Tucker Ryer Hermans

School of Computing
50 S Central Campus Drive Room 3190
Salt Lake City, UT, 84112

thermans@cs.utah.edu
robot-learning.cs.utah.edu
+1 (801) 581-8122

Education

Georgia Institute of Technology, School of Interactive Computing *Atlanta, GA*
Ph.D. Robotics, 2014

- Thesis: "Representing and Learning Affordance-Based Behaviors"
- Thesis Committee: Aaron Bobick (**advisor**), James M. Rehg (**co-advisor**), Henrik Christensen, Charles C. Kemp, Mike Stilman, and Dieter Fox (University of Washington)

Georgia Institute of Technology, College of Computing *Atlanta, GA*
M.S. Computer Science: Computational Perception and Robotics, 2012

Bowdoin College *Brunswick, ME*
A.B. Magna Cum Laude in Computer Science (Honors) and German, 2009

Humboldt Universität zu Berlin *Berlin, Germany*
Coursework in Computer Science and German Literature, 2007–2008

Experience

School of Computing, University of Utah *July 2015–Present*
Assistant Professor

NVIDIA, Seattle, WA *March 2020–Present*
Senior Research Scientist

NVIDIA, Seattle, WA *May 2019–August 2019*
Visiting Professor

Department of Mechanical Engineering, University of Utah *January 2016–Present*
Adjunct Assistant Professor

Technische Universität Darmstadt, Department of Computer Science *April 2014–July 2015*
Postdoctoral Researcher in Robot Learning

Georgia Institute of Technology, School of Interactive Computing *Aug 2009–April 2014*
Graduate Research Assistant

Georgia Institute of Technology, School of Interactive Computing *Fall 2011*
Graduate Teaching Assistant: CS 4495 Computer Vision

Awards and Honors

CoRL Best Systems Paper *2019*
ICRA Best Paper in Robot Manipulation–*Finalist* *2019*
NSF CAREER Award *2019*
3M Non-Tenured Faculty Award *2019*
ICRA Best Medical Robotics Paper *2017*
ICDL-Epirob CIS Student Travel Grant *2013*
Georgia Tech President's Fellowship *2009–2013*
Phi Beta Kappa, Alpha of Maine *2009*

Maine State Police Colonel's Award *2009*
RoboCup Standard Platform League: Second Place *2009*
RoboCup Standard Platform League: Third Place *2008*
RoboCup Standard Platform League: World Champion *2007*
Sarah and James Bowdoin Scholar *2006, 2007*

Invited Talks

"Improving Multi-fingered Robot Manipulation by Unifying Learning and Planning" *January 2020*
Robotics Seminar, University of Michigan

"Improving Multi-fingered Robot Manipulation by Unifying Learning and Planning" *September 2019*
Robotics Institute Seminar, Carnegie Mellon University

"Improving Multi-fingered Robot Manipulation by Unifying Learning and Planning" *September 2019*
Institute for Robotics and Intelligent Machines Seminar, Georgia Tech

"Improving Multi-fingered Robot Manipulation by Unifying Learning and Planning" *December 2018*
NVIDIA, Seattle, WA

"Planning Multi-fingered Grasps in Learned Neural Networks" *April 2018*
RSS 2018 Symposium, Cornell University

"Learning and Planning for Autonomous, Multi-fingered Robot Manipulation" *October 2017*
Robotics Colloquium, University of Washington

"Within-Hand Manipulation Benchmark" *September 2017*
Workshop on Benchmarking Protocols for Robot Manipulation

"Visual and Tactile Learning for Robot Manipulation" *January 2016*
Department of Mechanical Engineering, Brigham Young University

"Visual and Tactile Learning for Robot Manipulation" *April 2015*
School of Computing, University of Utah

"Visual and Tactile Learning for Robot Manipulation" *March 2015*
School of Computer Science, McGill University

"Visual and Tactile Learning for Robot Manipulation" *February 2015*
Department of Computer Science, Drexel University

"Tactile Sensing for Object Manipulation in Clutter" *September 2014*
Third Workshop on Robotics in Clutter, IROS 2014

Publications

Journal Articles

[J1] K. Jensen-Nau[†], T. Hermans, and K. K. Leang. "Near-Optimal Area-Coverage Path Planning of Energy Constrained Aerial Robots with Application in Autonomous Environmental Monitoring." *IEEE Transactions on Automation Science and Engineering*, 2020.

