

# Prof. Siddhartha Srinivasa

## Activity Report 2018-20

The Personal Robotics Lab  
Paul G. Allen School of Computer Science & Engineering  
University of Washington  
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### Honors and Awards

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- ACM/HRI Best Paper Award Winner for Technical Advances in HRI [13], 2019
- ICAPS Best Student Paper Award Winner [27], 2019
- IEEE Fellow, 2018
- ICAPS Best Paper Award Winner [16], 2018
- ACM/IEEE HRI Best Paper Award Finalist [9], 2018

### Mentoring

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#### Current Students

Gilwoo Lee	Ph.D.	<i>Scalable Bayesian Reinforcement Learning</i>	2015-
Brian Hou	Ph.D.		2016-
Aditya Vamsikrishna	Ph.D.		2016-
Samuel Ainsworth	Ph.D.		2016-
Sherdil Niyaz	Ph.D.		2017-
Liyiming Ke	Ph.D.		2017-
William Agnew	Ph.D.	+Pedro Domingos	2017-
Ethan Gordon	Ph.D.		2018-
Matthew Schmittle	Ph.D.	+Dieter Fox	2018-
Amal Nanvati	Ph.D.	+Maya Cakmak	2019-

#### Current Postdoctoral Fellows

Tapomayukh Bhattacharjee	2017-
Christoforos Mavrogiannis	2019-

#### Current Staff

Rosario Scalise	2017-
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#### Alumni - Postdoc

Sanjiban Choudhury	2018-2019 Now: Researcher, Aurora
Matthew Barnes	2018-2019 Now: Software Engineer, Google
Fereshteh Sadeghi	2019
Oren Salzman	2016-2019 Now: Assistant Professor, Technion
Daqing Yi	2016-2018 Now: Software Engineer, Google

## Alumni - Ph.D.

Stefanos Nikolaidis, Ph.D.	2014-2018
Thesis: <i>Mathematical Models of Adaptation in Human-Robot Collaboration</i>	Now: Assistant Professor, USC
Zita Marinho, Ph.D. (+Geoff Gordon)	2012-2018
Thesis: <i>Moment-based Algorithms for Structured Prediction</i>	Now: Research Scientist, Saco Brothers
Laura Herlant, Ph.D.	2013-2018
Thesis: <i>Algorithms, Implementation, and Studies on Eating with a Shared Control Robot Arm</i>	Now: Senior Robotics Research Scientist, iRobot

## Alumni - M.S.

Jeongseok Lee, M.S.	2016-18
Thesis: <i>A Linear-Time Variational Integrator for Multibody Systems</i>	Now: Engineer, Amazon

## Graduate Interns

Rishabh Madan (IIT Kharagpur)	2019-2020
Sara Sheikholeslami (UBC)	2019
Lerrel Pinto (CMU)	Summer 2019
Daniel Gallenberger (TU Munich)	Spring 2018
Daniel Gallenberger (TU Munich)	Spring 2018

## Undergraduate Interns

Sumegh Roychowdhury (IIT Kharagpur)	Summer 2020
Sidharth Talia (Bharati Vidyapeeth College of Engineering)	Summer 2020
Rajat Kumar Jenamani (IIT Kharagpur)	Summer 2019
Jeffrey Maxwell	2019
Shivam Singhal	2019
Savanna Yee	2018
Nanda Sundaresan	2018
Kaiden James Field	2018
Connor Geiman	2018
Tao Jin	2018
Rahul Vernwal (IIT Kharagpur)	Summer 2018
Maha Alrashed (BU)	Summer 2018
Abdullah Albakry (NC State)	Summer 2018
Ramon (Yiren) Qu	2017-

## Publications ([Google Scholar](#))

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### Refereed Journals

1. J. Gammell, T. Barfoot, and S. Srinivasa. Batch Informed Trees (BIT\*): Informed asymptotically optimal any-time search. *The International Journal of Robotics Research*, 2020. (To appear)
2. B. Yang, P. Lancaster, S. Srinivasa, and J. Smith. Benchmarking robot manipulation with the rubik's cube. *IEEE Robotics and Automation Letters*, 2020
3. T. Bhattacharjee, G. Lee, H. Song, and S. Srinivasa. Towards robotic feeding: Role of haptics in fork-based food manipulation. *IEEE Robotics and Automation Letters*, 2019
4. M. Chen, S. Nikolaidis, H. Soh, D. Hsu, and S. Srinivasa. Trust-aware decision making for human-robot collaboration: Model learning and planning. *ACM Transactions on Human-Robot Interaction*, 2019. (To appear)

