Karl Pertsch

https://kpertsch.github.io
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Research Interests

My goal is to build intelligent agents that help humans in their everyday tasks in unstructured real-world environments. To this end, I work on developing robot foundation models that can control a wide range of robots across many scenes and tasks, and serve as the foundation for further specialization. In particular, I currently focus on three key challenges: (1) building large and diverse robot training datasets, (2) training expressive robot policies on this data, and (3) developing approaches for scalably evaluating the capabilities of such robot foundation models.

Education

University of Southern California, Los Angeles, CA — Aug 2018 - May 2023
Ph.D. in Computer Science (Advisor: Joseph J. Lim), GPA: 4.0 / 4.0

University of Pennsylvania, Philadelphia, PA — Aug 2017 - Aug 2018
Fulbright Visiting Scholar, GPA: 4.0 / 4.0

TU Dresden, Dresden, Germany — Sept 2012 - Aug 2017
Diploma in Electrical Engineering, GPA: 4.0 / 4.0 (with distinction)

Professional Experience

UC Berkeley and Stanford University, Berkeley, Palo Alto, CA — Jun 2023 - Jun 2025
Postdoctoral Scholar co-advised by Sergey Levine and Chelsea Finn
- Research on robot foundation models, focusing on large robot data, models, and scalable evaluation

Google Brain Robotics, Mountain View, CA — May 2022 - May 2023
Student Researcher with Karol Hausman
- Research in robot learning from large scale robot and human video data

Facebook AI Research, Menlo Park, CA — Aug 2021 - Mar 2022
Research Intern with Akshara Rai and Dhruv Batra
- Research in robot learning from cross-domain demonstrations, e.g. from human videos

RAIL Lab, UC Berkeley, Berkeley, CA — Feb 2019 - Jul 2019
Visiting Researcher with Sergey Levine
- Research on hierarchical prediction models for visual planning

GRASP Lab, UPenn, Philadelphia, PA — Aug 2017 - May 2018
Fulbright Visiting Scholar with Kostas Daniilidis
- Research in unsupervised learning of action representations

Computer Vision Lab, TU Dresden, Germany — Apr 2017 - Aug 2017
Diploma Thesis with Carsten Rother
- Research on 6DoF object pose estimation

Institute of Automotive Engineering, TU Dresden, Germany — Apr 2016 - Jan 2017
Research Assistant with Bernard Bäker
- Research in RL for learning energy-optimal driving strategies for hybrid electric vehicles

BMW Research, Munich, Germany — Sept 2015 - Mar 2016
Research Intern with Lawrence Louis and Moritz Werling
- Research in predictive models for autonomous vehicle control

Conference Papers

[C20] Dibya Ghosh*, Homer Walke*, **Karl Pertsch***, Kevin Black*, Oier Mees*, Sudeep Dasari, Joey Hejna, Charles Xu, Jianlan Luo, Tobias Kreiman, You Liang Tan, Lawrence Yunliang Chen, Pannag Sanketi, Quan Vuong, Ted Xiao, Dorsa Sadigh, Chelsea Finn, and Sergey Levine. "Octo: An Open-Source Generalist Robot Policy", *RSS*, 2024

[C19] Alexander Khazatsky*, **Karl Pertsch***, Suraj Nair, Ashwin Balakrishna, Sudeep Dasari, Siddharth Karamcheti, and Soroush Nasiriany et al.. "Droid: A large-scale in-the-wild robot manipulation dataset", *RSS*, 2024

[C18] Lucy Xiaoyang Shi, Zheyuan Hu, Tony Z Zhao, Archit Sharma, **Karl Pertsch**, Jianlan Luo, Sergey Levine, and Chelsea Finn. "Yell at your robot: Improving on-the-fly from language corrections", *RSS*, 2024