[J2] Q. Lu, M. Van der Merwe, B. Sundaralingam, and T. Hermans. "Multi-Fingered Grasp Planning via Inference in Deep Neural Networks." *IEEE Robotics & Automation Magazine (Special Issue on Deep Learning and Machine Learning in Robotics)*, 2020.

[J3] S. Cruciani*, B. Sundaralingam*, K. Hang, V. Kumar, T. Hermans, and D. Kragic. "Benchmarking In-Hand Manipulation" *IEEE Robotics & Automation Letters (Special Issue on Benchmarking Protocols for Robotic Manipulation)*, 2020.

[J4] Q. Lu and T. Hermans. "Modeling Grasp Type Improves Learning-Based Grasp Planning." *IEEE Robotics & Automation Letters (RA-L)* (Presented at ICRA 2019), 2019.

[J5] J. R. Watson and T. Hermans. "Assembly Planning by Subassembly Decomposition using Blocking Reduction." *IEEE Robotics & Automation Letters (RA-L)*, 2019.

[J6] B. Sundarlingam and T. Hermans. "Relaxed-Rigidity Constraints: Kinematic Trajectory Optimization and Collision Avoidance for In-Grasp Manipulation." *Autonomous Robots: (Special Issue on RSS 2017)*, 2019.

[J7] J. D. Carrico†, T. Hermans, K. J. Kim, and K. K. Leang. "3D-Printing and Machine Learning Control of Soft Ionic Polymer-Metal Composite Actuators" *Scientific Reports (Special Collection: Soft Sensors and Actuators)*, 2019.

[J8] F. Veiga, J. Peters, and T. Hermans. "Stabilization of Novel Objects using Slip Prediction." *IEEE Transactions on Haptics*, 2018.

Peer-Reviewed Conference and Workshop Papers

[C1] M. Van der Merwe, Q. Lu, B. Sundaralingam, M. Matak, and T. Hermans. "Learning Continuous 3D Reconstructions for Geometrically Aware Grasping." *IEEE International Conference on Robotics and Automation (ICRA), 2020.*

[C2] M. Wilson and T. Hermans. "Learning to Manipulate Object Collections Using Grounded State Representations." *Conference on Robot Learning (CoRL)*, 2019. **Best Systems Paper Award**

[C3] A. Conkey and T. Hermans. "Active Learning of Probabilistic Movement Primitives." *IEEE-RAS International Conference on Humanoid Robotics (Humanoids)*, 2019.

[C4] A. Conkey and T. Hermans. "Learning Task Constraints from Demonstration for Hybrid Force/Position Control." *IEEE-RAS International Conference on Humanoid Robotics (Humanoids)*, 2019.

[C5] B. Sundaralingam, A. Lambert, A. Handa, B. Boots, T. Hermans, S. Birchfield, N. Ratliff, and D. Fox. "Robust Learning of Tactile Force Estimation through Robot Interaction."*IEEE International Conference on Robotics and Automation (ICRA)*, 2019. **Best Paper in Robot Manipulation Award–Finalist**

[C6] S. Payne†, C. F. Garrison IV†, S. E. Markhan†, T. Hermans, and K. K. Leang, "Assembly Planning using a Multi-arm System for Polygonal Furniture." *ASME Dynamic Systems and Control Conference (DSCC)*, 2019.

[C7] R. Sabbagh Novin, A. Yazdani, T. Hermans, and A. Merryweather. "Dynamics Model Learning and Manipulation Planning for Objects in Hospitals using a Patient Assistant Mobile (PAM) Robot." *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2018.

