

Jonathan A. DeCastro

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RESEARCH INTERESTS	Robotics • Generative Modeling • Formal Methods • Optimization • Cyber-Physical Systems • Control and Dynamical Systems	
EDUCATION	Cornell University , Ithaca, NY Ph.D., Mechanical and Aerospace Engineering Advisor: Prof. Hadas Kress-Gazit Graduate Minors: Computer Science, Computational Science and Engineering 2015–2017 M.S., Mechanical and Aerospace Engineering 2011–2014 Virginia Tech , Blacksburg, VA B.S., M.S., Mechanical Engineering 1997–2003	
COURSES	Applied Math and Optimization : Linear Systems, Probability, Heuristic Methods for Optimization, Convex Optimization, Mathematical Programming Controls and Systems : Hybrid Systems, Robust Control, Stochastic Control, Multivariable Control Robotics and Dynamics : Intermediate Dynamics, Robot Learning, Autonomous Mobile Robots, Robotic Manipulation	
INDUSTRY AND RESEARCH EXPERIENCE	Research Scientist , Toyota Research Institute, Cambridge, MA <i>Simulation and Tools</i> July 2016–Present Graduate Research Assistant , Cornell University, Ithaca, NY <i>Verifiable Robotics Research Group</i> August 2011–February 2017 Lead Systems Engineer , Impact Technologies, LLC., Rochester, NY <i>Control and Prediction Group</i> July 2008–August 2011 Research Scientist , NASA Glenn Research Center, Cleveland, OH <i>Intelligent Control and Autonomy Branch</i> July 2003–July 2008	
JOURNAL PUBLICATIONS	X. Huang, S. McGill, J. DeCastro , B. Williams, L. Fletcher, J. Leonard, G. Rosman. DiversityGAN: Diversity-Aware Vehicle Motion Prediction via Latent Semantic Sampling. <i>Robotics and Automation Letters</i> . Accepted, with oral presentation at IROS 2020. J. Alonso-Mora, J. DeCastro , V. Raman, D. Rus and H. Kress-Gazit. Reactive Mission and Motion Planning while Avoiding Dynamic Obstacles. <i>Autonomous Robots</i> , 42(4):801–824, 2018. J. DeCastro , R. Ehlers, M. Rungger, A. Balkan, and H. Kress-Gazit. Automated Generation of Dynamics-Based Runtime Certificates for High-Level Control. <i>Discrete Event Dynamic Systems Special Issue on Formal Methods in Control</i> , 27(2):371–405, 2017. J. DeCastro and H. Kress-Gazit. Synthesis of Nonlinear Continuous Controllers for Verifiably-Correct High-Level, Reactive Behaviors. <i>International Journal of Robotics Research</i> , 34(3):378–394, 2015. doi:10.1177/0278364914557736 X. Zhang, L. Tang and J. DeCastro . Robust Fault Diagnosis of Aircraft Engines: A Nonlinear Adaptive Estimation-Based Approach. <i>IEEE Trans. on Control Systems Technology</i> , 21(3):861–868, 2013. doi:10.1109/TCST.2012.2187057. J. DeCastro . Rate-Based Model Predictive Control of Turbofan Engine Clearance. <i>AIAA Journal of Propulsion and Power</i> . 23(4):804–813, 2007. doi:10.2514/1.25846 AIAA NOS Best Young Professional Paper	

