David Held

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Current appointment

Assistant Professor, Robotics Institute, Carnegie Mellon University — 2017 - Present

Education

Stanford University — 2012 - 2016
Ph.D. in Computer Science.
Thesis: Deep Learning and Probabilistic Methods for Robotic Perception from Streaming Data
Advised by Sebastian Thrun and Silvio Savarese.

Stanford University — 2010 - 2012
Masters of Science in Computer Science.
Thesis: Autonomous Driving: Car Detection, Tracking, and Street Sign Detection
Advised by Sebastian Thrun and Vaughan Pratt.

Massachusetts Institute of Technology — 2006 - 2007
Masters of Science in Mechanical Engineering.

Massachusetts Institute of Technology — 2001 - 2005
Bachelor of Science in Mechanical Engineering with a concentration in Controls Engineering.

Publications

Ancha, S., Pathak, G., Narasimhan, S., **Held, D.**, Active Safety Envelopes using Light Curtains with Probabilistic Guarantees, Robotics: Science and Systems (RSS), 2021

Okorn, B.*, Gu, Q.*, Hebert, M., **Held, D**., ZePHyR: Zero-shot Pose Hypothesis Rating, International Conference of Robotics and Automation (ICRA), 2021

Raaj, Y., Ancha, S., Tamburo, R., **Held, D.**, Narasimhan, S., Exploiting & Refining Depth Distributions with Triangulation Light Curtains, Conference on Computer Vision and Pattern Recognition (CVPR), 2021

Hu, P., Huang, A., Dolan, J., **Held, D.**, Ramanan, D., Safe Local Motion Planning with Self-Supervised Freespace Forecasting, Conference on Computer Vision and Pattern Recognition (CVPR), 2021

Lin, X., Wang, Y., Okin, J., **Held, D**., SoftGym: Benchmarking Deep Reinforcement Learning for Deformable Object Manipulation, Conference on Robot Learning (CoRL), 2020

Wang, Y., Narasimhan, G., Lin, X., Okorn, B., **Held, D**., Visual Self-Supervised Reinforcement Learning with Object Reasoning, Conference on Robot Learning (CoRL), 2020

Zhou, W., Bajracharya, S., **Held, D**.; PLAS: Latent Action Space for Offline Reinforcement Learning; Conference on Robot Learning (CoRL), 2020 - **Plenary talk** (Selection rate 4.1%)

Ancha, S., Raaj, Y., Hu, P., Narasimhan, S., **Held, D.**, Active 3D Perception using Light Curtains, European Conference on Computer Vision (ECCV), 2020 - **Spotlight** (Selection rate 5.3%)

Qian*, J., Weng*, T., Zhang, L., Okorn, B., **Held, D.**; Cloth Region Segmentation for Robust Grasp Selection; International Conference on Intelligent Robots and Systems (IROS), 2020

Wang, J., Ancha, S., Chen, Y., **Held, D.**, Self-supervised Learning for 3D Data Association; International Conference on Intelligent Robots and Systems (IROS), 2020

Okorn, B., Xu, M., Hebert, M., **Held, D.**, Learning Orientation Distributions for Object Pose Estimation, International Conference on Intelligent Robots and Systems (IROS), 2020

Weng, X., Wang, J., **Held, D**., Kitani, K., 3D Multi-Object Tracking: A Baseline and New Evaluation Metrics; International Conference on Intelligent Robots and Systems (IROS), 2020

Mittal, H., Okorn, B., **Held. D.,** Just Go with the Flow: Self-Supervised Scene Flow Estimation. Conference on Computer Vision and Pattern Recognition (CVPR), 2020 **- Oral** (Selection rate 5.7%)

Hu, P., Ziglar, J., **Held, D.**, Ramanan, D. What You See is What You Get: Exploiting Visibility for 3D Object Detection. Conference on Computer Vision and Pattern Recognition (CVPR), 2020 **- Oral** (Selection rate 5.7%)

Weng, T., Pallankize, A., Tang, Y., Kroemer, O., **Held, D.** Multi-modal Transfer Learning for Grasping Transparent and Specular Objects. Robotics and Automation Letters (RA-L) with presentation at the International Conference of Robotics and Automation (ICRA), 2020

