Karol Hausman

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Research Interest

I am interested in enabling robots to autonomously acquire general-purpose skills with minimal supervision in real-world environments.

Work Experience

06.2018 - Present — Senior Research Scientist at **Google Brain**, Mountain View, USA
Robot Manipulation Team Lead. Making robot learning useful.
10.2020 promoted from Research Scientist.

2013 - 2018 — Short-Term Visiting Researcher Positions (concurrent with PhD) at:

Google DeepMind, London, UK
Adviser: Prof. M. Riedmiller

Qualcomm Research, San Diego, CA
Adviser: Dr. C. Wierzynski

NASA Jet Propulsion Laboratory, Pasadena, CA
Adviser: Dr. S. Weiss, Dr. L. Matthies

Bosch Research Center, Palo Alto, CA
Adviser: Dr. S. Osentoski, Dr. S. Niekum

12.2011 - 03.2013 — Research Assistant at **Technical University Munich**, Munich, DE
Adviser: Dr. D. Pangercic, Prof. M. Beetz
Developed an open-source framework for interactive perception on the PR2 robot.

Education

08.2013 - 05.2018 — Ph.D. in Computer Science, **University of Southern California**
Adviser: Prof. G. Sukhatme
Thesis: "Rethinking Perception-Action Loops via Interactive Perception and Learned Representations"
summa cum laude

10.2011 - 10.2013 — M.Sc. in Robotics, **Technical University Munich**
Adviser: Prof. D. Cremers
Thesis: "Object Segmentation and Recognition using Interactive Perception"
summa cum laude, ranked 2nd in the graduating class

10.2007 - 09.2012 — M.Sc. and B.Sc. in Mechatronics, **Warsaw University of Technology**
summa cum laude, ranked 1st in the graduating class

10.2009 - 07.2010 — Faculty of Philosophy and Sociology, **University of Warsaw**
Completed one year coursework towards a B.A. Degree in Philosophy
ranked 1st in the class

Teaching

- Stanford Deep Multi-Task and Meta Learning (CS330): Co-lecturer (4 lectures)
- UC Berkeley Deep Reinforcement Learning (CS285): Guest lecture "Multi-Task RL: a Curse or a Blessing?"

Invited Talks

- OpenAI Robotics Symposium, 2020. *postponed*
- "Unclogging Robot Learning", RSS 2020 Workshop on Structured Approaches to Robot Learning for Improved Generalization, 07.2020.
- "How to Evaluate a Generalist? Benchmarks in Robot Learning.", Benchmarking in Robotics Workshop, 08.2019.
- "Skill Representation and Supervision in Multi-Task RL.", ICML 2019 Workshop on Multi-Task and Lifelong Reinforcement Learning, 06.2019.
- "Robot Skill Embeddings and their Applications.", Re-Work 06.2018, 01.2019.
- "Learning Representations for Perception-Action Loops", Nvidia, 11.2017, Google Brain, 12.2017, UC Berkeley, 03.2018.
- "Rethinking Perception-Action Loops", University of Washington, 05.2017, MIT, 05.2017, University of Pennsylvania, 05.2017, Google DeepMind, 07.2017.
- "Multi-Sensor Fusion with Seamless Sensor Switching and Trajectory Optimization for Self-Calibration", Google Tango, 10.2016, UCLA, 10.2016, Qualcomm, 06.2016.
- "Active and Interactive Perception", Stanford, 10.2016.
- "Active and Interactive Perception", NASA JPL, 09.2015.
- "Robotic Explorers for Environmental Monitoring", Google, 05.2014.
- "Active Articulation Model Estimation", Bosch Research Center, 10.2014.
- "Interactive Object Segmentation and Recognition", TU Berlin, 12.2012.

Journal Articles and Book Chapters

J6. R. Julian*, E. Heiden*, Z. He, H. Zhang, S. Schaal, J. Lim, G. Sukhatme, **K. Hausman**. **Scaling Simulation-to-Real Transfer by Learning a Latent Space of Robot Skills**, *In The International Journal of Robotics Research (IJRR)*, 2020.

