Stanford



# Somil Bansal

Assistant Professor of Aeronautics and Astronautics

## Bio

### BIO

Somil Bansal is an assistant professor at the Department of Aeronautics and Astronautics at Stanford. Before joining Stanford, he was an assistant professor in the ECE department at the University of Southern California. He received an MS and a Ph.D. in Electrical Engineering and Computer Sciences (EECS) from the University of California at Berkeley in 2014 and 2020, respectively. Before that, he obtained a B.Tech. in Electrical Engineering from the Indian Institute of Technology, Kanpur in 2012. After his PhD, he spent a year as a Research Scientist at Waymo (formerly known as the Google Self-Driving Car project). He has also collaborated closely with companies like Skydio, Google, Boeing, as well as NASA AMES/JPL. Somil is broadly interested in developing mathematical tools and algorithms for the control and analysis of safety-critical autonomous and robotic systems, with a special emphasis on ensuring the safety of learning-enabled systems. Somil has received several awards, most notably the NSF CAREER award, the Eli Jury Award at UC Berkeley for his doctoral research, the RSS Pioneer Award, and the Outstanding Graduate Student Instructor Award.

### ACADEMIC APPOINTMENTS

- Assistant Professor, Aeronautics and Astronautics

### HONORS AND AWARDS

- IEEE Early Career Award in Robotics and Automation, Robotics and Automation Society (RAS) (2026)
- CAREER Award, NSF (2022)
- Eli Jury Award, UC Berkeley (2020)
- RSS Pioneer, RSS (2019)
- Outstanding Graduate Student Instructor Award, UC Berkeley (2019)

### PROFESSIONAL EDUCATION

- PhD, UC Berkeley , Electrical Engineering and Computer Sciences (2020)
- MS, UC Berkeley , Electrical Engineering and Computer Sciences (2014)
- BTech, IIT Kanpur , Electrical Engineering (2012)

## Teaching

### COURSES

**2026-27**

- Introduction to Control Design Techniques: ENGR 205 (Win)

- Principles of Robot Autonomy I: AA 174A (Aut)
- Principles of Robot Autonomy I: AA 274A (Aut)
- Principles of Robot Autonomy I: CS 137A (Aut)
- Principles of Robot Autonomy I: CS 237A (Aut)
- Principles of Robot Autonomy I: EE 160A (Aut)
- Principles of Robot Autonomy I: EE 260A, ME 274A (Aut)
- Principles of Safety-Critical Autonomy: AA 276 (Spr)

**2025-26**

- Introduction to Control Design Techniques: ENGR 205 (Win)
- Principles of Safety-Critical Autonomy: AA 276 (Spr)

**2024-25**

- Introduction to Control Design Techniques: ENGR 205 (Win)
- Principles of Safety-Critical Autonomy: AA 276 (Spr)

### STANFORD ADVISEES

**Doctoral Dissertation Reader (AC)**

Maximilian Adang, Hugo Buurmeijer, Timothy Chen, Michelle Ho, Yuji Takubo, Isaac Ward

**Orals Evaluator**

Samuel Akinwande, Timothy Chen, Isaac Ward

**Doctoral Dissertation Advisor (AC)**

Colton Crosby, Zeyuan Feng, Aryaman Gupta, Sathwik Karnik, Jaeryoung Lee, Albert Lin, Thomas MacLean

**Master's Program Advisor**

Zeb Barry, Lucie Giannoni, Jackson Goenawan, Aditya Kothari, Athul Krishnan, Emily Parkerson, Ottavia Personeni, Yash Rampuria, Anna Ring