Hu, P., **Held, D.**, Ramanan, D. Learning to Optimally Segment Point Clouds. Robotics and Automation Letters (RA-L) with presentation at the International Conference of Robotics and Automation (ICRA), 2020

Ancha, S., Lin, J., **Held, D.** Combining Deep Learning and Verification for Precise Object Instance Detection. Conference on Robot Learning (CoRL), 2019

Lin, X., Baweja, H., Kantor, G.**, Held, D.,** Adaptive Auxiliary Task Weighting for Reinforcement Learning. Neural Information Processing Systems (NeurIPS), 2019

Lin, X., Guo, P., Florensa, C., **Held, D.**, Adaptive Variance for Changing Sparse-Reward Environments, *International Conference of Robotics and Automation (ICRA), 2019*

Yuan, W., Khot, T., **Held, D.**, Mertz, C., Hebert, M., PCN: Point Completion Network, *International Conference on 3D Vision (3DV)*, 2018 **- Best Paper Honorable Mention**

Florensa, C., **Held, D.,** Geng, X., Abbeel, P., Automatic Goal Generation for Reinforcement Learning Agents, *International Conference on Machine Learning (ICML)*, 2018

Huang, S., **Held, D.,** Abbeel, P., Dragan, A. Enabling Robots to Communicate their Objectives, *Autonomous Robotics (AURO)*, 2018

Florensa, C., **Held, D.**, Wulfmeier, M. and Abbeel, P., Reverse Curriculum Generation for Reinforcement Learning, *Conference on Robot Learning (CoRL), 2017.*

Clavera, I., **Held, D.**, Abbeel, P., Policy Transfer via Modularity, *International Conference on Intelligent Robots and Systems (IROS), 2017.*

Achiam, J., **Held, D.**, Tamar, A. and Abbeel, P., Constrained Policy Optimization. *International Conference on Machine Learning (ICML), 2017.*

Huang, S. H., **Held, D.**, Abbeel, P., & Dragan, A. D. Enabling Robots to Communicate their Objectives. *Robotics: Science and Systems (RSS), 2017.*

Held, D., McCarthy, Z., Zhang, M., Shentu, F., Abbeel, P., Probabilistically Safe Policy Transfer. *International Conference of Robotics and Automation (ICRA), 2017.*

Held, D., Thrun, S., Savarese, S., Learning to Track at 100 FPS with Deep Regression Networks. *European Conference on Computer Vision (ECCV), 2016.*

Held, D., Guillory, D., Rebsamen, B., Thrun, S., Savarese, S., A Probabilistic Framework for Real-time 3D Segmentation using Spatial, Temporal, and Semantic Cues. *Robotics: Science and Systems (RSS), 2016.*

Held, D., Thrun, S., Savarese, S. Robust Single-View Instance Recognition. *International Conference of Robotics and Automation (ICRA), 2016.*

Held, D., Levinson, J., Thrun, S., Savarese, S. Robust Real-Time Tracking Combining 3D Shape, Color, and Motion. *International Journal of Robotics Research (IJRR), 2016.*

Held, D., Levinson, J., Thrun, S., Savarese, S. Combining 3D Shape, Color, and Motion for Robust Anytime Tracking. *Robotics: Science and Systems (RSS), 2014.*

Held, D., Levinson, J., Thrun, S. Precision Tracking with Sparse 3D and Dense Color 2D Data *International Conference of Robotics and Automation (ICRA), 2013.* **- Best Vision Paper Finalist**

Held, D., Levinson, J., Thrun, S. A Probabilistic Framework for Car Detection in Images using Context and Scale. *International Conference of Robotics and Automation (ICRA), 2012.*

Held, D., Yekutieli, Y., Flash, T. Characterizing Stiffness of Multi-Segment Flexible Arm Movements. *International Conference of Robotics and Automation (ICRA), 2012.*

Levinson, J.; Askeland, J.; Becker, J.; Dolson, J.; **Held, D.**; Kammel, S.; Kolter, J.Z.; Langer, D.; Pink, O.; Pratt, V.; Sokolsky, M.; Stanek, G.; Stavens, D.; Teichman, A.; Werling, M.; Thrun, S. (2011) Towards Fully Autonomous Driving: Systems and Algorithms. Intelligent Vehicles Symposium (IV), IEEE, June 2011.