[C17] Quan Vuong*, **Karl Pertsch*** Abby O'Neill, Abdul Rehman, Abhiram Maddukuri, Abhishek Gupta, Abhishek Padalkar, Abraham Lee, Acorn Pooley, Agrim Gupta, Ajay Mandlekar, Ajinkya Jain, Albert Tung, Alex Bewley, Alex Herzog, Alex Irpan, Alexander Khazatsky, Anant Rai, Anchit Gupta, and Andrew Wang et al.. "Open X-embodiment: Robotic learning Datasets and RT-X Models", *IEEE International Conference on Robotics and Automation (ICRA)*, 2024

[C16] Sumedh Sontakke, Jesse Zhang, Séb Arnold, **Karl Pertsch**, Erdem Bıyık, Dorsa Sadigh, Chelsea Finn, and Laurent Itti. "Roboclip: One demonstration is enough to learn robot policies", *NeurIPS*, 2023

[C15] Yevgen Chebotar, Quan Vuong, Karol Hausman, Fei Xia, Yao Lu, Alex Irpan, Aviral Kumar, Tianhe Yu, Alexander Herzog, and **Karl Pertsch** et al.. "Q-transformer: Scalable offline reinforcement learning via autoregressive q-functions", *CoRL*, 2023

[C14] Jesse Zhang, Jiahui Zhang, **Karl Pertsch**, Ziyi Liu, Xiang Ren, Minsuk Chang, Shao-Hua Sun, and Joseph J Lim. "Bootstrap your own skills: Learning to solve new tasks with large language model guidance", *CoRL*, 2023

[C13] Anthony Brohan, Noah Brown, Justice Carbajal, Yevgen Chebotar, ..., and **Karl Pertsch** et al.. "Rt-2: Vision-language-action models transfer web knowledge to robotic control", *Conference on Robot Learning (CoRL)*, 2023

[C12] Shivin Dass*, **Karl Pertsch***, Hejia Zhang, Youngwoon Lee, Joseph J. Lim, and Stefanos Nikolaidis. "Assisted Teleoperation for Scalable Robot Data Collection", *Robotics: Science and Systems (RSS)*, 2023

[C11] Anthony Brohan, Noah Brown, Justice Carbajal, Yevgen Chebotar, Joseph Dabis, Chelsea Finn, Keerthana Gopalakrishnan, Karol Hausman, Alex Herzog, Jasmine Hsu, Julian Ibarz, Brian Ichter, Alex Irpan, and **Karl Pertsch** et al.. "Rt-1: Robotics transformer for real-world control at scale", *Robotics: Science and Systems (RSS)*, 2023

[C10] **Karl Pertsch**, Ruta Desai, Vikash Kumar, Franziska Meier, Joseph J. Lim, Dhruv Batra, and Akshara Rai. "Cross-Domain Transfer via Semantic Skill Imitation", *Conference on Robot Learning (CoRL)*, 2022

[C9] Jun Yamada, **Karl Pertsch**, Anisha Gunjal, and Joseph J. Lim. "Task-Induced Representation Learning", *International Conference on Learning Representations (ICLR)*, 2022

[C8] Taewook Nam, Shao-Hua Sun, **Karl Pertsch**, Sung Ju Hwang, and Joseph J. Lim. "Skill-based Meta-Reinforcement Learning", *International Conference on Learning Representations (ICLR)*, 2022

[C7] **Karl Pertsch**, Youngwoon Lee, Yue Wu, and Joseph J. Lim. "Demonstration-Guided Reinforcement Learning with Learned Skills", *Conference on Robot Learning (CoRL)*, 2021

[C6] **Karl Pertsch**, Youngwoon Lee, and Joseph J. Lim. "Accelerating Reinforcement Learning with Learned Skill Priors", *Conference on Robot Learning (CoRL)*, 2020

[C5] Jun Yamada*, Youngwoon Lee*, Gautam Salhotra, **Karl Pertsch**, Max Pflueger, Gaurav S. Sukhatme, Joseph J. Lim, and Peter Englert. "Motion Planner Augmented Reinforcement Learning for Robot Manipulation in Obstructed Environments", *Conference on Robot Learning (CoRL)*, 2020

