaboration. Now at Burro Robotics)
- 2023 Xiwen Liu (ESE, Title: Compute-In-Memory on Emerging Memory Technology: From Device to Algorithm. Now Asst. Prof. at Hong Kong University of Science & Technology)
- 2023 T. Turner Topping (MEAM, Title: Compositional Methods for Agile Quadrupedal Behaviors. Now at Ghost Robotics)
- 2022 Connor Brennan (Neuroscience, Title: Computation from noisy dynamics. Now postdoc at MILA)
- 2022 Tahiya Salam (ESE, Title: Learning Environmental Models with Multi-Robot Teams Using a Dynamical Systems Approach. Now at Vian Inc.)
- 2022 Jorge A. Mendez (CIS, Title: Lifelong Machine Learning of Functionally Compositional Structures. Now postdoc at MIT)
- 2022 Dushyant Sahoo (ESE, Title: Extracting Generalizable Hierarchical Patterns of Functional Connectivity in the Brain. Now at JP Morgan Chase)
- 2022 Nikolaos Kolotouros (CIS, Title: Reconstructing 3D Humans From Images. Now at Google)
- 2022 Yibo Yang (MEAM, Title: Deep Learning and Uncertainty Quantification: Methodologies and Applications. Now at Meta)
- 2021 Matthew O'Kelly (ESE, Title: Accelerated Risk Assessment and Domain Adaptation for Autonomous Vehicles. Postdoc at MIT → Now at Waymo)
- 2021 Arbaaz Khan (ESE, Title: Graph Convolutions for Teams of Robots. Rivian → Now at Amazon)
- 2021 Ke Sun (ESE, Title: Stochastic motion planning for mobile robots. Now at Zoox)
- 2021 Kuk Jung (ESE, Title: Computer-aided Clinical Trials for Medical Devices. Now postdoc at Penn)

- 2021 Clark Zhang (ESE, Title: Machine Learning for Robot Motion Planning. Now at Nuro.AI)
 2020 Achin Jain (ESE, Title: Methods for Data-Driven Model Predictive Control. Now at Amazon Web Services)
 2020 Matteo Terzi (CS, Title: Learning interpretable representations for classification, anomaly detection, human gesture and action recognition, University of Padova. Now postdoc at University of Padova)

Qualifying Exam Committees

2024: Lyra Zhornyak, Wen Jiang; **2023:** Zirui Zang; **2022:** Tom Zhang, Anish Bhattacharya, Xinyi Chen, Seungwon Lee, Rahul Ramesh, Nikolaos Kolotouros, Jason Ma, Mostafa Ismail; **2021:** Kelvin Ng, Yinshuang Xu; **2020:** Nofel Yaseen, Jorge Mendez, Carlos Esteves; **2019:** Ty Nguyen, Stephen Phillips.

TEACHING

ESE 546 Principles of Deep Learning ([Syllabus](#), [Notes](#))

ESE 650 Learning in Robotics ([Syllabus](#), [Notes](#))

PUBLICATIONS AND PREPRINTS

Google Scholar profile: https://scholar.google.com/citations?user=c_z5hWEAAA&hl=en&oi=ao.
 Citations: 4447, h-index: 24

Selected publications

- Mao, J., Griniasty, I., Teoh, H. K., Ramesh, R., Yang, R., Transtrum, M., Sethna, J. P. & Chaudhari, P. The Training Process of Many Deep Networks Explores the Same Low-Dimensional Manifold. Proceedings of the National Academy of Sciences (PNAS) (2024)
- Ramesh, R., Bisulco, A., DiTullio, R. W., Wei, L., Balasubramanian, V., Daniilidis, K. & Chaudhari, P. Many Perception Tasks Are Highly Redundant Functions of Their Input Data. arXiv preprint arXiv:2407.13841 (2024)
- Yang, R., Mao, J. & Chaudhari, P. Does the Data Induce Capacity Control in Deep Learning? in Proc. of International Conference of Machine Learning (ICML) (2022)
- Gao, Y. & Chaudhari, P. An Information-Geometric Distance on the Space of Tasks in Proc. of International Conference of Machine Learning (ICML) (2021)
- Chaudhari, P., Choromanska, A., Soatto, S., LeCun, Y., Baldassi, C., Borgs, C., Chayes, J., Sagun, L. & Zecchina, R. Entropy-SGD: Biasing Gradient Descent into Wide Valleys in Proc. of International Conference of Learning and Representations (ICLR) (2017)

All publications

*, ** Equal Contribution

† Journal Articles

All entries below have proceedings and have been peer-reviewed (except arXiv preprints and editorials). These manuscripts have also been presented and reviewed at non-archival workshops, which are not mentioned.