5. R. Holladay, O. Salzman, and S. Srinivasa. Minimizing task-space fréchet error via efficient incremental graph search. *IEEE Robotics and Automation Letters*, 2019
6. J. Lee, M. X. Grey, S. Ha, T. Kunz, S. Jain, Y. Ye, S. S. Srinivasa, M. Stilman, and C. K. Liu. DART: Dynamic animation and robotics toolkit. *The Journal of Open Source Software*, 3(22):500, feb 2018
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5. T. Bhattacharjee, M. Cabrera, A. Caspi, M. Cakmak, and S. Srinivasa. A community-centered design framework for robot-assisted feeding systems. In *International ACM SIGACCESS Conference on Computers and Accessibility*, 2019
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14. A. Mandalika, S. Choudhury, O. Salzman, and S. Srinivasa. Generalized Lazy Search for Robot Motion Planning: Interleaving Search and Edge Evaluation via Event-based Toggles. In *International Conference on Automated Planning and Scheduling*, 2019. **Best Student Paper Award Winner**
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20. H. Song, T. Bhattacharjee, and S. Srinivasa. Sensing shear forces during food manipulation: Resolving the trade-off between range and sensitivity. In *IEEE International Conference on Robotics and Automation*, 2019
21. T. Weng, L. Perlmutter, S. Nikolaidis, S. Srinivasa, and M. Cakmak. Robot object referencing through situated legible projections. In *IEEE International Conference on Robotics and Automation*, 2019
22. R. Aronson, T. Santini, T. Kübler, E. Kasneci, S. Srinivasa, and H. Admoni. Eye-hand behavior in human-robot shared manipulation. In *ACM/IEEE International Conference on Human-Robot Interaction*, 2018
23. M. Chen\*, S. Nikolaidis\*, H. Soh, D. Hsu, and S. Srinivasa. Planning with trust for human-robot collaboration. In *ACM/IEEE International Conference on Human-Robot Interaction*, 2018. **Best Conference Paper Award Finalist**
24. S. Choudhury, S. Srinivasa, and S. Scherer. Bayesian active edge evaluation on expensive graphs. In *International Joint Conference on Artificial Intelligence*, 2018
25. N. Haghtalab, S. Mackenzie, A. Procaccia, O. Salzman, and S. Srinivasa. The Provable Virtue of Laziness in Motion Planning. In *International Conference on Automated Planning and Scheduling*, 2018. **Best Conference Paper Award Winner**
26. A. Hefny, Z. Marinho, W. Sun, S. Srinivasa, and G. Gordon. Recurrent predictive state policy networks. In *International Conference on Machine Learning*, 2018
27. J. Lee, D. Yi, and S. Srinivasa. Sampling of pareto-optimal trajectories using progressive objective evaluation in multi-objective motion planning. In *IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2018
28. A. Mandalika, O. Salzman, and S. Srinivasa. Lazy Receding Horizon A\* for Efficient Path Planning in Graphs with Expensive-to-Evaluate Edges. In *International Conference on Automated Planning and Scheduling*, 2018
29. S. Niyaz, A. Kuntz, O. Salzman, R. Alterovitz, and S. Srinivasa. Following surgical trajectories with concentric tube robots via nearest-neighbor graphs. In *International Symposium on Experimental Robotics*, 2018
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31. D. Yi, R. Thakker, C. Gulino, O. Salzman, and S. Srinivasa. Generalizing informed sampling for asymptotically-optimal sampling-based kinodynamic planning via markov chain monte carlo. In *IEEE International Conference on Robotics and Automation*, 2018

## Reports and Theses

1. S. S. Srinivasa, P. Lancaster, J. Michalove, M. Schmittle, C. Summers, M. Rockett, J. R. Smith, S. Choudhury, C. Mavrogiannis, and F. Sadeghi. MuSHR: A low-cost, open-source robotic racecar for education and research. *CoRR*, abs/1908.08031, 2019
2. T. Bhattacharjee, D. Gallenberger, D. Dubois, L. L'Écuyer-Lapiere, Y. Kim, A. Mandalika, R. Scalise, R. Qu, H. Song, E. Gordon, and S. Srinivasa. Autonomous robot feeding for upper-extremity mobility impaired people: Integrating sensing, perception, learning, motion planning, and robot control. In *Conference on Neural Information Processing Systems*, 2018. **Best Demo Award Winner**
3. B. Newman, R. Aronson, S. Srinivasa, K. Kitani, and H. Admoni. HARMONIC: A multimodal dataset of assistive human-robot collaboration. *CoRR*, abs/1807.11154, 2018

## Seminars

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Army Research Laboratories	2019
Carnegie Mellon University	2019
Northwestern	2018
Toyota Technological Institute at Chicago	2018
Georgia Tech	2018
Amazon	2018

**Others:** Too numerous to count.

## Teaching

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### CSE 490R Robotics

Winter 2017-

#### Paul G. Allen School for Computer Science & Engineering

Brand new undergraduate-level robotics course on robotics in the real world. The course covers state estimation (particle filters, motion models, sensor models etc), planning/control (search based planners, lattice based planners, trajectory following techniques etc), and perception and learning (object detection, learning from demonstrations etc.). Student teams implement algorithms on the RACECAR platform developed by Prof. Srinivasa for the course.