[C8] B. Sundaralingam and T. Hermans. "Geometric In-Hand Regrasp Planning: Alternating Optimization of Finger Gaits and In-Grasp Manipulation." *IEEE International Conference on Robotics and Automation (ICRA)*, 2018.

[C9] Q. Lu, K. Chenna, B. Sundaralingam, and T. Hermans. "Planning Multi-Fingered Grasps as Probabilistic Inference in a Learned Deep Network." *International Symposium on Robotics Research*, 2017.

[C10] B. Sundarlingam and T. Hermans. "Relaxed-Rigidity Constraints: In-Grasp Manipulation using Purely Kinematic Trajectory Optimization." *Robotics: Science and Systems*, 2017.

[C11] K. M. Popek†, T. Hermans, and J. J. Abbott. "First Demonstration of Simultaneous Localization and Propulsion of a Magnetic Capsule in a Lumen using a Single Rotating Magnet." *IEEE International Conference on Robotics and Automation (ICRA)*, 2017. **Best Medical Robotics Paper Award**

[C12] Z. Yi, R. Calandra, H. van Hoof, F. Veiga, T. Hermans, Y. Zhang, and J. Peters. "Active Tactile Object Exploration with Gaussian Processes," *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2016.

[C13] J. Hoelscher, J. Peters, and T. Hermans. "Evaluation of Tactile Feature Extraction for Interactive Object Recognition." *IEEE-RAS International Conference on Humanoid Robotics (Humanoids)*, 2015.

[C14] H. van Hoof, T. Hermans, G. Neumann, and J. Peters. "Learning Robot In-Hand Manipulation with Tactile Features." *IEEE-RAS International Conference on Humanoid Robotics (Humanoids)*, 2015.

[C15] F. Veiga, H. van Hoof, J. Peters, and T. Hermans. "Detecting Slip and Stabilizing Grip of Novel Objects with Tactile Sensing." *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Hamburg, Germany, 2015.

[C16] T. Hermans, F. Li, J. M. Rehg, A. F. Bobick. "Learning Contact Locations for Pushing and Orienting Unknown Objects." *IEEE-RAS International Conference on Humanoid Robotics (Humanoids)*, Atlanta, GA, USA, October 2013.

[C17] A. Ciptadi, T. Hermans, J. M. Rehg. "An In Depth View of Saliency." *British Machine Vision Conference (BMVC)*, Bristol, United Kingdom, September 2013.

[C18] T. Hermans, F. Li, J. M. Rehg, A. F. Bobick. "Learning Stable Pushing Locations." *IEEE International Conference on Developmental Learning and Epigenetic Robotics (ICDL-Epirob)*, Osaka, Japan, August 2013.

[C19] T. Hermans, J. M. Rehg, A. F. Bobick. "Decoupling Behavior, Perception, and Control for Autonomous Learning of Affordances." *IEEE International Conference on Robotics and Automation (ICRA)*, Karlsruhe, Germany, May 2013.

[C20] T. Hermans, J. M. Rehg, A. F. Bobick."Decoupling Behavior, Control, and Perception in Affordance-Based Manipulation." *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS): Workshop on Cognitive Assistive Systems*, Vilamoura, Portugal, October 2012.

[C21] T. Hermans, J. M. Rehg, A. F. Bobick."Guided Pushing for Object Singulation." *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Vilamoura, Portugal, October 2012.

[C22] A. Cosgun, T. Hermans, V. Emeli, M. Stilman. "Push Planning for Object Placement on Cluttered Table Surfaces." *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2011.

[C23] T. Hermans, J. M. Rehg, A. F. Bobick. "Affordance Prediction via Learned Object Attributes," *ICRA Workshop on Semantic Perception, Mapping, and Exploration*, 2011.

[C24] H. Zhou, T. Hermans, A. V. Karandikar, J. M. Rehg. "Movie Genre Classification via Scene Categorization." *ACM Multimedia*, Florence, Italy, November 2010.