**Doctoral (Program)**

Bryan Boateng, John Cao

## Publications

### PUBLICATIONS

- **Hamilton-Jacobi reachability for hybrid systems: Unified goal-driven control with safety guarantees** *INTERNATIONAL JOURNAL OF ROBOTICS RESEARCH*
  Borquez, J., Peng, S., Bansal, S.
  2026
- **Safety-Aware Imitation Learning via MPC-Guided Disturbance Injection** *IEEE ROBOTICS AND AUTOMATION LETTERS*
  Qiu, L., Ciftci, Y., Bansal, S.
  2026; 11 (6): 7222-7229
- **Safety Evaluation of Motion Plans Using Trajectory Predictors as Forward Reachable Set Estimators** *IEEE ROBOTICS AND AUTOMATION LETTERS*
  Chakraborty, K., Feng, Z., Veer, S., Sharma, A., Ding, W., Topan, S., Ivanovic, B., Pavone, M., Bansal, S.
  2026; 11 (3): 3262-3269
- **One Filter to Deploy Them All: Robust Safety for Quadrupedal Navigation in Unknown Environments** *IEEE TRANSACTIONS ON ROBOTICS*
  Lin, A., Peng, S., Bansal, S.

2026; 42: 545-560

- **Robust Verification of Controllers under State Uncertainty via Hamilton-Jacobi Reachability Analysis**
  Lin, A., Pinto, A., Bansal, S.
  edited by Lindemann, L., Tu, S., Wierman, A., Atanasov, N., Sukhatme, G.
  JMLR-JOURNAL MACHINE LEARNING RESEARCH.2026: 1432-1446
- **DualGuard MPPI: Safe and Performant Optimal Control by Combining Sampling-Based MPC and Hamilton-Jacobi Reachability** *IEEE ROBOTICS AND AUTOMATION LETTERS*
  Borquez, J., Raus, L., Ciftci, Y., Bansal, S.
  2025; 10 (7): 6944-6951
- **Stable-BC: Controlling Covariate Shift With Stable Behavior Cloning** *IEEE ROBOTICS AND AUTOMATION LETTERS*
  Mehta, S. A., Ciftci, Y., Ramachandran, B., Bansal, S., Losey, D. P.
  2025; 10 (2): 1952-1959
- **A Physics-Informed Machine Learning Framework for Safe and Optimal Control of Autonomous Systems**
  Tayal, M., Singh, A., Kolathaya, S., Bansal, S.
  edited by Singh, A., Fazel, M., Hsu, D., Lacoste-Julien, S., Berkenkamp, F., Maharaj, T., Wagstaff, K., Zhu, J.
  JMLR-JOURNAL MACHINE LEARNING RESEARCH.2025: 59237-59258
- **Linear Supervision for Nonlinear, High-Dimensional Neural Control and Differential Games**
  Sharpless, W., Feng, Z., Bansal, S., Herbert, S.
  edited by Ozay, N., Balzano, L., Panagou, D., Abate, A.
  JMLR-JOURNAL MACHINE LEARNING RESEARCH.2025: 365-377
- **Updating Robot Safety Representations Online from Natural Language Feedback**
  Santos, L., Li, Z., Peters, L., Bansal, S., Bajcsy, A.
  edited by Ott, C.
  IEEE.2025: 7778-7785
- **System-Level Safety Monitoring and Recovery for Perception Failures in Autonomous Vehicles**
  Chakraborty, K., Feng, Z., Veer, S., Sharma, A., Ivanovic, B., Pavone, M., Bansal, S.
  edited by Ott, C.
  IEEE.2025: 12885-12891
- **Exact Imposition of Safety Boundary Conditions in Neural Reachable Tubes**
  Singh, A., Feng, Z., Bansal, S.
  edited by Ott, C.
  IEEE.2025: 5489-5495
- **Reachability Analysis for Black-Box Dynamical Systems**
  Chilakamarri, V., Feng, Z., Bansal, S.
  edited by Ott, C.
  IEEE.2025: 3552-3558
- **SAFE-GIL: SAFEty Guided Imitation Learning for Robotic Systems**
  Ciftci, Y., Chiu, D., Feng, Z., Sukhatme, G. S., Bansal, S.
  edited by Ott, C.
  IEEE.2025: 3559-3566
- **Providing Safety Assurances for Systems With Unknown Dynamics** *IEEE CONTROL SYSTEMS LETTERS*
  Wang, H., Borquez, J., Bansal, S.
  2024; 8: 1108-1113
- **Verification of Neural Reachable Tubes via Scenario Optimization and Conformal Prediction**
  Lin, A., Bansal, S.
  edited by Abate, A., Cannon, M., Margellos, K., Papachristodoulou, A.
  JMLR-JOURNAL MACHINE LEARNING RESEARCH.2024: 719-731