- Student authors at the University of Pennsylvania were mentored
1. • † Sun, Y., Chaudhari, P., Barnett, I. J. & Dobriban, E. A Confidence Interval for the ℓ_2 Expected Calibration Error. arXiv preprint arXiv:2408.08998 (2024)
 2. • Ramesh, R., Bisulco, A., DiTullio, R. W., Wei, L., Balasubramanian, V., Daniilidis, K. & Chaudhari, P. Many Perception Tasks Are Highly Redundant Functions of Their Input Data. arXiv preprint arXiv:2407.13841 (2024)
 3. • † Liu, T. Y., Marchi, M., Ramesh, R., Chaudhari, P., Tabuada, P. & Soatto, S. Taming AI Bots: Controllability of Neural States in Large Language Models. arXiv preprint arXiv:2305.18449 (2023)
 4. • † Liu, X., Lei, J., Prabhu, A., Tao, Y., Spasojevic, I., Chaudhari, P., Atanasov, N. & Kumar, V. SlideSLAM: Sparse, Lightweight, Decentralized Metric-Semantic SLAM for Multi-Robot Navigation. arXiv preprint arXiv:2406.17249 (2024)
 5. • † Wu, Y., Spasojevic, I., Chaudhari, P. & Kumar, V. Optimal Convex Cover as Collision-Free Space Approximation for Trajectory Generation. arXiv preprint arXiv:2406.09631 (2024)
 6. • Jena, R., Chaudhari, P. & Gee, J. C. Deep Implicit Optimization for Robust and Flexible Image Registration. arXiv preprint arXiv:2406.07361 (2024)
 7. • Jena, R., Sethi, D., Chaudhari, P. & Gee, J. C. Deep Learning in Medical Image Registration: Magic or Mirage? arXiv preprint arXiv:2408.05839 (2024)
 8. • † Chintapalli, S. S., Wang, R., Yang, Z., Tassopoulou, V., Yu, F., Bashyam, V., Erus, G., Chaudhari, P., Shou, H. & Davatzikos, C. NeuroSynth: MRI-derived Neuroanatomical Generative Models and Associated Dataset of 18,000 Samples. arXiv preprint arXiv:2407.12897 (2024)
 9. Liu, T. Y., Soatto, S., Marchi, M., Chaudhari, P. & Tabuada, P. Meanings and Feelings of Large Language Models: Observability of Latent States in Generative AI. arXiv preprint arXiv:2405.14061 (2024)
 10. • He, S., Osman, Z. & Chaudhari, P. From NeRFs to Gaussian Splats, and Back in CVPR Workshop on Embodied AI (arXiv:2405.09717) (2024)
 11. • Shao, Y., Li, T., Keyvanian, S., Kumar, V., Chaudhari, P. & Figueroa, N. Constraint-Aware Intent Estimation for Dynamic Human-Robot Object Co-Manipulation. Robotics Science and Systems (RSS) (2024)
 12. • He, S., Tao, Y., Spasojevic, I., Kumar, V. & Chaudhari, P. An Active Perception Game for Robust Autonomous Exploration. arXiv preprint arXiv:2404.00769 (2024)
 13. • Jena, R., Wu, Y., Greenwood, J. C., Chaudhari, P. & Gee, J. Automated Estimation of Microcirculation Capillary Density Using Relative Perfusion Maps in Medical Imaging 2024: Image Processing **12926** (2024), 188–194