### CSE 599 Advanced Robotics

Fall 2017-

#### Paul G. Allen School for Computer Science & Engineering

Brand new graduate-level robotics course on motion planning algorithms. The course covers the Piano Movers Problem, sampling-based planning, minimum dispersion graphs, efficient search, lazy and anytime planning, planning under uncertainty with application to mobile manipulators and humanoid robots, with a focus on algorithmic foundations and theorem proving.

## Professional Activities

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Board Member	RSS Foundation	2016-
Editor	International Journal of Robotics Research (IJRR)	2014-
<b>Selected Organization</b>		
Organizer	UW CSE MSR Summer Institute on Social Robotics	2018

## Grants Active in Period

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US Army Research Laboratory	2020-21
Scalable, Adaptive, and Resilient Autonomy	\$150,000
Title: <i>Safe, Fluent, and Generalizable Outdoor Autonomy</i>	
co-PI, PI: Byron Boots, UW	
HONDA	2018-21

HONDA Research Institute Title: <i>Formalizing Mathematical Models of Curiosity</i> PI	\$2,700,000
Office of Naval Research (#ONR N00014-16-R-BA01) Long Range BAA for Navy and Marine Corps Science and Technology Title: <i>Enabling dexterous physics-based manipulation via a learning framework for shared autonomy</i> PI	2017-20 \$2,096,633
National Science Foundation (#1839371) Division of Mathematical Sciences, the Division of Computing and Communication Foundations, and the Division of Information and Intelligent Systems Title: <i>Safe Imitation Learning for Robotics</i> co-PI, PI: Zaid Harchaoui, UW	2018-21 \$125,000
RCTA T3 Robotics Collaborative Technology Alliance Title: <i>Robust Outdoor Mobile Manipulation</i> PI	2017-18 \$355,594
Amazon Amazon Research Award Title: <i>Data Efficient Policy Search for Reinforcement Learning</i> PI	2017-18 \$80,000
National Science Foundation (#1748582) National Robotics Initiative (NRI) Title: <i>NRI: Collaborative Research: Learning Deep Sensorimotor Policies for Shared Autonomy</i> PI, co-PI: Sergey Levine, Berkeley	2017-19 \$453,379
National Science Foundation (#1544797) Cyber-Physical Systems (CPS) Title: <i>CPS: Synergy: Collaborative Research: Learning control sharing strategies for assistive cyber-physical systems</i> PI, co-PI: Brenna Argall, Northwestern	2015-18 \$435,928
National Science Foundation (#1409003) Robust Intelligence, Division of Information & Intelligent Systems (IIS) Title: <i>RI: Medium: The Foundations of a Manipulation Repertoire</i> Co-PI, PI: Matt Mason, Co-PI: Michael Erdmann, CMU	2014-18 \$358,737

## Selected Press Coverage ([Longer list](#))

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2019

Fast Company	The best interactive design of the year
Geek Wire	Robotic race car platform from Univ. of Washington designed to speed research around A.I.
BBC News	Robot arm can feed people with mobility issues

2018

MIT Tech Review	Research robots sometimes left unsecured on the internet, study finds
KUOW Public Radio	The Record: Robotics
Washington Post	An expert explains how close we are to 'The Jetsons.'
GeekWire	UW's HERB robot makes cameo on X-Files as automated sushi waiter

2017 (moved to UW)

BBC World Live	Autonomous Weapons that use AI
IEEE The Institute	IEEE Members Build Robots to Help People with Disabilities Live Independently
New York Times	Learning to love our robot co-workers
GeekWire	Robotics expert moves entire team to UW, including famous Oreo-cracking robot

## References

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- [1] S. Ainsworth, M. Barnes, and S. Srinivasa. Mo states mo problems: Emergency stop mechanisms from observation. In *Advances in Neural Information Processing Systems*, 2019.
- [2] R. Aronson, T. Santini, T. Kübler, E. Kasneci, S. Srinivasa, and H. Admoni. Eye-hand behavior in human-robot shared manipulation. In *ACM/IEEE International Conference on Human-Robot Interaction*, 2018.
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- [4] T. Bhattacharjee, M. Cabrera, A. Caspi, M. Cakmak, and S. Srinivasa. A community-centered design framework for robot-assisted feeding systems. In *International ACM SIGACCESS Conference on Computers and Accessibility*, 2019.
- [5] T. Bhattacharjee, D. Gallenberger, D. Dubois, L. L’Écuyer-Lapiere, Y. Kim, A. Mandalika, R. Scalise, R. Qu, H. Song, E. Gordon, and S. Srinivasa. Autonomous robot feeding for upper-extremity mobility impaired people: Integrating sensing, perception, learning, motion planning, and robot control. In *Conference on Neural Information Processing Systems*, 2018. **Best Demo Award Winner**.
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- [15] J. Gammell, T. Barfoot, and S. Srinivasa. Batch Informed Trees (BIT\*): Informed asymptotically optimal anytime search. *The International Journal of Robotics Research*, 2020. (To appear).
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