[C25] H. Work, E. Chown, T. Hermans, J. Butterfield, M. McGranaghan. "Player Positioning in the Four-Legged League." *RoboCup: Robot Soccer World Cup XII*. Suzhou, China, 2008.

[C26] H. Work, E. Chown, T. Hermans, J. Butterfield. "Robust Team-Play in Highly Uncertain Environments." *International Joint Conference on Autonomous Agents and Multiagent Systems*. Estoril, Portugal, May 2008.

Conference Abstracts

[A1] H. J. Sulkar, C. W. Kolz, K. Aliaj, T. W. Knighton, T. Hermans, and H. B. Henninger."In Vitro Simulation of Physiologic Human Shoulder Motion." *Congress of the International Society of Biomechanics / American Society of Biomechanics (ISB/ASB)*, 2019.

[A2] T. Hermans, F. Veiga, H. van Hoof, J. Hoelscher, J. Peters. "Demonstration: Learning for Tactile Manipulation." *Neural Information Processing Systems (NeurIPS)*, 2014.

Technical Reports

[T1] T. Hermans, J. Strom, G. Slavov, J. Morrison, A. Lawrence, E. Krob, E. Chown, "Northern Bites 2009 Team Report." *Bowdoin College, Tech. Rep.*, 2009.

[T2] E. Chown, J. Fishman, J. Strom, G. Slavov, T. Hermans, N. Dunn, A. Lawarence, J. Morrison, E. Krob, "Northern Bites 2008 Standard Platform Robot Team." *Bowdoin College, Tech. Rep.*, 2008.

Key

› Underlined - Student advisee
› Dagger † - Committee student
› Starred * - Equal contribution (i.e. joint first authors)

Funding

Total Funding to Date: $2,007,012

Awarded (Current)

[A1] NSF: CAREER: Improving Multi-fingered Manipulation by Unifying Learning and Planning
- › Role: PI (sole investigator)
- › Total Award: $532,664
- › Duration: 03/15/2019–03/14/2024
- › Additional REU Support: $16000

[A2] 3M Non-tenured Faculty Award (Unrestricted Gift)
- › Role: PI (sole investigator)
- › Total Award: $30,000
- › Awarded: 06/01/2019

[A3] NSF: EAGER: Toward Magnetic Manipulation of Nonmagnetic Objects
- › Role: Co-PI (PI: Jake Abbott; Mechanical Engineering)
- › Total Award: $248,739
- › My Portion: $109,866
- › Duration: 09/01/2018–08/31/2020

[A4] DARPA: MCS: OPICS: Obvious Plans and Inferences for Common Sense via Infant Behavior Learning
- › Role: Co-PI (PI: Alan Fern, Oregon State University)
- › Total Award: $8,990,450
- › My Portion: $1,089,205
- › Duration: 07/15/2019–07/14/2023

[A5] NIH: R01: Biomechanics of Reverse Total Shoulder Arthroplasty
- › Role: Co-I; *Added after grant was awarded* (PI: Heath Henninger; Orthopaedics)
- › Total Award: $2,003,321
- › My Portion: $35,000
- › Duration: 05/01/2016–04/30/2021

[A6] Keck Foundation: Dark Sky Studies Minor Development
- › Role: Co-I (PI: Stephen Goldsmith; City & Metropolitan Planning)
- › Total Award: $250,000
- › My Portion: $11,277
- › Duration: 01/01/2019–12/31/2021

Awarded (Expired)

[E1] NSF: CRII: RI: Enabling Manipulation of Object Collections via Self-Supervised Robot Learning
- Role: PI (sole investigator)
- Total Award: $175,000
- Duration: 03/01/2017–02/28/2019
- Additional REU Support: $8000

