HARISH RAVICHANDAR

Curriculum Vitae

School of Interactive Computing
Georgia Institute of Technology
Atlanta GA 30332
harish.ravichandar@gatech.edu
harishchaandar@gmail.com
harishravichandar.com

ACADEMIC POSITIONS

- **Assistant Professor (Tenure-Track)** *starting Fall 2021*
  School of Interactive Computing
  Georgia Institute of Technology

- **Research Scientist** *May 2019 – present*
  School of Interactive Computing
  Georgia Institute of Technology

- **Postdoctoral Fellow** *July 2018 – May 2019*
  School of Interactive Computing
  Georgia Institute of Technology
  Advisor: Sonia Chernova

- **Graduate Research Assistant** *Aug 2014 – May 2018*
  Electrical & Computer Engineering
  University of Connecticut

- **Graduate Research Assistant** *May 2013 – May 2014*
  Electrical & Computer Engineering
  University of Florida

EDUCATION

- **Ph.D.,** *Electrical & Computer Engineering* *2018*
  University of Connecticut
  Advisory Committee: Ashwin Dani, Krishna Pattipati, Liang Zhang

- **M.S.,** *Electrical & Computer Engineering* *2014*
  University of Florida
  Advisor: Haniph Latchman

- **B.E.,** *Instrumentation & Control Engineering* *2012*
  Anna University, Chennai, India

HONORS AND AWARDS

- **Outstanding Research Scientist Award** *2020*
  College of Computing, Georgia Tech
- **Thank-a-Teacher Award** *2019*
  Center for Teaching & Learning, Georgia Tech
- **Outstanding Post-Doctoral Research Award** *2019*
  College of Computing, Georgia Tech
- **Best Presentation Award** *2018*
  College of Computing, Georgia Tech Postdoctoral Research Symposium
- **Graduate Fellowship** *2016-2018*
  UTC Institute for Advanced System Engineering, University of Connecticut
- **Summer Pre-Doctoral Fellowship** *2016 & 2017*
  Electrical and Computer Engineering, University of Connecticut
- **Best Robotics Student Paper Award** *2015*
  ASME Dynamic Systems and Controls Conference (DSCC)
- **IEEE Control System Society Video Contest Award** *2015*

FUNDING

- **Army Research Office**, $505,000 *2020-2022*
  PI: **H. Ravichandar**
  Learning Task Requirements from Demonstrations for Heterogeneous Multi-Agent Systems.

INVITED TALKS

- **Cornell Robotics Seminar** *Feb 2021*
  "Trait-based Coordination of Heterogenous Multi-Agent Teams"
- **MIT AeroAstro Humans Interacting with Autonomy Workshop** *Jan 2021*
  "*From Coexistence to Collaboration: Towards reliable collaborative robots"*
- **Institute for Robotics and Intelligent Machines, Georgia Tech** *Oct 2020*
  "*From Coexistence to Collaboration: Towards reliable collaborative robots"*
- **University of California, San Diego** *Apr 2020*
  "*From Coexistence to Collaboration: Towards reliable collaborative robots"*
- **Army Science Planning and Strategy Meeting** *Jan 2019*
  "*A Unified Modeling Framework for Task Assignment in Heterogenous Teams*"

- **Google Brain, New York** *Feb 2018*
  "*Imitation Learning and Intention Inference: Towards Seamless HRI*

- **Robot Autonomy and Interactive Learning (RAIL) Lab, Georgia Tech** *Feb 2018*
  "*Learning Complex Goal-Directed Motions with Convergence Guarantees*"

- **Personal Robotics Lab, Carnegie Mellon University** *April 2017*
  "*Anticipating Human Intentions for Human-Robot Collaboration*"

- **The MITRE Corporation** *July 2016*
  "*Learning and Anticipating Human Motion for Human-Robot Collaboration*"

PUBLICATIONS

Peer-reviewed

BOOK CHAPTERS

BC1. A. P. Dani, I. Salehi, G. Yao, **H. Ravichandar**, "Learning and Coordination of Movement Primitives for Bimanual Manipulation Tasks using Concurrent Synchronization" in "*Recent Advances in Industrial Robotics*", Editors: Satyandra K. Gupta, Venkat Krovi, and Craig Schlenoff, WSPC, 2020. [*in press*]

BC2. **H. Ravichandar**, A. P. Dani, "Human Intention Inference using Expectation- Maximization Algorithm with Online Model Learning" in "*Human Modeling: System-level Investigation into Human Mechanisms for Assistive Technologies*", Editors: Jun Ueda, Yuichi Kurita, Elsevier, 2016.