[C4] **Karl Pertsch***, Oleh Rybkin*, Frederik Ebert, Chelsea Finn, Dinesh Jayaraman, and Sergey Levine. "Long-Horizon Visual Planning with Goal-Conditioned Hierarchical Predictors", *Neural Information Processing Systems (NeurIPS)*, 2020

[C3] **Karl Pertsch***, Oleh Rybkin*, Jingyun Yang, Shenghao Zhou, Kosta Derpanis, Joseph J. Lim, Kostas Daniilidis, and Andrew Jaegle. "KeyIn: Keyframing for Visual Planning", *Conference on Learning for Dynamics and Control (L4DC)*, 2020

[C2] Oleh Rybkin*, **Karl Pertsch***, Konstantinos G. Derpanis, Kostas Daniilidis, and Andrew Jaegle. "Learning what you can do before doing anything", *International Conference on Learning Representations (ICLR)*, 2019

[C1] Omid Hosseini Jafari*, Siva Karthik Mustikovela*, **Karl Pertsch**, Eric Brachmann, and Carsten Rother. "iPose: Instance-Aware 6D Pose Estimation of Partly Occluded Objects", *Asian Conference on Computer Vision (ACCV)*, 2018

Technical Reports

[T8] Michal Zawalski*, William Chen*, **Karl Pertsch**, Oier Mees, Chelsea Finn, and Sergey Levine. "Robotic Control via Embodied Chain-of-Thought Reasoning", *Arxiv Preprint*, 2024

[T7] Moo Jin Kim*, **Karl Pertsch***, Siddharth Karamcheti*, Ted Xiao, Ashwin Balakrishna, Suraj Nair, Rafael Rafailov, Ethan Foster, Grace Lam, Pannag Sanketi, Quan Vuong, Thomas Kollar, Benjamin Burchfiel, Russ Tedrake, Dorsa Sadigh, Sergey Levine, Percy Liang, and Chelsea Finn. "OpenVLA: An Open-Source Vision-Language-Action Model", *Arxiv Preprint*, 2024

[T6] Xuanlin Li*, Kyle Hsu*, Jiayuan Gu*, **Karl Pertsch**, Oier Mees, Homer Rich Walke, Chuyuan Fu, Ishikaa Lunawat, Isabel Sieh, Sean Kirmani, Sergey Levine, Jiajun Wu, Chelsea Finn, Hao Su, Quan Vuong, and Ted Xiao. "Evaluating Real-World Robot Manipulation Policies in Simulation", *Arxiv Preprint*, 2024

[T5] Olivia Y Lee, Annie Xie, Kuan Fang, Karl Pertsch, and Chelsea Finn. "Affordance-Guided Reinforcement Learning via Visual Prompting", *RSS Workshop on Lifelong Learning*, 2024

[T4] Taewook Nam, Juyong Lee, Jesse Zhang, Sung Ju Hwang, Joseph J. Lim, and **Karl Pertsch**. "Lift: Unsupervised reinforcement learning with foundation models as teachers", *NeurIPS Deep RL Workshop*, 2023

[T3] Anthony Liang, Ishika Singh, **Karl Pertsch**, and Jesse Thomason. "Transformer Adapters for Robot Learning", *CoRL Workshop on Pretraining Robot Learning*, 2022

[T2] Jesse Zhang*, **Karl Pertsch***, Jiahui Zhang, Taewook Nam, Sung Ju Hwang, Xiang Ren, and Joseph J. Lim. "Scalable Semantic Policy Pre-Training via Language Instruction Relabeling", *CoRL Workshop on Language in RL*, 2022

[T1] Jesse Zhang*, **Karl Pertsch***, Jiefan Yang, and Joseph J. Lim. "Minimum Description Length Skills for Accelerating Reinforcement Learning", *NeurIPS Workshop on Self-Supervised Learning in RL*, 2021

Honors and Awards

- Best Conference Paper Award, ICRA — 2024
- Best Paper Runner-up, CoRL Workshop on Language and Robot Learning — 2022
- Best Paper Presentation Award, CoRL — 2020
- Best Paper Runner-up, NeurIPS Workshop on Robot Learning — 2020
- Fulbright Scholarship — 2017
- TU Dresden Best Diploma in Electrical Engineering Award — 2017
- TU Dresden Best Pre-Diploma Award — 2014
- Deutschlandstipendium — 2013 - 2017
  - German national scholarship for outstanding academic achievements