Jones, L.A., **Held, D.** & Hunter, I. Surface Waves and Spatial Localization in Vibrotactile Displays. Proceedings of the IEEE Haptics Symposium, 2010.

Jones, L.A. & **Held, D.** Characterization of Tactors Used in Vibrotactile Displays. Journal of Computing and Information Sciences in Engineering, 2008.

Jin, Z., Waydo, S., Wildanger, E.B., Lammers, M., Scholze, H., Foley, P., **Held, D.**, Murray, R.M. MVWT-II: The Second Generation Caltech Multi-Vehicle Wireless Testbed. 2004 American Control Conference (ACC), 2004.

Research and Industry Experience

U.C. Berkeley Robot Learning Lab 2016 - 2017
Post-doctoral researcher. Developed deep reinforcement learning algorithms for object manipulation

Stanford Autonomous Driving Team 2010 - 2016
Ph.D. Student. Developed perception algorithms for self-driving car.

Google [x] Self-driving Car Team 2013
Intern. Developed perception algorithms for Google's self-driving car.

Weizmann Laboratory for Vision Research and Robotics 2009 - 2010
Research Assistant. Developed novel method to analyze stiffness of simulated octopus arm.

Evolven Software 2008-2009
Software developer. Developed enterprise software for configuration management.

MIT Bioinstrumentation Lab 2006 - 2007
Master's Thesis. Modeled the interaction of tactors with skin for a vibrotactile display.

Harvard Social Psychology Lab 2005
Research Assistant. Tested the contrast effect with images.

MIT Aerospace Controls Lab 2004
Research Assistant. Analyzed digital magnetometer signals for controlling a UAV.

Caltech Controls and Dynamical Systems 2003
Research Assistant. Designed an outdoor testbed of 12 miniature hovercrafts.

Patents

Robust Anytime Tracking Combining 3D Shape, Color, and Motion with Annealed Dynamic Histograms (Provisional Patent: 14/733,902)

Awards

NSF CAREER Award 2021
Google Research Faculty Award 2017
Best Vision Paper Finalist, ICRA 2013
Best Master's Thesis of 2012 in Stanford's Computer Science Department

Invited Talks

RSS Workshop: Deformable Object Simulation in Robotics	2021
CVPR Workshop: 3D Deep Learning and Robotics	2021
Naver Labs Europe	2021
Technion Robotics Seminar	2021
ICPR Workshop: Perception and Modeling for Manipulation of Objects	2021
IPAM Workshop: Individual Vehicle Autonomy: Perception and Control	2020
Aachen University, Aachen, Germany,	2019
CVPR Workshop: Bringing Robots to the Computer Vision Community	2019
Deep Learning Summit, Boston, MA,	2019
Brown University, Providence, RI,	2018
UT Austin	2018
Symposium on Machine Learning in Science and Engineering	2018
Carnegie Mellon University, RoboOrg Meta-Seminar	2017
Carnegie Mellon University, Robotics Institute Seminar	2017
Cornell University	2017
Carnegie Mellon University	2017
University of British Columbia	2017
Microsoft Research, Cambridge, UK	2017
Hebrew University (Israel)	2017
University of Michigan	2017
Tel Aviv University (Israel)	2017
Princeton University	2017
Massachusetts Institute of Technology	2017
University of California, Los Angeles	2017
University of Southern California	2017
Toyota Technology Institute of Chicago	2017
University of California, San Diego	2017
Northeastern University	2017
Columbia University	2017
Weizmann Institute (Israel)	2017
University of Cambridge	2017
Spotlight Talk at NeurIPS Workshop on Reliable Machine Learning in the Wild	2016
Future Star Talks Series at RSS Workshop on Deep Learning for Autonomous Robots	2016
Northeastern College of Computer and Information Science Seminar	2016
Harvard School of Engineering and Applied Sciences Special Seminar	2016
Johns Hopkins Laboratory for Computational Sensing and Robotics Seminar	2016
University of Maryland Computer Vision Laboratory Seminar	2016
TTI Chicago Young Researcher Seminar Series	2016
MIT Robotics Seminar	2015
UC Berkeley	2015
Carnegie Mellon University VASC Seminar Talk	2015
University of Toronto AI Seminar	2015
University of Michigan AI Seminar	2015
The Future of Driverless Car Technology, UCLA VC Fund	2015
Google [x] Self-driving Car Team	2015
Stanford-Seoul National University Workshop on Automated Driving	2015