J5. J. Preiss, **K. Hausman**, G. Sukhatme, S. Weiss. **Simultaneous Self-Calibration and Navigation using Trajectory Optimization**, *In The International Journal of Robotics Research (IJRR)*, 2017.

J4. **K. Hausman**, J. Preiss, G. Sukhatme, S. Weiss. **Occlusion-Aware Trajectory Optimization for Self-Calibration with Application to UAVs**, *In IEEE Robotics and Automation Letters (RA-L)*, 2017.

J3. **K. Hausman***, J. Bohg*, B. Sankaran*, O. Brock, D. Kragic, S. Schaal, G. Sukhatme. **Interactive Perception: Leveraging Action in Perception and Perception in Action**, *In The IEEE Transactions on Robotics (T-RO)*, 2017.

J2. **K. Hausman**, J. Mueller, A. Hariharan, N. Ayanian, G. Sukhatme. **Cooperative Multi-Robot Control for Target Tracking with Onboard Sensing**, *In The International Journal of Robotics Research (IJRR)*, 2015.

J1. **K. Hausman**, D. Pangercic, Z. Marton, F. Belent-Benczedi, C. Bersch, M. Gupta, G. Sukhatme, M. Beetz. **Interactive Segmentation of Textured and Textureless Objects**, *In Handling Uncertainty and Networked Structure in Robot Control*, L. Busoniu and L. Tamas (eds.), Springer, 2015.

Conference Publications

C25. R. Julian, B. Swanson, G. Sukhatme, S. Levine, C. Finn, **K. Hausman**. **Never Stop Learning: The Effectiveness of Fine-Tuning in Robotic Reinforcement Learning**, *Conference on Robot Learning (CoRL)*, 2020.

C24. S. Pirk, **K. Hausman**, A. Toshev, M. Khansari. **Modeling Long-horizon Tasks as Sequential Interaction Landscapes**, *Conference on Robot Learning (CoRL)*, 2020.

C23. T. Yu, S. Kumar, A. Gupta, S. Levine, **K. Hausman**, C. Finn. **Gradient Surgery for Multi-Task Learning**, *Neural Information Processing Systems (NeurIPS)*, 2020.

C22. C. Bodnar, A. Li, **K. Hausman**, P. Pastor, M. Kalakrishnan. **Quantile QT-Opt for Risk-Aware Vision-Based Robotic Grasping**, *Best Systems Paper Finalist, Robotics: Science and Systems (RSS)*, 2020.

C21. A. Sharma, M. Ahn, S. Levine, V. Kumar, **K. Hausman***, S. Gu*. **Emergent Real-World Robotic Skills via Unsupervised Off-Policy Reinforcement Learning**, *Robotics: Science and Systems (RSS)*, 2020.

C20. T. Xiao, E. Jang, D. Kalashnikov, S. Levine, J. Ibarz, **K. Hausman***, A. Herzog*. **Thinking While Moving: Deep Reinforcement Learning with Concurrent Control**, *International Conference on Learning Representations (ICLR)*, 2020.

C19. A. Sharma, S. Gu, S. Levine, V. Kumar, **K. Hausman**. **Dynamics-Aware Unsupervised Discovery of Skills**, *oral presentation, International Conference on Learning Representations (ICLR)*, 2020.

C18. M. Woodward, C. Finn, **K. Hausman**. **Learning to Interactively Learn and Assist**, *oral presentation, AAAI*, 2020.

C17. A. Gupta, V. Kumar, C. Lynch, S. Levine, **K. Hausman**. **Relay Policy Learning: Solving Long-Horizon Tasks via Imitation and Reinforcement Learning**, *Conference on Robot Learning (CoRL)*, 2019.

C16. T. Yu*, D. Quillen*, Z. He*, R. Julian, **K. Hausman**, C. Finn, S. Levine. **Meta-World: A Benchmark and Evaluation for Multi-Task and Meta Reinforcement Learning** *Conference on Robot Learning (CoRL)*, 2019.

C15. R. Julian*, E. Heiden*, Z. He, H. Zhang, S. Schaal, J. Lim, G. Sukhatme, **K. Hausman**. **Scaling Simulation-to-real Transfer by Learning Composable Robot Skills**, *International Symposium on Experimental Robotics (ISER)*, 2018.