- **Parameterized Fast and Safe Tracking (FaSTrack) using DeepReach**
  Jeong, H., Gong, Z., Bansal, S., Herbert, S.
  edited by Abate, A., Cannon, M., Margellos, K., Papachristodoulou, A.
  JMLR-JOURNAL MACHINE LEARNING RESEARCH.2024: 1006-1017
- **Cooptimizing Safety and Performance With a Control-Constrained Formulation** *IEEE CONTROL SYSTEMS LETTERS*
  Wang, H., Dhande, A., Bansal, S.
  2024; 8: 2739-2744
- **Detecting and Mitigating System-Level Anomalies of Vision-Based Controllers**
  Gupta, A., Chakraborty, K., Bansal, O., IEEE
  IEEE.2024: 9953-9959
- **On Safety and Liveness Filtering Using Hamilton-Jacobi Reachability Analysis** *IEEE TRANSACTIONS ON ROBOTICS*
  Borquez, J., Chakraborty, K., Wang, H., Bansal, S.
  2024; 40: 4235-4251
- **Discovering Closed-Loop Failures of Vision-Based Controllers via Reachability Analysis** *IEEE ROBOTICS AND AUTOMATION LETTERS*
  Chakraborty, K., Bansal, S.
  2023; 8 (5): 2692-2699
- **Parameter-Conditioned Reachable Sets for Updating Safety Assurances Online**
  Borquez, J., Nakamura, K., Bansal, S., IEEE
  IEEE.2023: 10553-10559
- **Generating Formal Safety Assurances for High-Dimensional Reachability**
  Lin, A., Bansal, S., IEEE
  IEEE.2023: 10525-10531
- **Online Update of Safety Assurances Using Confidence-Based Predictions**
  Nakamura, K., Bansal, S., IEEE
  IEEE.2023: 12765-12771
- **Computation of Regions of Attraction for Hybrid Limit Cycles Using Reachability: An Application to Walking Robots** *IEEE ROBOTICS AND AUTOMATION LETTERS*
  Choi, J. J., Agrawal, A., Sreenath, K., Tomlin, C. J., Bansal, S.
  2022; 7 (2): 4504-4511
- **FaSTrack:A Modular Framework for Real-Time Motion Planning and Guaranteed Safe Tracking** *IEEE TRANSACTIONS ON AUTOMATIC CONTROL*
  Chen, M., Herbert, S. L., Hu, H., Pu, Y., Fisac, J., Bansal, S., Han, S., Tomlin, C. J.
  2021; 66 (12): 5861-5876
- **Provably Safe and Scalable Multivehicle Trajectory Planning** *IEEE TRANSACTIONS ON CONTROL SYSTEMS TECHNOLOGY*
  Bansal, S., Chen, M., Tanabe, K., Tomlin, C. J.
  2021; 29 (6): 2473-2489
- **Visual Navigation Among Humans With Optimal Control as a Supervisor** *IEEE ROBOTICS AND AUTOMATION LETTERS*
  Tolani, V., Bansal, S., Faust, A., Tomlin, C.
  2021; 6 (2): 2288-2295
- **DeepReach: A Deep Learning Approach to High-Dimensional Reachability**
  Bansal, S., Tomlin, C. J., IEEE
  IEEE.2021: 1817-1824
- **A Robust Control Framework for Human Motion Prediction** *IEEE ROBOTICS AND AUTOMATION LETTERS*
  Bajcsy, A., Bansal, S., Ratner, E., Tomlin, C. J., Dragan, A. D.
  2021; 6 (1): 24-31
- **A Hamilton-Jacobi Reachability-Based Framework for Predicting and Analyzing Human Motion for Safe Planning**