14. • † Jena, R., Chaudhari, P. & Gee, J. C. FireANTs: Adaptive Riemannian Optimization for Multi-Scale Diffeomorphic Registration. arXiv preprint arXiv:2404.01249 (2024)
15. Marchi, M., Soatto, S., Chaudhari, P. & Tabuada, P. Heat Death of Generative Models in Closed-Loop Learning. arXiv preprint arXiv:2404.02325 (2024)
16. • Yu, F., Wang, R., Chaudhari, P. & Davatzikos, C. Investigating Causal Genetic Effects on Overall Survival of Glioblastoma Patients Using Normalizing Flow and Structural Causal Model in Medical Imaging 2024: Computer-aided Diagnosis **12927** (2024), 326–331
17. • Prabhu, A., Liu, X., Spasojevic, I., Wu, Y., Shao, Y., Ong, D., Lei, J., Green, C., Chaudhari, P. & Kumar, V. UAVs for Forestry: Metric-semantic Mapping and Diameter Estimation with Autonomous Aerial Robots. Mechanical Systems and Signal Processing (MSSP) (2024)
18. • Tang, H., Zhou, X., Deng, J., Pan, Z., Tian, H. & Chaudhari, P. Retrieving Conditions from Reference Images for Diffusion Models. arXiv preprint arXiv:2312.02521 (2023)
19. • Jena, R., Iyer, G. S., Choudhary, S., Smith, B., Chaudhari, P. & Gee, J. SplatArmor: Articulated Gaussian Splatting for Animatable Humans from Monocular RGB Videos. arXiv preprint arXiv:2311.10812 (2023)
20. • He, S., Hsu, C. D., Ong, D., Shao, Y. S. & Chaudhari, P. Active Perception Using Neural Radiance Fields in Proc. of American Control Conference (ACC) (2024)
21. • Cheng, D., Ojeda, F. C., Prabhu, A., Liu, X., Zhu, A., Green, P. C., Ehsani, R., Chaudhari, P. & Kumar, V. TreeScope: An Agricultural Robotics Dataset for LiDAR-Based Mapping of Trees in Forests and Orchards in Proc. of International Conference on Robotics and Automation (ICRA) (2024)
22. • Shao, Y. S., Wu, Y., Jarin-Lipschitz, L., Chaudhari, P. & Kumar, V. Design and Evaluation of Motion Planners for Quadrotors in Proc. of International Conference on Robotics and Automation (ICRA) (2024)
23. • † Wang, R., Erus, G., *Chaudhari, P. & *Davatzikos, C. Adapting Machine Learning Diagnostic Models to New Populations Using a Small Amount of Data: Results from Clinical Neuroscience. arXiv preprint arXiv:2308.03175 (2023)
24. Liu, Y., Chaudhari, P. & Fakoor, R. Budgeting Counterfactual for Offline RL in Proc. of Neural Information and Processing Systems (NeurIPS) (2023)
25. • Chen, D., Chang, W. & Chaudhari, P. Learning Capacity: A Measure of the Effective Dimensionality of a Model. arXiv preprint arXiv:2305.17332 (2023)
26. • † Mao, J., Griniasty, I., Teoh, H. K., Ramesh, R., Yang, R., Transtrum, M., Sethna, J. P. & Chaudhari, P. The Training Process of Many Deep Networks Explores the Same Low-Dimensional Manifold. Proceedings of the National Academy of Sciences (PNAS) (2024)
27. • Jena, R., Chaudhari, P., Gee, J., Iyer, G., Choudhary, S. & Smith, B. M. Mesh Strikes Back: Fast and Efficient Human Reconstruction from RGB Videos. arXiv preprint arXiv:2303.08808 (2023)

