

Somil Bansal

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ACADEMIC POSITIONS	Stanford University <i>Assistant Professor</i> <i>Department of Aeronautics and Astronautics</i> <i>Director, Safe and Intelligent Autonomy Laboratory</i>	Oct 2024 - Present
	University of Southern California <i>Assistant Professor</i> <i>Department of Electrical and Computer Engineering and Department of Computer Science</i> <i>Director, Safe and Intelligent Autonomy Laboratory</i>	Aug 2021 - Sep 2024
RESEARCH INTERESTS	I am broadly interested in robotics and autonomous systems. Specifically, my research focuses on understanding how machine learning methods can be combined with classical, model-based planning and control methods with the goal of: 1. enabling robots to make intelligent decisions in a data-efficient manner, especially when they rely on perception and vision sensors; 2. assuring robot safety while it relies on learning for decision-making.	
EDUCATION	University of California, Berkeley <i>Ph.D. in Electrical Engineering and Computer Sciences</i> Advisor: Claire Tomlin Thesis: <i>Safe and Data-Efficient Learning for Robotics: A Control Theoretic Approach</i>	2015 - 2020
	University of California, Berkeley <i>MS in Electrical Engineering</i> Advisor: Claire Tomlin	2012 - 2014
	Indian Institute of Technology, Kanpur <i>B.Tech. in Electrical Engineering</i>	2008 - 2012
AWARDS & HONORS	National Science Foundation CAREER Award For <i>Safety Assurances for Perception-Enabled Robotic Systems</i> .	2023
	Eli Jury Award For <i>outstanding dissertation in the area of systems and control</i> .	UC Berkeley, 2020
	RSS Pioneer A cohort of the world's top early career researchers in robotics.	RSS, 2019
	Outstanding Graduate Student Instructor Award	UC Berkeley, 2019
	Graduate Student Gold Fellowship	Department of EECS, UC Berkeley, 2013
	Excellence Award in Community Services For <i>outstanding work in various aspects of community service</i> .	IIT Kanpur, 2012
	Academic Excellence Award	IIT Kanpur, 2010, 2011
	MITACS Globalink Fellowship	IIT Kanpur, 2011

Amit Saxena Memorial Award

IIT Kanpur, 2011

WORK
EXPERIENCE**Waymo, Mountain View***Research Scientist*

September 2020 - July 2021

Skydio, Redwood City*Computer Vision and Planning Intern*

May 2018 - Aug 2018

Applied Predictive Technologies, San Francisco*Business Consultant*

Aug 2014 - Sep 2015

Broadcom, Sunnyvale*Performance Engineering Intern*

Summer 2013

University of Western Ontario, London, Canada*Research Intern*

Summer 2011

TEACHING
EXPERIENCE**EE599: Learning and Control for Safety-Critical Robotic Systems**
Instructor

USC, Spring 2023, 2024

EE482: Linear Control Systems
Instructor

USC, Fall 2021, 2022, 2023

EE598: Electrical Engineering Research Seminar
Instructor

USC, Fall 2022, Spring 2023, Fall 2023

EE221A: Linear System Theory

Graduate Student Instructor

UC Berkeley, Fall 2016, 2018

Received the *Outstanding Graduate Student Instructor Award*.PROFESSIONAL
ACTIVITIES**Award Committee**

- Annual European Systems & Control PhD Thesis Award, 2024
- Learning for Dynamics & Control Conference, 2022

Program Committee (Associate Editor, Area Chair)

RA-L 2023, 2024; CoRL 2020, 2021, 2024; ICRA 2021; HSCC 2020

Conference Organization

Local Co-chair, RSS 2025

Organized Workshops and Tutorials

- [Deployable Decision Making in Embodied Systems](#), NeurIPS 2021.
- [Safe Real-World Robot Autonomy](#), IROS 2021.
- [Robust Autonomy: Safe Robot Learning and Control in Uncertain Real-World Environments](#), RSS 2019, 2020.
- [Hamilton-Jacobi Reachability: A Brief Overview and Recent Advances](#), CDC 2017.
- [Design of Robotics and Embedded systems, Analysis, and Modeling \(DREAM\) Seminar](#), UC Berkeley 2017-2019.