C14. **K. Hausman**, J.T. Springenberg, Z. Wang, N. Heess, M. Riedmiller. **Learning an Embedding Space for Transferable Robot Skills**, *International Conference on Learning Representations (ICLR)*, 2018.

C13. A. Agha-mohammadi, E. Heiden, **K. Hausman**, G. Sukhatme. **Confidence-rich Grid Mapping**, *In International Symposium on Robotics Research (ISRR)*, 2017.

C12. **K. Hausman***, Y.Chebotar*, S. Schaal, G. Sukhatme, J. Lim. **Multi-Modal Imitation Learning from Unstructured Demonstrations using Generative Adversarial Nets**, *In Neural Information Processing Systems (NIPS)*, 2017.

C11. E. Heiden, **K. Hausman**, G. Sukhatme, A. Agha-mohammadi. **Planning High-speed Safe Trajectories in Confidence-rich Maps**, *In IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2017.

C10. Y.Chebotar*, **K. Hausman***, M. Zhang*, G. Sukhatme, S. Schaal, S. Levine. **Combining Model-Based and Model-Free Updates for Trajectory-Centric Reinforcement Learning**, *In International Conference on Machine Learning (ICML)*, 2017.

C9. J. Preiss, **K. Hausman**, G. Sukhatme, S. Weiss. **Trajectory Optimization for Self-Calibration and Navigation**, *In Robotics: Science and Systems (RSS)*, 2017.

C8. **K. Hausman***, Y. Chebotar*, O. Kroemer, G. Sukhatme, S. Schaal. **Generalizing Regrasping with Supervised Policy Learning**, *In International Symposium on Experimental Robotics (ISER)*, 2016.

C7. **K. Hausman**, G. Kahn, S. Patil, J. Mueller, K. Goldberg, P. Abbeel, G. Sukhatme. **Occlusion-Aware Multi-Robot 3D Tracking**, *In IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2016.

C6. Y. Chebotar, **K. Hausman**, Z. Su, G. Sukhatme, S. Schaal. **Self-Supervised Regrasping using Spatio-Temporal Tactile Features and Reinforcement Learning**, *In IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2016.

C5. **K. Hausman**, S. Weiss, R. Brockers, L. Matthies, G. Sukhatme. **Self-Calibrating Multi-Sensor Fusion with Probabilistic Measurement Validation for Seamless Sensor Switching on a UAV**, *In IEEE International Conference on Robotics and Automation (ICRA)*, 2016.

C4. Z. Su, **K. Hausman**, Y. Chebotar, A. Molchanov, G. Loeb, G. Sukhatme, S. Schaal. **Force Estimation and Slip Detection for Grip Control using a Biomimetic Tactile Sensor**, *In Proceedings of the IEEE-RAS International Conference on Humanoid Robotics (Humanoids)*, 2015.

C3. **K. Hausman**, S. Niekum, S. Osentoski, G. Sukhatme. **Active Articulation Model Estimation through Interactive Perception**, *In IEEE International Conference on Robotics and Automation (ICRA)*, 2015.

C2. **K. Hausman**, J. Mueller, A. Hariharan, N. Ayanian, G. S. Sukhatme. **Cooperative Control for Target Tracking with Onboard Sensing**, *In Proceedings, International Symposium on Experimental Robotics (ISER)*, Jun 2014.

C1. **K. Hausman**, F. Balint-Benczedi, D. Pangercic, Z. Marton, R. Ueda, K. Okada, M. Beetz. **Tracking-based Interactive Segmentation of Textureless Objects**, *In IEEE International Conference on Robotics and Automation (ICRA)*, 2013.
Best Service Robotics Paper Finalist.

Reviewed Workshop Papers and Abstracts

W18. **K.Hausman**, J. T. Springenberg, Z. Wang, N. Heess, and M. Riedmiller. **Learning Skill Embeddings for Transferable Robot Skills**, *NIPS Deep Reinforcement Learning Symposium*, 2017.