28. • Gao, Y., Pan, Z., Zhou, X., Kang, L. & Chaudhari, P. Fast Diffusion Probabilistic Model Sampling through the Lens of Backward Error Analysis. arXiv preprint arXiv:2304.11446 (2023)
29. • *De Silva, A., *Ramesh, R., **Chaudhari, P. & **Vogelstein, J. T. Prospective Learning: Principled Extrapolation to the Future in Proc. of Conference on Lifelong Learning Agents (CoLLAs) (2023)
30. • Jena, R., Zhornyak, L., Doiphode, N., Chaudhari, P., Buch, V., Gee, J. & Shi, J. Beyond mAP: Re-evaluating and Improving Performance in Instance Segmentation with Semantic Sorting and Contrastive Flow in Proc. of Conference on Computer Vision and Pattern Recognition (CVPR) (2023)
31. † Piasini, E., Liu, S., Chaudhari, P., Balasubramanian, V. & Gold, J. I. How Occam’s Razor Guides Human Decision-Making. bioRxiv 2023.01.10.523479 (2023)
32. † DiTullio, R. W., Piasini, E., Chaudhari, P., Balasubramanian, V. & Cohen, Y. E. Time as a Supervisor: Temporal Regularity and Auditory Object Learning. Frontiers In Computational Neuroscience (2023)
33. • Ramesh, R., Mao, J., Griniasty, I., Yang, R., Teoh, H. K., Transtrum, M., Sethna, J. & Chaudhari, P. A Picture of the Space of Typical Learnable Tasks in Proc. of International Conference of Machine Learning (ICML) (2023)
34. • *De Silva, A., *Ramesh, R., Priebe, C. E., **Chaudhari, P. & **Vogelstein, J. T. The Value of Out-of-Distribution Data in Proc. of International Conference of Machine Learning (ICML) (2023)
35. • † Wang, R., *Chaudhari, P. & *Davatzikos, C. Bias in Machine Learning Models Can Be Significantly Mitigated by Careful Training: Evidence from Neuroimaging Studies. Proceedings of the National Academy of Sciences **120**, e2211613120 (2023)
36. • Xu, S., Bu, Z., Chaudhari, P. & Barnett, I. J. Sparse Neural Additive Model: Interpretable Deep Learning with Feature Selection via Group Sparsity in Proc. of European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML/PKDD) (2023)
37. Fakoor, R., Mueller, J., Lipton, Z. C., Chaudhari, P. & Smola, A. J. Time-Varying Propensity Score to Bridge the Gap between the Past and Present in ICLR (2024)
38. • Yu, F., Kazerooni, A. F., Toorens, E., Akbari, H., Sako, C., Mamourian, E., Bagley, S., Binder, Z. A., Lustig, R. A., Brem, S., et al. An AI-Based Coordinate System Elucidates Radiogenomic Heterogeneity of Glioblastoma via Deep Learning and Manifold Embeddings. Neuro-Oncology **24**, vii166–vii166 (2022)
39. • Hsu, C. D., Haile, M. A. & Chaudhari, P. A Model for Multi-Agent Heterogeneous Interaction Problems in Proc. of American Control Conference (ACC) (2024)
40. • Wang, R., Chaudhari, P. & Davatzikos, C. Editorial for "Non-Invasive Evaluation of the Notch Signaling Pathway via Radiomic Signatures Based on Multiparametric MRI in Association