JOURNAL ARTICLES

J1. **H. Ravichandar**, K. Shaw, S. Chernova, "STRATA: Unified Framework for Task Assignments in Large Teams of Heterogeneous Agents", *Journal of Autonomous Agents and Multi-Agent Systems (J-AAMAS)*, vol. 34, no. 38, 2020.

J2. **H. Ravichandar***, A. Polydoros*, S. Chernova[#], A. Billard[#], "Recent Advances in Robot Learning from Demonstration", *Annual Review of Control, Robotics, and Autonomous Systems*, vol. 3, no. 1, 2020. [** and [#] indicate equal contribution*]

J3. **H. Ravichandar**, A. P. Dani, "Learning Pose Dynamics from Demonstrations via Contraction Analysis", *Autonomous Robots*, vol. 43, no. 4, pp. 897–912, 2019.

J4. **H. Ravichandar**, A. Kumar, A. P. Dani, "Gaze and Motion Information Fusion for Human Intention Inference", *International Journal on Intelligent Robotics and Applications*, vol. 2, no. 2, pp. 136-148, 2018.

J5. **H. Ravichandar**, A. P. Dani, "Human Intention Inference using E-M Algorithm with Online Learning", *IEEE Transactions on Automation Science and Engineering*, vol. 14, no. 2, pp. 855-868,2017.

MAGAZINE ARTICLES

M1. A. P. Dani, I. Salehi, G. Rotithor, D. Trombetta, **H. Ravichandar**, "Human-in-the-loop Robot Control for Human-Robot Collaboration", *IEEE Control Systems*, vol. 40, no. 6, Dec. 2020.

CONFERENCE PROCEEDINGS

C1. M. Rudolph, S. Chernova, **H. Ravichandar**, "Desperate Times Call for Desperate Measures: Towards Risk-Adaptive Task Allocation", *IEEE International Conference on Intelligent Robots and Systems (IROS)*, 2021.

C2. G. Neville, A. Messing, **H. Ravichandar**, S. Hutchinson, S. Chernova, "An Interleaved Approach to Trait-Based Task Allocation and Scheduling", *IEEE International Conference on Intelligent Robots and Systems (IROS)*, 2021.

C3. J. Kolb, M. Kishore, K. Shaw, **H. Ravichandar**, S. Chernova, "Predicting Individual Human Performance in Human-Robot Teaming", *IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)*, 2021.

C4. **H. Ravichandar**, K. Shaw, S. Chernova, "STRATA: Unified Framework for Task Assignments in Large Teams of Heterogeneous Agents", *Autonomous Agents and Multi-Agent Systems (AAMAS) - J-AAMAS track*, 2021.

C5. K. Chen, D. Kent, N. Shrivatsav, **H. Ravichandar**, S. Chernova "Learning Hierarchical Task Networks with Preferences from Unannotated Demonstrations", *Conference on Robot Learning (CoRL)*, 2020.

C6. G. Neville, **H. Ravichandar**, K. Shaw, S. Chernova, "Approximated Dynamic Trait Models for Heterogeneous Multi-Robot Teams", *International Conference on Intelligent Robots and Systems (IROS)*, 2020.

C7. A. Jain, D. Chen, D. Bansal, D. Kent, **H. Ravichandar**, S. Chernova, "Anticipatory Human-Robot Collaboration via Multi-Objective Trajectory Optimization", *International Conference on Intelligent Robots and Systems (IROS)*, 2020.

C8. M. A. Rana, A. Li, **H. Ravichandar**, M. Mukadam, S. Chernova, B. Boots, N.Ratliff, D. Fox, "Learning Reactive Motion Policies in Multiple Task Spaces from Human Demonstrations", *Conference on Robot Learning (CoRL)*, 2019.