W17. **K.Hausman**, J. T. Springenberg, Z. Wang, N. Heess, and M. Riedmiller. **Learning Robot Skill Embeddings**, *NIPS Workshop on Acting and Interacting in the Real World: Challenges in Robot Learning*, 2017.

W16. A. Agha-mohammadi, E. Heiden, **K. Hausman** and G. Sukhatme. **Confidence-aware Occupancy Grids**, *IROS Workshop on Vision-based Agile Autonomous Navigation of UAVs*, 2017.

W15. E. Heiden, **K. Hausman**, G. Sukhatme and A. Agha-mohammadi. **High-speed Safe Trajectory Planning in Confidence-rich Maps**, *IROS Workshop on Vision-based Agile Autonomous Navigation of UAVs*, 2017.

W14. **K. Hausman***, Y.Chebotar*, S. Schaal, G. Sukhatme, J. Lim. **IntentionGAN: Multi-Task Imitation Learning from Unstructured Demonstrations**, *Conference on Robot Learning (CoRL)*, 2017.

W13. **K. Hausman***, Y.Chebotar*, S. Schaal, G. Sukhatme, J. Lim. **IntentionGAN: Multi-Modal Imitation Learning from Unstructured Demonstrations**, *RSS Workshop on Learning from Demonstration in High-Dimensional Feature Spaces*, 2017.

W12. Y.Chebotar*, **K. Hausman***, M. Zhang*, G. Sukhatme, S. Schaal, S. Levine. **Combining Model-Based and Model-Free Updates for Deep Reinforcement Learning**, *In RSS 2017 Workshop on New Frontiers for Deep Learning in Robotics*, 2017.
Best Paper Award

W11. Y. Chebotar*, **K. Hausman***, O. Kroemer, G. Sukhatme, S. Schaal. **Regrasping using Tactile Perception and Supervised Policy Learning**, *In AAAI Symposium on Interactive Multi-Sensory Object Perception for Embodied Agents*, 2017.

W10. Y. Chebotar*, **K. Hausman***, O. Kroemer, G. Sukhatme, S. Schaal. **Supervised Policy Fusion with Application to Regrasping**, *In IROS 2016 Workshop on Closed-loop Grasping and Manipulation: Challenges and Progress*, 2016.

W9. **K. Hausman**, James Preiss, G. Sukhatme, S. Weiss. **Observability-Aware Trajectory Optimization for Self-Calibration with Application to UAVs**, *In RSS 2016 Workshop on Robot-Environment Interaction for Perception and Manipulation*, 2016.

W8. Y. Chebotar, **K. Hausman**, Z. Su, A. Molchanov, O. Kroemer, G. Sukhatme, S. Schaal. **BiGS: BioTac Grasp Stability Dataset**, *In ICRA 2016 Workshop on Grasping and Manipulation Datasets*, 2016.

W7. Z. Su, **K. Hausman**, Y. Chebotar, A. Molchanov, G. Loeb, G. Sukhatme, S. Schaal. **Slip Classification Using Tangential and Torsional Skin Distortions on a Biomimetic Tactile Sensor**, *In BMVA Workshop on Visual, Tactile and Force Sensing for Robot Manipulation*, 2015.

W6. Z. Su, **K. Hausman**, Y. Chebotar, A. Molchanov, G. Loeb, G. Sukhatme, S. Schaal. **Slip Detection and Classification for Grip Control using Multiple Sensory Modalities on a Biomimetic Tactile Sensor**, *In IROS 2015 Workshop on Multimodal Sensor-Based Robot Control for HRI and Soft Manipulation*, 2015.

W5. **K. Hausman**, G. Kahn, S. Patil, J. Mueller, K. Goldberg, P. Abbeel, G. Sukhatme. **Optimization-based Cooperative Multi-Robot Target Tracking with Reasoning about Occlusions**, *In IROS 2015 Workshop on On-line Decision-Making in Multi-Robot Coordination*, 2015.

W4. **K. Hausman**, C. Corcos, J. Mueller, F. Sha, G. S. Sukhatme. **Towards Interactive Object Recognition**, *In IROS 2014 3rd Workshop on Robots in Clutter: Perception and Interaction in Clutter*, 2014.