- C. Mavrogiannis, **J. DeCastro**, and S. S. Srinivasa. Implicit Multi-Agent Coordination at Unsignalized Intersections via Topological Inference. (Under review), 2020.
- X. Huang, S. McGill, **J. DeCastro**, B. Williams, L. Fletcher, J. Leonard, G. Rosman. CARPAL: Confidence-Aware Intent Recognition for Parallel Autonomy. (Under review), 2020.
- S. Shiroshita, S. Maruyama, D. Nishiyama, M. Ynocente Castro, K. Hamzaoui, G. Rosman, **J. DeCastro**, K. -H. Lee, and A. Gaidon. Behaviorally Diverse Traffic Simulation via Reinforcement Learning. *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, (to appear) Virtual Conference, October 25–29, 2020.
- J. DeCastro**, K. Leung, N. Aréchiga, and M. Pavone. Interpretable Policies from Formally-Specified Temporal Properties. *Proceedings of the 23rd IEEE International Conference on Intelligent Transportation Systems (ITSC)*, (To appear) Virtual Conference, September 20–23, 2020.
- D. Nishiyama, M. Ynocente Castro, S. Maruyama, S. Shiroshita, K. Hamzaoui, Y. Ouyang, G. Rosman, **J. DeCastro**, K. -H. Lee, and A. Gaidon. Discovering Avoidable Planner Failures of Autonomous Vehicles using Counterfactual Analysis in Behaviorally Diverse Simulation. *Proceedings of the 23rd IEEE International Conference on Intelligent Transportation Systems (ITSC)*, (To appear) Virtual Conference, September 20–23, 2020.
- J. DeCastro**, L. Liebenwein, C. I. Vasile, R. Tedrake, S. Karaman and D. Rus. Counterexample-Guided Safety Contracts for Autonomous Driving. *Proceedings of the 13th International Workshop on the Algorithmic Foundations of Robotics (WAFR)*, Mérida, Mexico, December 9–11, 2018.
- L. Liebenwein, W. Schwarting, C. I. Vasile, **J. DeCastro**, J. Alonso-Mora, S. Karaman and D. Rus. Compositional and Contract-based Verification for Autonomous Driving on Road Networks. *International Symposium on Robotics Research (ISRR)*, Puerto Varas, Chile, December 11–14, 2017.
- J. DeCastro** and H. Kress-Gazit. Nonlinear Controller Synthesis and Automatic Workspace Partitioning for Reactive High-Level Behaviors. *Proceedings of the 19th ACM International Conference on Hybrid Systems: Computation and Control (HSCC)*, Vienna, Austria, April 12–14, 2016.
- J. DeCastro**, J. Alonso-Mora, V. Raman, D. Rus and H. Kress-Gazit. Collision-Free Reactive Mission and Motion Planning for Multi-Robot Systems. In: *Proceedings of the 17th International Symposium on Robotics Research (ISRR)*, Sestri Levante, Italy, September 12–15, 2015.
- J. DeCastro**, V. Raman and H. Kress-Gazit. Dynamics-Driven Adaptive Abstraction for Reactive High-Level Mission and Motion Planning. In: *Proceedings of the IEEE/RSJ International Conference on Robotics and Automation (ICRA 2015)*, Seattle, WA, USA, May 26–30, 2015.
- J. DeCastro** and H. Kress-Gazit. Guaranteeing Reactive High-Level Behaviors for Robots with Complex Dynamics. In: *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2013)*, Tokyo, Japan, November 3–8, 2013.
- J. DeCastro**, L. Tang, B. Zhang and G. Vachtsevanos. A Safety Verification Approach to Fault-Tolerant Aircraft Supervisory Control. In: *Proceedings of the AIAA Guidance, Navigation, and Control Conference*, Portland, OR, USA, August 8–11, 2011.
- J. DeCastro**, J. S. Litt, and D. K. Frederick. A Modular Aero-Propulsion System Simulation of a Large Commercial Aircraft Engine. In: *Proceedings of the 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit*, Hartford, CT USA, July 21–23, 2008.

- D. Jackson, **J. DeCastro**, S. Kong, D. Koutentakis, A. Leong Feng Ping, A. Solar-Lezama, M. Wang and X. Zhang. Certified Control for Self-Driving Cars. *4th Workshop on the Design and Analysis of Robust Systems (DARS)*, New York, NY, USA, 2019.
- N. Aréchiga, **J. DeCastro**, S. Kong and K. Leung. Better AI through Logical Scaffolding. *2nd Workshop on Formal Methods for ML-Enabled Autonomous Systems (FoMLAS)*, New York, NY, USA, 2019. arXiv:<https://arxiv.org/abs/1909.06965>.
- J. DeCastro**, R. Ehlers, M. Rungger, A. Balkan, P. Tabuada, and H. Kress-Gazit. Dynamics-Based Reactive Synthesis and Automated Revisions for High-Level Robot Control. *CoRR*, abs/1410.6375, 2014. arXiv:<http://arxiv.org/abs/1410.6375>.
- J. DeCastro**. Mission Possible: Guaranteeing Reactive Missions for Complex Robots. In: *ICRA 2015 Ph.D. Forum*, Seattle, WA, USA, May 26, 2015.