External Reviewer for Conferences, Journals, and Grant Panels

- *Robotics*: RA-L, TRO, RSS, ICRA, CoRL, IROS
- *Control Theory*: CDC, ACC, HSCC, IFAC, L4DC, TAC, TCST, LCSS
- *NSF Proposal Panelist and Reviewer*

MEDIA
ATTENTION

- [AI helps robots navigate around humans in offices](#) , VentureBeat 2020.
- [A framework for indoor robot navigation among humans](#), TechXplore 2020.
- [A new approach for robot navigation in novel environments](#), TechXplore 2019.

ADVISING &
MENTORSHIP

Current PhD Students

Kaustav Chakraborty, Javier Borquez, Yusuf Umut Ciftci, Hao Wang, Albert Lin, Zeyuan Feng, Aryaman Gupta

Current MS Students

Krinal Doma

Current Undergraduate Students

Le Qiu, Samuel Honor, Aditya Singh, Adityaya Dhande, Vamsi Krishna Chilakamarri, Kyle Woo, Wenhao Tang, Luke Raus, Adrian Faust, Jay Park, Tianhao (Stan) Wu

Past MS Students

Shuang Peng (PhD student at USC), Varun Tolani (Research scientist at Zipline), Chuck Tang (Software engineer at Mosaic ML), Anjian Li (PhD student at Princeton), Ted Xiao (Researcher at Google Brain)

Past Undergraduate Students

Xingpeng Xia (PhD student at Michigan), Aryaman Gupta (PhD student at USC), Albert Lin (PhD student at USC), Kensuke Nakamura (PhD student at CMU), Khalil Sarwari (Founder & CEO at Netvyne), Lucas Medino (Computer vision engineer at Neurobots), Eli Bronstein (PhD student at UC Berkeley), Nathan Blair (PhD student at UC Santa Barbara), Jonathan Lee (PhD student at Stanford), Frank Jiang (PhD student at KTH), Kevin Lin (MS student at Stanford)

OUTREACH

Viterbi Women in Science and Engineering Program Committee

2023-2024

Providing leadership support to the WiSE program to advance women in science and engineering at USC.

USC CS Speaker Series Program

2022-2024

Collaborate with the Los Angeles County Office of Education (LACOE) and high school teachers to develop a series of robotics modules for high school students, focused on safety and ethics in robotics.

Girls in Engineering Camp

2019

Organizing a week-long summer camp for middle school students to explore different aspects of what it means to be an engineer.

Inclusion@RSS

2019

Mentored early career graduate students who belong to traditionally underrepresented groups in robotics.

Berkeley School Volunteers

2017-2018

Volunteer teacher for middle school students in public schools.

National Social Service Volunteer (Prayas Program)

2008-2012

Taught underrepresented and underprivileged K-12 students who could not afford quality education. I was awarded the **IIT Kanpur excellence award in community services** for my efforts.

INVITED
TALKS

Safety-Guided Imitation Learning for Robots

Workshop on Safety of Learning from Demonstrations (LfD) algorithms in the Wild, NSF FRR PI Meeting, 2024.

Continual Safety Assurances for Learning-Enabled Robotic Systems

UT Austin, Department of Computer Science, 2024.

NYU, Department of Electrical and Computer Engineering, Department of Computer Science, 2024.

Stanford University, Department of Aeronautics and Astronautics, 2024.

Autonomy Talks, 2024.

Safety for Learning-Enabled Autonomous Systems

Workshop on AI-Driven Safe Autonomy, University of Southern California, 2023.

Safety for Learning-Based Robot Control

Controls & Dynamics Seminar, University of California, San Diego, 2023.

Scaling Safety Analysis for Robotics: High-Dimensional Systems to Real-Time Computation

Control, Dynamical Systems, and Computation Seminar, University of California, Santa Barbara, 2022.

Safe and Data Efficient Visual Learning for Robotics

Swiss Federal Institute of Technology Lausanne (EPFL), 2021.

Scaling Safety Analysis for Robotics

Workshop on Safe Autonomous Systems, Seoul National University, 2021.

Scaling Hamilton-Jacobi Reachability Analysis for Robotics

Princeton University, 2021.

Semiautonomous Seminar, UC Berkeley, 2021.

University of California, San Diego, 2020.

Safe and Data-Efficient Learning for Robotics

GRASP Student Faculty Industry (SFI) Seminar Series, University of Pennsylvania, 2021.

Safe and Data-Efficient Learning for Robotics

Google Robotics Seminar, 2020.

Waymo, 2020.

Facebook AI Research Seminar, 2020.