Teaching

Statistical Techniques in Robotics (16-831) - 2018-2021
Special Seminar: Deep Reinforcement Learning for Robotics (16-881) - 2019-2021
Graduate Computer Vision (16-720-A), co-taught with Srinivasa Narasimhan - 2017

Mentoring

Current PhD students:	Brian Okorn (co-advised with Martial Hebert)
	Xingyu Lin
	Siddarth Ancha (co-advised with Srinivasa Narasimhan)
	Thomas Weng
	Wenxuan Zhou
	Benjamin Eisner
Current MS students:	Harshit Sikchi
	Qiao Gu
	Gaurav Pathak
	Zixuan Huang
	Chuer Pan

Past MS students:
Sujay Bajracharya
Jianing (Aurora) Qian
Gautham Narayan Narasimhan
Yufei Wang
Jenny Nan
Mengyun (Olivia) Xu
Edward Ahn
Harjatin Baweja
Pengsheng Guo
Tiancheng Jin
Ignasi Clavera
Devin Guillory

Past undergraduate researchers:
M. Nomaan Qureshi
Rahul Chakwate
Kai Zhang
Patrick Liu
Jake Olkin
Yifan Qiao
Michael Zhang
Fred Shentu
Xinyang Geng
Helen Jiang
Derin Dutz
Naor Brown
Jacquelyn Kunkel
Elizabeth Kim
Katherine Ray

Past MRSD teams:
Cubi: Jorge Anton, Nithin Subbiah Meganathan, Laavanye Bahl, Changsheng Shen, Paulo Camasmie

Beyond Sight: Chien Chih Ho, Pengsheng Guo, Rohit Murthy, Vivek Gopal Ramaswamy, and Oliver Krengel

Service

Associate Editor:
RA-L 2020-2021
IROS 2018-2021
ICRA 2017-2021
ICRA Workshops 2021
ICML 2019-2020
NeurIPS 2019-2020

Co-organizer:
RSS Workshop - Workshop on Visual Learning and Reasoning for Robotics, 2020-2021
NeurIPS Workshop - Deep Learning for Action and Interaction, 2016
ICRA Publications co-Chair (unofficial), 2016
Stanford AI Lab Distinguished Speaker Series 2014-2015
Bay Area Vision Meeting 2014
ONR Workshop on Structured Learning for Scene Understanding 2014

Reviewer:
Black in AI Innovation and Research Summer Research Grant, 2021
CoRL 2019-2021
RSS 2016-2018, 2020-2021
ICRA Workshops 2021
RSS Pioneers 2018-2020
NeurIPS Workshop - Black in AI 2018-2020
RA-L 2019-2020
ICRA 2014-2016, 2018-2019
Journal of Field Robotics, 2019
ICML Workshop - Multi-Task and Lifelong Reinforcement Learning, 2019
CVPR Workshop - Real-World Challenges and New Benchmarks for Deep

Learning in Robotic Vision 2018
CoRL 2017-2018
CVPR VOCVALC - 2nd International workshop on Visual Odometry and Computer Vision Applications based Location Clues 2018
TPAMI 2017-2018
IROS 2013-2016
NeurIPS Workshop - Acting and Interacting in the Real World: Challenges in Robot Learning, 2017
NeurIPS Workshop - Hierarchical Reinforcement Learning, 2017
CVPR Workshop - Deep Learning for Robotic Vision 2015, 2017
IETE Journal of Research 2016
T-RO 2015
CVPR 2015
CVPR Workshop - Computer Vision in Vehicle Technology, 2015
ITS 2011-2014

Other:

AI4All Summer Program, 2018-2019, 2021
AI Mentor-Matching Program, 2017-2021
NSF Panel - 2019-2021

Training programs:

Mental Health First Aid Certification
Bias Busters
Floor Marshal Training
Active Shooter Training
Green Dot Overview Training
Social Host Training

Media Coverage

"New deep learning algorithms could improve robot sight," Tech Target, 2018

"How computers with humanlike senses will change our lives," Wall Street Journal