INVITED TALKS	Formally-Specifiable Agent Behavior Models for Autonomous Vehicle Test Generation, <i>Automation and Test in Europe Conference (DATE 2020)</i> , March 2020. Hosts: Prof. Jyotirmoy Deshmukh and Nikos Aréchiga.	
	Simulation and Verification for Autonomous Vehicles in Traffic Scenarios, <i>NSF ExCAPE Annual Meeting</i> , U. Penn, June 2017. Host: Prof. Rajeev Alur.	
	Guaranteeing Reactive Missions for Complex Robots, <i>Invited Seminar Speaker</i> , NASA Jet Propulsion Laboratory, December 2015.	
	Guaranteeing Reactive Missions for Complex Robots, <i>Invited Seminar Speaker</i> , MIT Lincoln Laboratory, November 2015.	
	Generalized Collision-Free Reactive Mission and Motion Planning for Multi-Robot Systems, <i>NSF ExCAPE Annual Meeting</i> , MIT, June 2015. Host: Prof. Armando Solar-Lezama.	
	Abstractions and Revisions for Synthesis for Nonlinear Robots, <i>NSF ExCAPE Annual Meeting</i> , U. C. Berkeley, March 2014. Host: Prof. Sanjit Seshia.	
TEACHING AND MENTORING EXPERIENCE	Reactive High-Level Robot Controller Synthesis: Optimality, Environment, and Dynamics, <i>NSF ExCAPE Robotics Workshop</i> , Rice University, November 2013. Host: Prof. Lydia Kavraki.	
	Teaching Assistant , System Dynamics, Cornell University	Spring 2016
	Teaching Assistant , Autonomous Mobile Robots, Cornell University	Spring 2015
	Mentor , Undergraduate Research, Cornell University	Spring 2015, Spring 2016
	Instructor , System Modeling, Rochester Institute of Technology	Winter 2010–2011
	<ul style="list-style-type: none"> Administered, lectured and graded for senior undergrad and graduate students 	
SERVICE AND OUTREACH	Workshop Organizer , “Command Your Own Robot”	2014, 2015
	Voting Member , Cornell Graduate and Professional Student Assembly	2013–2014
	Program Committee	
	<ul style="list-style-type: none"> Hybrid Systems Computation and Control (HSCC) 	2018, 2019
	<ul style="list-style-type: none"> Spring Simulation Conference (SpringSim) 	2020
	Reviewer	
	<ul style="list-style-type: none"> Robotics and Automation Letters (RA-L) 	2018, 2020
	<ul style="list-style-type: none"> Intelligent Vehicles Symposium (IV) 	2020
	<ul style="list-style-type: none"> Hybrid Systems Computation and Control (HSCC): Program Committee Member 	2018, 2019
	<ul style="list-style-type: none"> IEEE Transactions on Robotics (T-RO) 	2016, 2018
	<ul style="list-style-type: none"> International Conference on Intelligent Robots and Systems (IROS) 	2016, 2018, 2019
	<ul style="list-style-type: none"> International Conference on Cyber-Physical Systems (ICCPS) 	2015
HONORS AND AWARDS	<ul style="list-style-type: none"> International Conference on Robotics and Automation (ICRA) 	2014, 2015, 2017, 2018, 2020
	<ul style="list-style-type: none"> American Control Conference (ACC) 	2014
	<ul style="list-style-type: none"> IEEE Transactions on Industrial Electronics 	2011, 2012, 2013
	<ul style="list-style-type: none"> ASME Turbo Expo 	2005, 2007, 2010
	Travel Grant to ICRA in Seattle, WA; sponsored by IEEE RAS and NSF	2015
	Cornell MAE Fellowship , a merit-based award to incoming Ph.D. students	2011–2012
	ASME Propulsion Best Paper Award	2009
	NASA Group Achievement Award for outstanding group accomplishment (C-MAPSS Team)	2009
	NASA Space Act Award for an outstanding technical contribution	2007
	AIAA Best Young Professional Paper awarded by the Northern Ohio Section of AIAA	2007