- With Biological Functions of Patients With Glioma: A Multi-Institutional Study". *Journal of magnetic resonance imaging: JMRI* (2022)
41. • *Gao, Y., *Ramesh, R. & Chaudhari, P. Deep Reference Priors: What Is the Best Way to Pretrain a Model? in *Proc. of International Conference of Machine Learning (ICML)* (2022)
 42. • Cowlagi, A. & Chaudhari, P. Does the Geometry of the Data Control the Geometry of Neural Predictions? in *AAAI (Student Track)* **36** (2022), 12931–12932
 43. • Yang, R., Mao, J. & Chaudhari, P. Does the Data Induce Capacity Control in Deep Learning? in *Proc. of International Conference of Machine Learning (ICML)* (2022)
 44. † Vogelstein, J. T., Verstynen, T., Kording, K. P., Isik, L., Krakauer, J. W., Etienne-Cummings, R., Ogburn, E. L., Priebe, C. E., Burns, R., Kутten, K., et al. Prospective Learning: Back to the Future. *arXiv preprint arXiv:2201.07372* (2022)
 45. • Ramesh, R. & Chaudhari, P. Model Zoo: A Growing "Brain" That Learns Continually in *Proc. of International Conference of Learning and Representations (ICLR)* (2022)
 46. • † Wang, R., Chaudhari, P. & Davatzikos, C. Embracing the Disharmony in Medical Imaging: A Simple and Effective Framework for Domain Adaptation. *Medical Image Analysis* (2021)
 47. • Wang, R., Chaudhari, P. & Davatzikos, C. Harmonization with Flow-Based Causal Inference in *Proc. of the International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)* (2021)
 48. Fakoor, R., Mueller, J., Chaudhari, P. & Smola, A. J. Continuous Doubly Constrained Batch Reinforcement Learning in *Proc. of Conference on Neural Information Processing Systems (NeurIPS)* (2021)
 49. • Zhang, W., Schmeckpeper, K., Chaudhari, P. & Daniilidis, K. Deformable Linear Object Prediction Using Locally Linear Latent Dynamics in *Proc. of the International Conference on Robotics and Automation (ICRA)* (2021)
 50. • † Gao, Y. & Chaudhari, P. A Free-Energy Principle for Representation Learning. *Machine Learning: Science and Technology* **2**, 045004 (2021)
 51. • Gao, Y. & Chaudhari, P. An Information-Geometric Distance on the Space of Tasks in *Proc. of International Conference of Machine Learning (ICML)* (2021)
 52. • Nguyen, T., Miller, I. D., Cohen, A., Thakur, D., Prasad, S., Guru, A., Taylor, C. J., Chaudhari, P. & Kumar, V. PennSyn2Real: Training Object Recognition Models without Human Labeling in *Proc. of the International Conference on Robotics and Automation (ICRA)* (2021)
 53. • Hsu, C. D., Jeong, H., Pappas, G. J. & Chaudhari, P. Scalable Reinforcement Learning Policies for Multi-Agent Control in *International Conference on Intelligent Robots and Systems (IROS)* (2021)
 54. • Chen, X. & Chaudhari, P. MIDAS: Multi-agent Interaction-Aware Decision-Making with Adaptive Strategies for Urban Autonomous Navigation in *Proc. of the International Conference on Robotics and Automation (ICRA)* (2021)

55. • Maggipinto, M., Susto, G. A. & Chaudhari, P. Proximal Deterministic Policy Gradient in Proc. of the International Conference of Intelligent Robots and Autonomous Systems (IROS) (2020)
56. Fakoor, R., Mueller, J., Erickson, N., Chaudhari, P. & Smola, A. J. Fast, Accurate, and Simple Models for Tabular Data via Augmented Distillation in Proc. of Conference on Neural Information Processing Systems (NeurIPS) (2020)
57. • Jain, A., Chaudhari, P. & Morari, M. BayesRace: Learning to Race Autonomously Using Prior Experience in Proc. of Conference on Robot Learning (CoRL) (2020)
58. Fakoor, R., Chaudhari, P. & Smola, A. J. DDPG++: Striving for Simplicity in Continuous-Control off-Policy Reinforcement Learning. arXiv preprint arXiv:2006.15199 (2020)
59. • Gao, Y. & Chaudhari, P. A Free-Energy Principle for Representation Learning in Proc. of International Conference of Machine Learning (ICML) (2020)
60. Fakoor, R., Chaudhari, P., Mueller, J. & Smola, A. J. TraDE: Transformers for Density Estimation. arXiv preprint arXiv:2004.02441 (2020)
61. † Fioresi, R., Chaudhari, P. & Soatto, S. A Geometric Interpretation of Stochastic Gradient Descent Using Diffusion Metrics. *Entropy* **22**, 101 (2020)
62. Fakoor, R., Chaudhari, P., Soatto, S. & Smola, A. J. Meta-Q-Learning in Proc. of International Conference of Learning and Representations (ICLR) (2020)
63. Dhillon, G. S., Chaudhari, P., Ravichandran, A. & Soatto, S. A Baseline for Few-Shot Image Classification in Proc. of International Conference of Learning and Representations (ICLR) (2020)
64. Li, H., Chaudhari, P., Yang, H., Lam, M., Ravichandran, A., Bhotika, R. & Soatto, S. Rethinking the Hyper-Parameters for Fine-Tuning in Proc. of International Conference of Learning and Representations (ICLR) (2020)
65. † Terzi, M., Susto, G. A. & Chaudhari, P. Directional Adversarial Training for Cost Sensitive Deep Learning Classification Applications. *Journal of Engineering Applications of Artificial Intelligence* (2019)
66. Fakoor, R., Chaudhari, P. & Smola, A. J. P3O: Policy-on Policy-off Policy Optimization in Proc. of Conference on Uncertainty in Artificial Intelligence July 22-25 (2019)
67. † Chaudhari, P., Choromanska, A., Soatto, S., LeCun, Y., Baldassi, C., Borgs, C., Chayes, J., Sagun, L. & Zecchina, R. Entropy-SGD: Biasing Gradient Descent into Wide Valleys. *Journal of Statistical Mechanics: Theory and Experiment* **2019**, 124018 (2019)
68. Chaudhari, P. & Soatto, S. Stochastic Gradient Descent Performs Variational Inference, Converges to Limit Cycles for Deep Networks in Proc. of International Conference of Learning and Representations (ICLR) (2018)
69. Chaudhari, P., Baldassi, C., Zecchina, R., Soatto, S., Talwalkar, A. & Oberman, A. Parle: Parallelizing Stochastic Gradient Descent in Conference on Machine Learning and Systems (MLSys) (2018)