C9. S. Banerjee, A. Daruna, D. Kent, W. Liu, J. Balloch, A. Jain, A. Krishnan, M. A. Rana, **H. Ravichandar**, B. Shah, N. S. Srikanth, S. Chernova, "Taking Recoveries to Task: Recovery-Driven Development for Recipe-Based Robot Tasks", *International Symposium on Robotics Research (ISRR)*, 2019.

C10. **H. Ravichandar***, S. R. Ahmadzadeh*, M. A. Rana, S. Chernova, "Skill Acquisition via Automated Multi-Coordinate Cost Balancing", *IEEE International Conference on Robotics and Automation (ICRA)*, 2019. [** indicates equal contribution*]

C11. **H. Ravichandar**, D. Trombotta, A. P. Dani, "Human Intention-Driven Learning Control for Trajectory Synchronization in Human-Robot Collaborative Tasks", *IFAC International Conference on Cyber-Physical & Human Systems (CPHS)*, 2018.

C12. B. P. Baillie, **H. Ravichandar**, I. Salehi, A. P. Dani, George Bollas, "Approaches for Creation and Evaluation of Computationally Efficient Thermofluid System Models", *International Symposium on Advanced Control of Chemical Processes (ADCHEM)*, 2018.

C13. **H. Ravichandar**, I. Salehi, B. Baillie, G. Bollas, A. P. Dani, "Learning Stable Nonlinear Dynamical Systems with External Inputs using Gaussian Mixture Models*", American Control Conference (ACC)*, 2018, pp. 4825-4830.

C14. **H. Ravichandar**, I. Salehi, A. P. Dani, "Learning Partially Contracting Dynamical Systems from Demonstrations", *Proceedings of the Machine Learning Research*, vol. 78 (*Conference on Robot Learning*), 2017, pp. 369-378.

C15. **H. Ravichandar**, A. Kumar, A. P. Dani, K. R. Pattipati, "Learning and Predicting Sequential Tasks using Recurrent Neural Networks and Multiple Model Filtering", *AAAI Fall Symposium Series, Shared Autonomy in Research and Practice*, 2016, pp. 331-337.

C16. P. K. Thota, **H. Ravichandar**, A. P. Dani, "Learning and Synchronization of Movement Primitives for Bimanual Manipulation Tasks", *IEEE Conference on Decision and Control (CDC)*, 2016, pp. 945-950.

C17. **H. Ravichandar***, A. Kumar*, A. P. Dani, "Bayesian Human Intention Inference Through Multiple Model Filtering with Gaze-based Priors", *International Conference on Information Fusion (FUSION)*, 2016, pp. 2296-2302. [** indicates equal contribution*]

C18. **H. Ravichandar**, P. K. Thota, A. P. Dani, "Learning Periodic Motions from Human Demonstrations using Transverse Contraction Analysis", *IEEE American Control Conference (ACC)*, 2016, pp. 4853-4858.

C19. **H. Ravichandar**, A. P. Dani, "Learning Contracting Nonlinear Dynamics from Human Demonstrations for Robot Motion Planning", *ASME Dynamic Systems and Control Conference (DSCC)*, 2015 [*Best Robotics Student Paper Award*]

C20. **H. Ravichandar**, A. P. Dani, J. Khadijah-Hajdu, N. Kirsch, Q. Zhong, N. Sharma, "Expectation Maximization Method to Identify an Electrically Stimulated Musculoskeletal Model", *ASME Dynamic Systems and Control Conference (DSCC)*, 2015.

C21. **H. Ravichandar**, A. P. Dani, "Human Intention Inference using Artificial Neural Network-based E-M Algorithm", *IEEE Intelligent Robots and Systems (IROS)*, 2015, pp. 1819-1824.

C22. **H. Ravichandar**, A. P. Dani, 'Human Intention Inference using Interacting Multiple Model Filtering', *IEEE International Conference on Multisensor Fusion and Information Integration for Intelligent Systems (MFI)*, 2015, pp. 220-225.

C23. **H. Ravichandar**, A. P. Dani, "Gyro-aided Image-Based Tracking using Mutual Information Optimization and User Inputs*", IEEE International Conference on Systems, Man, and Cybernetics (SMC)*, 2014, pp. 858-863.