Scaling Hamilton-Jacobi Reachability Analysis for Robotics: Multi-agent Systems to Real-time Computation

Institute for Pure & Applied Mathematics (IPAM), 2020.

Safe and Data-Efficient Learning for Robotics

Yale University, Department of Mechanical Engineering and Materials Science, 2020.

Georgia Tech University, School of Electrical and Computer Engineering, 2020.

Cornell University, Department of Electrical and Computer Engineering, 2020.

Cornell University, Department of Computer Science, 2020.

Harvard University, School of Engineering And Applied Sciences, 2020.

University of British Columbia, Department of Computer Science, 2020.

University of Southern California, Department of Electrical and Computer Engineering, 2020.

Safe Learning-Enabled Decision Making for Robotics in Novel Environments

ETH Zurich, Department of Mechanical and Process Engineering, 2019.

Safe Learning-Enabled Decision Making for Autonomous Navigation in Novel Environments

University of Toronto, UTIAS, 2019.
 CITRIS/CPAR Control Theory and Automation Symposium, 2019.
 Workshop on Algorithms and Architectures for Learning-in-the-loop Systems in Autonomous Flight, ICRA 2019.

Combining Optimal Control and Learning for Visual Navigation in Novel Environments

Simons Institute Annual Industry Day, 2019.

Deep Learning Quadrotor Dynamics for Flight Control

CITRIS-Honeywell Drones: Technology, Policy and Society Conference, 2018.

Overcoming Model Bias in Model-Based Learning

Berkeley Artificial Intelligence/ Berkeley Deep Drive Workshop, UC Berkeley, 2016.

PRE-PRINTS

Failure Detection and Mitigation of Vision-Based Controllers via Reachability Analysis

Aryaman Gupta, Kaustav Chakraborty, *Somil Bansal*
IEEE Transactions on Robotics (TRO), 2024 (under review)

Co-optimization of Safety and Performance Using Control Constraints

Hao Wang, Aditya Dhande, *Somil Bansal*
IEEE Control Systems Letters (L-CSS), 2024 (under review)

Stable-BC: Controlling Covariate Shift with Stable Behavior Cloning

Shaunak Mehta, Yusuf Umut Ciftci, Balamurugan Ramachandran, *Somil Bansal*, Dylan Losey
IEEE Robotics and Automation Letters (RA-L), 2024 (under review)

SAFE-GIL: SAFETy Guided Imitation Learning

Yusuf Umut Ciftci, Zeyuan Feng, *Somil Bansal*
International Conference on Robotics and Automation (ICRA), 2025 (under review)

Imposing Exact Safety Specifications in Neural Reachable Tubes

Aditya Singh, Zeyuan Feng, *Somil Bansal*
International Conference on Robotics and Automation (ICRA), 2025 (under review)

PUBLICATIONS

On Safety and Liveness Filtering Using Reachability Analysis

Javier Borquez, Kaustav Chakraborty, Hao Wang, *Somil Bansal*
IEEE Transactions on Robotics (TRO), 2024

Hamilton-Jacobi Reachability Analysis for Hybrid Systems with Controlled and Forced Transitions

Javier Borquez, Shuang Peng, Yiyu Chen, Quan Nguyen, *Somil Bansal*
Robotics: Science and Systems (RSS), 2024

Detecting and Mitigating System-Level Anomalies of Vision-Based Controllers

Aryaman Gupta, Kaustav Chakraborty, *Somil Bansal*
International Conference on Robotics and Automation (ICRA), 2024

Providing Safety Assurances for Systems With Unknown Dynamics

Hao Wang, Javier Borquez, *Somil Bansal*
IEEE Control Systems Letters (L-CSS), 2024

Verification of Neural Reachable Tubes via Scenario Optimization and Conformal Prediction

Albert Lin, *Somil Bansal*
Conference on Learning for Dynamics and Control (L4DC), 2024

Parameterized Fast and Safe Tracking Using DeepReach

Hyun Joe Jeong, Zheng Gong, *Somil Bansal*, Sylvia Herbert
Conference on Learning for Dynamics and Control (L4DC), 2024

Gait Switching and Enhanced Stabilization of Walking Robots with Deep Learning-based Reachability: A Case Study on Two-link Walker

Xingpeng Xia, Jason Choi, Ayush Agrawal, Koushil Sreenath, Claire J. Tomlin, *Somil Bansal*
IEEE Conference on Decision and Control (CDC), 2024