70. † Chaudhari, P., Oberman, A., Osher, S., Soatto, S. & Carlier, G. Deep Relaxation: Partial Differential Equations for Optimizing Deep Neural Networks. *Journal of Research in the Mathematical Sciences (RMS)* **5**, 1–30 (2018)
71. Chaudhari, P., Choromanska, A., Soatto, S., LeCun, Y., Baldassi, C., Borgs, C., Chayes, J., Sagun, L. & Zecchina, R. Entropy-SGD: Biasing Gradient Descent into Wide Valleys in *Proc. of International Conference of Learning and Representations (ICLR)* (2017)
72. Chaudhari, P. & Soatto, S. On the Energy Landscape of Deep Networks. *Workshop on Advances in non-convex analysis and optimization, International Conference on Machine Learning (ICML) June 19-24, 2016* (2015)
73. Zhu, M., Otte, M., Chaudhari, P. & Frazzoli, E. Game Theoretic Controller Synthesis for Multi-Robot Motion Planning Part I: Trajectory Based Algorithms in *Proc. of International Conference on Robotics and Automation (ICRA) June 1-4, 2014* (2014)
74. Chaudhari, P., Wongpiromsarn, T. & Frazzoli, E. Incremental Minimum-Violation Control Synthesis for Robots Interacting with External Agents in *Proc. of American Control Conference (ACC) Jun 4-6 2014* (2014)
75. Varricchio, V., Chaudhari, P. & Frazzoli, E. Sampling-Based Algorithms for Optimal Motion Planning Using Process Algebra Specifications in *Proc. of International Conference on Robotics and Automation (ICRA) Jun 1-4, 2014* (2014)
76. Castro, L. I. R., Chaudhari, P., Tumova, J., Karaman, S., Frazzoli, E. & Rus, D. Incremental Sampling-Based Algorithms for Minimum-Violation Motion Planning in *Proc. of Conference on Decision and Control (CDC) Dec 10-13, 2012* (2013)
77. Chaudhari, P., Karaman, S., Hsu, D. & Frazzoli, E. Sampling-Based Algorithms for Continuous-Time POMDPs in *Proc. of American Control Conference (ACC) Jun 17-19, 2013* (2013)
78. Chaudhari, P., Karaman, S. & Frazzoli, E. Sampling-Based Algorithm for Filtering Using Markov Chain Approximations in *Proc. of Conference on Decision and Control (CDC) Dec 10-13, 2012* (2012)

PATENTS

1. Chaudhari, P. & Ramesh, R. Methods, Systems and Computer Readable Media for Machine Learning of Multiple Tasks Aug. 2023
2. Jariwala, D., Xiwen, L., Katti, K. & Chaudhari, P. Analog Content-Addressable Memory From Complementary FETs Sept. 2023