WORKSHOP PAPERS

W1. J. Kolb, M. Kishore, K. Shaw, **H. Ravichandar**, S. Chernova, "Predicting Individual Human Performance in Human-Robot Teaming", *Workshop Your Study Design, International Conference of Human-Robot Interaction (HRI), 2021*.

W2. **H. Ravichandar**, K. Shaw, S. Chernova, "STRATA: Unified Framework for Task Assignments in Large Teams of Heterogeneous Robots", *Workshop on Resilient Robot Teams, IEEE International Conference on Robotics and Automation (ICRA)*, 2019.

PATENTS

P1. A. P. Dani and **H. Ravichandar**, "Skill Transfer from a Person to a Robot", US Patent # 10,807,233.

P2. A. P. Dani and **H. Ravichandar**, "Early Prediction of an Intention of a User's Actions", Serial #15/659,827 - *patent pending*.

TEACHING

- **Instructor**, Georgia Institute of Technology
  - *CS 3630: Introduction to Robotics and Perception* *Fall 2019*
    - Enrollment: 174 students
    - Worked with a team of 11 teaching assistants

- **Teaching Assistant**, University of Connecticut
  - *ECE 3111: Systems Analysis* *Fall 2014 - Fall 2015*
    - Substitute lecturer, held office hours and review sessions, and graded assignments and tests

- **Teaching Assistant**, University of Florida
  - *EEL* 4657: *Linear Control Systems* *Fall 2013 - Spring 2014*
    - Delivered lectures twice a week, held office hours, designed and graded tests
  - *EEL 4657C: Linear Control Systems Lab* *Fall 2013 - Spring 2014*
    - Developed a remote laboratory
    - Supervised lab sessions, held office hours, and graded reports

- **YouTube video lectures** (with over a 100,000 views as of August 2020) on topics related to linear systems in collaboration with *UConn IEEE-HKN chapter*, 2015.

SERVICE

DEPARTMENTAL SERVICE

- School Advisory Committee *Fall 2019 - Spring 2021*
  School of Interactive Computing, Georgia Tech

Associate Editor

- IEEE International Conference on Robotics and Automation (ICRA) *2021*

Workshop Organization

- Workshop on Heterogeneous Multi-Robot Task Allocation and Planning *July 12, 2020*
  Robotics: Science and Systems (RSS)

- Workshop on Interactive Robot Learning *June 5, 2020*
  International Conference on Robotics and Automation (ICRA)

Reviewer

- NSF Review Panel (2019, 2021)
- IEEE Robotics and Automation Letters (RA-L)
- IEEE Transactions on Robotics (T-RO)
- ACM Transactions on Human-Robot Interaction (T-HRI)
- IEEE Transactions on Automation Science and Engineering (T-ASE)
- IEEE Transactions on Cybernetics (T-Cyb)
- IEEE Transactions on Control Systems Technology (T-CST)
- IEEE International Conference on Robotics and Automation (ICRA)
- Conference on Robot Learning (CoRL)
- IEEE International Conference on Intelligent Robotics and Systems (IROS)
- International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS)
- International Symposium on Robotics Research (ISRR)
- American Controls Conference (ACC)
- IEEE Conference on Decision and Control (CDC)
- ASME Dynamical Systems and Controls Conference (DSCC)
- IEEE International Conference on Automation Science and Engineering (CASE)

References

- **Dr. Sonia Chernova** | chernova@gatech.edu
  Associate Professor, School of Interactive Computing
  Georgia Tech
- **Dr. Ashwin Dani** | ashwin.dani@uconn.edu
  Associate Professor, Electrical and Computer Engineering
  University of Connecticut
- **Dr. Magnus Egerstedt** | magnus.egerstedt@ece.gatech.edu
  Steve W. Chaddick Chair and Professor, School of Electrical and Computer Engineering
  Georgia Tech
- **Dr. Seth Hutchinson** | seth@gatech.edu
  Executive Director, Institute for Robotics and Intelligent Machines
  Professor and KUKA Chair for Robotics, School of Interactive Computing
  Georgia Tech
- **Dr. Brian Sadler** | brian.m.sadler6.civ@mail.mil
  Senior Scientist for Intelligence Systems
  Army Research Lab