Students

Advising

- Adam Conkey — Ph.D. Computing: Robotics; Expected Spring 2021
- Mohanraj Devendran Shantihi — Ph.D. Computing: Robotics; Expected Spring 2024
- Iain Lee — Ph.D. Computer Science; Expected Spring 2024
- Martin Matak — Ph.D. Computer Science; Expected Spring 2024
- Roya Sabbagh Novin — Ph.D. Mechanical Engineering; *ABD*; Expected Summer 2020
  (co-advisor Prof. A. Merryweather)
- Griffin Tabor — Ph.D. Computing: Robotics; Expected Spring 2023
- Mojtaba Amir Yazdani — Ph.D. Mechanical Engineering; *ABD*; Expected Summer 2020
  (co-advisor Prof. A. Merryweather)
- Rebecca Miles — M.S. Computing: Robotics (Project)
- A.J. Bull — B.S. Computer Science (Honor's Thesis)
  (UROP Scholar; NSF REU)
- Ryan Dalby — B.S. Mechanical Engineering
- Mark Van der Merwe — B.S. Computer Science (Honor's Thesis)
  (NSF GRFP; CRA Outstanding Undergraduate Researcher Honorable Mention; UROP Scholar)

Graduated

- Qingkai Lu — Ph.D. Computing: Robotics; Spring 2020
- Balakumar Sundaralingam — Ph.D. Computing: Robotics; Spring 2020
- Hunter Brown — B.S./M.S. Mechanical Engineering; Thesis, Spring 2018
- Kautilya Chenna — M.S. Mechanical Engineering; Course-based, Summer 2018
- Mohanraj Devendran Shantihi — M.S. Computer Science; Project, Spring 2019
- Philip Erickson — M.S. Computer Science; Project, Fall 2016
- Janine Hölscher — B.S. Informatik, TU Darmstadt; Thesis, Fall 2014
- Kanrun Huang — M.S. Computing: Robotics; Project, Fall 2018
- Tyler Jones — M.S. Mechanical Engineering; Project, Fall 2016
- Jiani Lin — M.S. Computer Science; Project, Spring 2017
- Rebeka Mukherjee — M.S. Computing: Robotics; Project, Spring 2019
- Jackson Ponstler — M.S. Computing: Robotics; Project, Fall 2016
- James Watson — M.S. Mechanical Engineering; Project, Summer 2018
- Matthew Wilson — B.S. Computer Engineering; Honor's Thesis, Spring 2019
  (UROP Scholar; NSF REU)
- Dustin Webb — M.S. Computing: Robotics; Project, Fall 2018

Committee Member

- Avishan Bagheri — Ph.D. Electrical & Computer Engineering
- Michael Bentley — Ph.D. Computing: Robotics
- Joey Bourne — Ph.D. Mechanical Engineering: Robotics
- Navid Fallahinia — Ph.D. Mechanical Engineering: Robotics
- Visak Kumar — Ph.D. Robotics, Georgia Tech
- Lan Pham — Ph.D. Mechanical Engineering: Robotics
- Ashkan Pourkand — Ph.D. Computing: Robotics
- Muhammad Asif Rana — Ph.D. Robotics, Georgia Tech
- Ali Samarefilsoofi — Ph.D. Mechanical Engineering: Robotics
- Melynda Schreiber — Ph.D. Mechanical Engineering

High School Student Interns

- Erin Floresca — Junior, AMES Academy (Spring-Summer 2018)
- Shriya Pingali — Junior, West High School (Summer 2017)

Teaching

- CS 5320/6320 "Computer Vision" — *Spring 2020*
- CS 4300 "Artificial Intelligence" — *Spring 2019*
- CS 6370 "Motion Planning" — *Fall 2015–2019*
- CS 7939 "Seminar in Robotics" — *Fall 2015–2017*
- CS 6300 "Artificial Intelligence" — *Spring 2016, 2018*
- CS 7930 "School of Computing Colloquium" — *Spring 2016, Fall 2016, Spring 2017*
- CS 7930 "Intro to Computing PhD" — *Fall 2017–2019*
- "Robot Learning Reading Group" — *2015–Present*

Academic Service: External

Robotics: Science and Systems (RSS) *2020*
Publication Chair

Robotics: Science and Systems (RSS) *2019*
Inclusion Chair

IEEE-RAS International Conference on Humanoid Robotics (Humanoids) *2019*
Session Chair