Bansal, S., Bajcsy, A., Ratner, E., Dragan, A. D., Tomlin, C. J., IEEE
IEEE.2020: 7149-7155

- **Generating Robust Supervision for Learning-Based Visual Navigation Using Hamilton-Jacobi Reachability**
  Li, A., Bansal, S., Giovanis, G., Tolani, V., Tomlin, C., Chen, M.
  edited by Jadbabaie, A., Pappas, G., Parrilo, P. A., Recht, B., Tomlin, C., Zeilinger, M., Bayen, A. M.
  JMLR-JOURNAL MACHINE LEARNING RESEARCH.2020: 500-510

- **Robust Sequential Trajectory Planning Under Disturbances and Adversarial Intruder** *IEEE TRANSACTIONS ON CONTROL SYSTEMS TECHNOLOGY*
  Chen, M., Bansal, S., Fisac, J. F., Tomlin, C. J.
  2019; 27 (4): 1566–82

- **Plug-and-Play Model Predictive Control for Load Shaping and Voltage Control in Smart Grids** *IEEE TRANSACTIONS ON SMART GRID*
  Le Floch, C., Bansal, S., Tomlin, C. J., Moura, S. J., Zeilinger, M. N.
  2019; 10 (3): 2334-2344

- **Reachability-Based Safety Guarantees using Efficient Initializations**
  Herbert, S. L., Bansal, S., Ghosh, S., Tomlin, C. J., IEEE
  IEEE.2019: 4810-4816

- **Closed-loop Model Selection for Kernel-based Models using Bayesian Optimization**
  Beckers, T., Bansal, S., Tomlin, C. J., Hirche, S., IEEE
  IEEE.2019: 828-834

- **An Efficient Reachability-Based Framework for Provably Safe Autonomous Navigation in Unknown Environments**
  Bajcsy, A., Bansal, S., Bronstein, E., Tolani, V., Tomlin, C. J., IEEE
  IEEE.2019: 1758-1765

- **A New Simulation Metric to Determine Safe Environments and Controllers for Systems with Unknown Dynamics**
  Ghosh, S., Bansal, S., Sangiovanni-Vincentelli, A., Seshia, S. A., Tomlin, C., ACM
  ASSOC COMPUTING MACHINERY.2019: 185-196

- **Decomposition of Reachable Sets and Tubes for a Class of Nonlinear Systems** *IEEE TRANSACTIONS ON AUTOMATIC CONTROL*
  Chen, M., Herbert, S. L., Vashishtha, M. S., Bansal, S., Tomlin, C. J.
  2018; 63 (11): 3675-3688

- **Safe Sequential Path Planning Under Disturbances and Imperfect Information**
  Bansal, S., Chen, M., Fisac, J. F., Tomlin, C. J., IEEE
  IEEE.2017: 5550-5555

- **FaSTrack: a Modular Framework for Fast and Guaranteed Safe Motion Planning**
  Herbert, S. L., Chen, M., Han, S., Bansal, S., Fisac, J. F., Tomlin, C. J., IEEE
  IEEE.2017

- **Hamilton-Jacobi Reachability: A Brief Overview and Recent Advances**
  Bansal, S., Chen, M., Herbert, S., Tomlin, C. J., IEEE
  IEEE.2017

- **Learning Quadrotor Dynamics Using Neural Network for Flight Control**
  Bansal, S., Akametalu, A. K., Jiang, F. J., Laine, F., Tomlin, C. J., IEEE
  IEEE.2016: 4653-4660