Discovering Closed-Loop Failures of Vision-Based Controllers via Reachability Analysis

Kaustav Chakraborty, *Somil Bansal*
IEEE Robotics and Automation Letters (RA-L), 2023

Online Update of Safety Assurances Using Confidence-Based Predictions

Kensuke Nakamura, *Somil Bansal*
International Conference on Robotics and Automation (ICRA), 2023

Parameter-Conditioned Reachable Sets for Updating Safety Assurances Online

Javier Borquez, Kensuke Nakamura, *Somil Bansal*
International Conference on Robotics and Automation (ICRA), 2023

Generating Formal Safety Assurances for High-Dimensional Reachability

Albert Lin, *Somil Bansal*
International Conference on Robotics and Automation (ICRA), 2023

Computation of Regions of Attraction for Hybrid Limit Cycles Using Reachability: An Application to Walking Robots

Jason Choi, Ayush Agrawal, Koushil Sreenath, Claire J. Tomlin, *Somil Bansal*
IEEE Robotics and Automation Letters (RA-L), 2022

DeepReach: A Deep Learning Approach to High-Dimensional Reachability

Somil Bansal, Claire J. Tomlin
International Conference on Robotics and Automation (ICRA), 2021

Visual Navigation Among Humans with Optimal Control as a Supervisor

Varun Tolani, *Somil Bansal*, Aleksandra Faust, Claire J. Tomlin
IEEE Robotics and Automation Letters (RA-L), 2021

Provably Safe and Scalable Multi-Vehicle Trajectory Planning

Somil Bansal, Mo Chen, Ken Tanabe, Claire Tomlin
IEEE Transactions on Control Systems Technology (TCST), 2020

A Hamilton-Jacobi Reachability-Based Framework for Predicting and Analyzing Human Motion for Safe Planning

Somil Bansal, Andrea Bajcsy, Ellis Ratner, Anca D. Dragan, Claire J. Tomlin
International Conference on Robotics and Automation (ICRA), 2020

Generating Robust Supervision for Learning-Based Visual Navigation Using Hamilton-Jacobi Reachability

Anjian Li, *Somil Bansal*, Georgios Giovanis, Varun Tolani, Claire J. Tomlin, Mo Chen
Conference on Learning for Dynamics and Control (L4DC), 2020

A Robust Control Framework for Human Motion Prediction

Andrea Bajcsy, *Somil Bansal*, Ellis Ratner, Claire J. Tomlin, Anca D. Dragan
IEEE Robotics and Automation Letters (RA-L), 2020

FaSTrack: a Modular Framework for Real-Time Motion Planning and Guaranteed Safe Tracking

Mo Chen, Sylvia Herbert, Haimin Hu, Ye Pu, Jaime F. Fisac, *Somil Bansal*, SooJean Han, Claire

Tomlin

IEEE Transactions on Automatic Control (TAC), 2020

Combining Optimal Control and Learning for Visual Navigation in Novel Environments

Somil Bansal, Varun Tolani, Saurabh Gupta, Jitendra Malik, Claire J. Tomlin

Conference on Robot Learning (CoRL), 2019

An Efficient Reachability-Based Framework for Provably Safe Autonomous Navigation in Unknown Environments

Andrea Bajcsy, **Somil Bansal**, Eli Bronstein, Varun Tolani, Claire J. Tomlin

IEEE Conference on Decision and Control (CDC), 2019

Reachability-Based Safety Guarantees Using Efficient Initializations

Sylvia Herbert, **Somil Bansal**, Shromona Ghosh, Claire J. Tomlin

IEEE Conference on Decision and Control (CDC), 2019

Closed-Loop Model Selection for Kernel-based Models Using Bayesian Optimization

Thomas Beckers, **Somil Bansal**, Claire J. Tomlin, Sandra Hirche

IEEE Conference on Decision and Control (CDC), 2019

A New Simulation Metric to Determine Safe Environments and Controllers for Systems with Unknown Dynamics

Shromona Ghosh, **Somil Bansal**, Alberto Sangiovanni-Vincentelli, Sanjit Seshia, Claire Tomlin

ACM International Conference on Hybrid Systems: Computation and Control (HSCC), 2019