Conference on Robot Learning (CoRL) *2017,2019*
Program Committee Member

Conference on Robot Learning (CoRL) *2018*
Area Chair

Robotics: Science and Systems (RSS) *2018*
Area Chair

IEEE Robotics & Automation Letters (RA-L) *2018–*
Associate Editor

International Journal of Robotics Research (IJRR) *2017–2018*
Guest Editor; *Special Issue on RSS 2017*

Robotics: Science and Systems (RSS) *2017*
Presentation Chair

IEEE International Conference on Robotics and Automation (ICRA) *2017–2019*
Associate Editor

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) *2016, 2017*
Associate Editor

National Science Foundation *2017, 2018, 2019*
Panel Reviewer

U.S. Army Medical Research and Materiel Command, Congressionally Directed Medical Research Programs (CDMRP) *2016*
Panel Reviewer

Workshop on "Visual and Tactile Learning for Interaction" at Robotics: Science and Systems *July 2015*
Lead Organizer

Faculty Hiring Committee, School of Interactive Computing, Georgia Tech *2012–2013*
Student Committee Member

Reviewer:
International Journal of Robotics Research, IEEE Transactions on Robotics, Autonomous Robots, IEEE Robotics and Automation Letters, IEEE Transactions on Haptics, IEEE Transactions on Cognitive and Developmental Systems, IROS, ICRA, Humanoids, International Symposium on Robotics Research (ISRR), Journal of Intelligent and Robotic Systems, NeurIPS 2014 Workshop: Autonomously Learning Robots, Human Robot Interaction: Workshops and Tutorials, AAMAS Robotics Track (2017), ECCV Workshop on Affordances (2014), RSS Workshop on Affordances (2014), IROS Workshop on Cognitive Robotics and Systems (2013), RSS Workshop on Robots in Clutter (2013), ICRA Workshop on Interactive Perception (2013), RoboCup Symposium (2010, 2011)

Academic Service: Outreach

Interviewed for: "An intro to artificial intelligence for the average human" *Jan 30, 2019*
KSL.com

Discussion Panelist: "The Changing Nature of Work, Robots and Mindfulness" *Jan 7, 2019*
Radioactive, KRCL

Outreach Lecture: "AlphaGo: In Context and In Depth" *April 10, 2018*
Science Movie Night: Natural History Museum of Utah

Outreach Lecture: "Robotics: Computing Interacting with the World" *April 2017*
Red, White, and U Day: University of Utah

Outreach Demonstration: "How to Program a Robot" *April 2016, 2017, 2018*
Project Youth: University of Utah

Outreach Demonstration: "Robot Learning for Manipulation" *November 2016, 2017*
Engineering Day: University of Utah

Academic Service: Internal

Diversity Committee, School of Computing, University of Utah *Fall 2019–*
Committee Chair

NCWIT Learning Circles Committee, School of Computing, University of Utah *2020*
Committee Chair

Diversity Committee, School of Computing, University of Utah *2016–*
Committee Member

School of Computing, University of Utah *2018*
Organized Undergraduate Panel on Internships

School of Computing, University of Utah *2017*
Proposed Department Standardization for Responsible Conduct in Research Training

Graduate Visit Weekend, School of Computing, University of Utah *2017*
Poster Session Organizer

School of Computing, University of Utah *Fall 2016, 2017*
Graduate Bootcamp Instructor

School of Computing, University of Utah *2016–2017*
Colloquium Chair

Faculty Hiring Committee: AI, School of Computing, University of Utah *2019–2020*
Committee Member

Faculty Hiring Committee: CS Gemstone, School of Computing, University of Utah *2016–2017, 2017–2018*
Committee Member

Faculty Hiring Committee: Computer Vision, School of Computing, University of Utah *2015–2016*
Committee Member

Graduate Admissions Committee, School of Computing, University of Utah *2016, 2017*
Committee Member