W3. **K. Hausman**, J. Mueller, A. Hariharan, N. Ayanian, G. S. Sukhatme. **Cooperative Multi-Robot Control for Target Tracking with Efficient Switching of Onboard Sensing Topologies**, *In IROS 2014 Workshop on Taxonomies of Interconnected Systems: Topology in Distributed Robotics*, 2014.

W2. **K. Hausman**, Ch. Bersch, D. Pangercic, S. Osentoski, Z. Marton, M. Beetz. **Segmentation of Cluttered Scenes through Interactive Perception**, *In ICRA 2012 Workshop on Semantic Perception and Mapping for Knowledge-enabled Service Robotics*, 2012.

W1. Ch. Bersch, D. Pangercic, S. Osentoski, **K. Hausman**, Z. Marton, R. Ueda, K. Okada, M. Beetz. **Segmentation of Textured and Textureless Objects through Interactive Perception**, *In RSS Workshop on Robots in Clutter: Manipulation, Perception and Navigation in Human Environments*, 2012.

Scholarships and Awards

2020	Best Systems Paper Finalist at RSS 2020
2018	Best Poster Award at USC Computer Science Annual Research Day
2017	Best Paper Award at RSS 2017 New Frontiers for Deep Learning in Robotics Workshop
2013 - 2014	USC Viterbi School of Engineering PhD Fellowship
2011 - 2013	DAAD (German Academic Exchange Service) scholarship for students with outstanding curriculum
2008 - 2011	Warsaw University of Technology annual scholarship for outstanding academic achievements
2013	Best Service Robotics Paper Finalist at ICRA 2013
2010	BEC Best Engineering Competition - 6th place in Poland
2004, 2005	International Championships in Mathematical and Logical Games, finalist x2

Advising:

- Ryan Julian - PhD student at USC and student researcher at Google Brain
- Abhishek Gupta - PhD student at UC Berkeley and student researcher at Google Brain
- Tianhe (Kevin) Yu - PhD student at Stanford and student researcher at Google Brain
- Cristian Bodnar - PhD student at Cambridge, intern at Google Brain
- Ike Uchendu - Google AI Resident
- Mark Woodward - Google AI Resident, *currently Researcher at Amazon*
- Archit Sharma - Google AI Resident, *currently PhD Student at Stanford*
- Evan Liu - Google AI Resident, *currently PhD Student at Stanford*
- Hugo Ponte - Google AI Resident, *currently start-up founder*
- Christoph Kohstall - Google AI Resident, *currently start-up founder*
- Eric Heiden - Simultaneous Mapping and Planning, *currently PhD student at USC*

Professional Activities

Associate Editor/Area Chair:

Conference on Robot Learning (CoRL) 2019-2020,
International Conference on Machine Learning (ICML) 2021,
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2021

Reviewer:

ICML 2019-20, NeurIPS 2018-20, ICRA 2013-2018, IROS 2014-2017, RSS 2017-2020, CoRL 2017-2018, IJCAI 2016, SIMPAR 2016, IEEE Transactions on Robotics, International Journal of Robotics Research, IEEE Robotics and Automation Letters, Autonomous Robots

Organizer:

RSS 2016 Workshop on Robot-Environment Interaction for Perception and Manipulation

Program Committee Member:

NeurIPS 2018-2020 Deep RL Workshop, NeurIPS 2019 Workshop on Meta-Learning, Neurips 2019-2020 Workshop on Robot Learning, NeurIPS 2019 Workshop on Learning with Rich Experience, ICLR 2021 Workshop on a Roadmap to Never-Ending RL, ICLR 2020 Workshop on Unsupervised RL, RSS 2017 Revisiting Contact Workshop, IJCAI 2016, SIMPAR 2016, ICRA 2013 Robots in Clutter Workshop

Entrepreneurial Activities

- 2012-2014: Zeebraamusic, Chief Operating Officer
  Responsible for technology strategy, team building, product development.
- 2015-2016: Robotics Consultant for two California-based start-ups.