Goal-Driven Dynamics Learning via Bayesian Optimization

Somil Bansal, Roberto Calandra, Ted Xiao, Sergey Levine, Claire Tomlin

IEEE Conference on Decision and Control (CDC), 2017

Hamilton-Jacobi Reachability: A Brief Overview and Recent Advances

Somil Bansal, Mo Chen, Sylvia Herbert, Claire Tomlin

IEEE Conference on Decision and Control (CDC), 2017

Safe Sequential Path Planning of Multi-Vehicle Systems Under Disturbances and Imperfect Information

Somil Bansal, Mo Chen, Jaime F. Fisac, Claire Tomlin

American Control Conference (ACC), 2017

Robust Sequential Path Planning Under Disturbances and Adversarial Intruder

Mo Chen, **Somil Bansal**, Jaime F. Fisac, Claire Tomlin

IEEE Transactions on Control Systems Technology (TCST), 2017

FaSTrack: a Modular Framework for Fast and Guaranteed Safe Motion Planning

Sylvia Herbert, Mo Chen, Soojean Han, **Somil Bansal**, Jaime F. Fisac, Claire Tomlin

IEEE Conference on Decision and Control (CDC), 2017

Plug-and-Play Model Predictive Control for Load Shaping and Voltage Control in Smart Grids

Caroline L. Floch, **Somil Bansal**, Claire Tomlin, Scott Moura, Melanie Zeilinger

IEEE Transactions on Smart Grid, 2017

Decomposition of Reachable Sets and Tubes for a Class of Nonlinear Systems

Mo Chen, Sylvia Herbert, Mahesh Vashishtha, **Somil Bansal**, Claire Tomlin

IEEE Transactions on Automatic Control (TAC), 2017

Learning Quadrotor Dynamics Using Neural Network for Flight Control

Somil Bansal, Anayo K. Akametalu, Frank Jiang, Forrest Laine, Claire Tomlin

IEEE Conference on Decision and Control (CDC), 2016

Plug-and-Play Model Predictive Control for Electrical Vehicle Charging and Voltage Control in Smart Grids

Somil Bansal, Melanie Zeilinger, Claire Tomlin
IEEE Conference on Decision and Control (CDC), 2014

BOOK
 CHAPTERS

Control and Safety of Autonomous Vehicles with Learning-Enabled Components

Somil Bansal, Claire Tomlin
Safe, Autonomous and Intelligent Vehicles, Springer, Page 57-75, 2019.

WORKSHOP
 PUBLICATIONS

Combining Optimal Control and Learning for Visual Navigation in Novel Environments

Somil Bansal, Varun Tolani, Saurabh Gupta, Jitendra Malik, Claire Tomlin
 Workshop on Deep Learning for Visual Navigation
Conference on Computer Vision and Pattern Recognition (CVPR), 2019

Safe Learning-Enabled Decision Making for Autonomous Navigation in Novel Environments

Somil Bansal, Claire Tomlin
 Workshop on Algorithms and Architectures for Learning-in-the-loop Systems in Autonomous Flight
International Conference on Robotics and Automation (ICRA), 2019

Advancing the Runtime of Hamilton-Jacobi Reachability Analysis

Somil Bansal, Claire Tomlin
 Workshop on Towards Online Optimal Control of Dynamic Robots
International Conference on Robotics and Automation (ICRA), 2019

TECHNICAL
 REPORTS

SPEC: An Approach to Determine Safe Environments and Controllers for Systems with Unknown Dynamics

Somil Bansal, Shromona Ghosh, Alberto Sangiovanni-Vincentelli, Sanjit Seshia, Claire Tomlin
Technical report, May 2020

Context-Specific Validation of Data-Driven Models

Somil Bansal, Shromona Ghosh, Alberto Sangiovanni-Vincentelli, Sanjit Seshia, Claire Tomlin
Technical report, March 2018

Safe and Resilient Multi-vehicle Trajectory Planning Under Adversarial Intruder

Somil Bansal, Mo Chen, Claire Tomlin
Technical report, November 2017

MBMF: Model-Based Priors for Model-Free Reinforcement Learning

Somil Bansal, Roberto Calandra, Kurtland Chua, Sergey Levine, Claire Tomlin
Technical report, June 2017

DISSERTATION

Safe and Data-Efficient Learning for Robotics: A Control Theoretic Approach

Somil Bansal
Ph.D. Dissertation; EECS Department, University of California, Berkeley, August 2020

Model Predictive Control Approach to Electric Vehicle Charging in Smart Grids

Somil Bansal
MS Dissertation; EECS Department, University of California, Berkeley, May 2014