Invited Talks

OpenVLA and Embodied Chain-of-Thought

- OpenAI, Invited talk at OpenAI Robotics — Aug 2024
- Waymo, Invited talk at Waymo reading group — Aug 2024

Building Generalist Robot Policies

- KAIST, Invited talk in Joseph Lim's lab — Feb 2024
- Google Deepmind, Invited talk at Google Deepmind Robotics — Feb 2024
- University of Pennsylvania, Invited talk at GRASP FSI Seminar — Apr 2024

Open X-Embodiment Datasets and Models

- Stanford University, Invited talk at Vision & Learning lab — Dec 2023

Accelerating Reinforcement Learning and Imitation with Learned Skills

- MILA, Invited talk in Glen Berseth's lab — Nov 2022
- UC Berkeley, Invited talk in Sergey Levine's lab — Jan 2023
- Stanford University, Invited talk in Chelsea Finn's lab — Jan 2023
- UC Berkeley, Invited talk in Pieter Abbeel's lab — Feb 2023
- Carnegie Mellon University, Invited talk in Deepak Pathak's lab — Feb 2023

A Scalable Framework for Skill-based Learning with Offline Data

- Stanford University, Invited talk at Vision & Learning Lab — Jul 2021
- University of Pennsylvania, Invited talk at PAL Lab — Jun 2021

Teaching

Teaching Assistant, USC — Spring 2019, Fall 2019, Fall 2020
CSCI-566 Deep Learning and its Application (Joseph J. Lim)

Teaching Assistant, TU Dresden — Spring 2016, Fall 2016
Department of Electrical Engineering General Tutoring

Teaching Assistant, TU Dresden — Fall 2014, Spring 2015
Math 1 & 2 for Electrical Engineering (Jörg Wensch)

Student Mentoring

Ph.D. Students

- Kyle Stachowitz (UC Berkeley) — in-progress
- Pranav Atreya (UC Berkeley) — in-progress
- William Chen (UC Berkeley) — in-progress
- Michal Zawalski (UC Berkeley) — in-progress
- Moo Jin Kim (Stanford) — in-progress
- Kyle Hsu (Stanford) — in-progress
- Xuanlin Li (UCSD) — in-progress
- Alexander Khazatsky (Stanford) — RSS 2024
- Sumedh Sontakke (USC) — NeurIPS 2023
- Jesse Zhang (USC) — CoRL 2023
- Taewook Nam (KAIST) — ICLR 2022

Master's Students

- Shivin Dass (USC → Ph.D. student at UT Austin) — RSS 2023

Undergraduate Students

- Olivia Y Lee (Stanford) — RSS 2024 (workshop)
- Lucy Shi (USC → Ph.D. student at Stanford) — RSS 2024
- Yue Wu (USC) — CoRL 2021
- Jingyun Yang (USC → Master's student at CMU → Ph.D. student at Stanford) — L4DC 2020

Visiting Scholars

- Jun Yamada (USC → Ph.D. student at Oxford) — CoRL 2020, ICLR 2022
- Anisha Gunjal (USC → M.S. student at UT Austin) — ICLR 2022

Services

Reviewer (Top Reviewer Awards Underlined)

- **ICLR**: 2020, 2021, 2022, 2023
- **ICML**: 2020, 2021, 2022, 2023
- **NeurIPS**: 2020, 2023
- **CoRL**: 2021, 2023, 2024
- **ICRA**: 2021, 2022, 2024
- **T-RO**: 2022
- **RA-L**: 2023
- **RSS**: 2023, 2024
- **iROS**: 2024
- **TMLR**: 2022, 2023
- **ICCV**: 2019

- **CVPR**: 2019
- **AURO**: 2023
- **TPAMI**: 2024

Associate Editor
- Robotics Automation Letters (RA-L), 2024

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