Jonas **Frey**

Ph.D. Student · ETH Zurich · Max Planck Institute · Robotics & Learning

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Research Interest

Main Areas perception, navigation, locomotion, reinforcement learning, intrinsic motivation, mapping

Applications search & rescue, long-term autonomy, legged robots, environmental monitoring

Education

Ph.D. in Robotics
ETH Zurich / MPI-IS

Learning Perception and Navigation - Towards Autonomous Legged Robots in the Wild.

Supervisors: Prof. Marco Hutter (ETHZ), Prof. Georg Martius (MPI-IS)

Apr. 2022 - Apr. 2025

M.Sc. in Robotics Systems and Control - summa cum laude / mit Auszeichnung
ETH Zurich

Thesis: Continual Learning of Semantic Segmentation for Mobile Robots - Best grade 6.0/6.0

Sep. 2019 - Aug. 2021

B.Sc. Electrical Engineering - Top $\sim$ 5%
Karlsruhe Institute of Technology

Thesis: Deep Neural Networks for Deformation Modelling in Robotics - Best grade 1.0/1.0

Oct. 2015 - Jan. 2019

Work and Research Experience

Incoming Joint-PostDoc
USA, CA

Stanford University & UC Berkeley

5/2025 -

- Prof. Marco Pavone (Stanford) - Prof. Jitendra Malik (UC Berkeley)
- Reasoning, Humanoids, Locomotion and Navigation

Visiting Researcher
England

University of Oxford - Dynamic Robot Systems Group

1/2023 - 1/2023

- Collaboration as part of the EU DigiForest Project
- Development of a Visual Traversability Estimation Framework

Visiting Researcher
USA, CA

NASA - Jet Propulsion Laboratory

9/2022 - 3/2023

- Navigation and Traversability Estimation for Off-Road Vehicle
- Development of the RoadRunner Framework

Robotics Engineer
Switzerland

ETH Zurich - Robotic Systems Lab

9/2021 - 3/2022

- Navigation and Traversability Estimation for Legged Robot ANYmal C
- PyTorch, Physics Simulation, Sparse CNN, ROS

Hardware Designer
Switzerland

ETH Zurich - Robotic Systems Lab

2/2020 - 10/2020

- PCB-Design: Altium Designer in collaboration with Bota Systems
- Industrial Standards (EtherCAT, HighSpeed, Cortex)

Collaborative Robotics Engineer
Germany

SEW-Eurodrive - R&D Department

2/2019 - 8/2019

- Navigation software stack development for mobile robots
- Industrial automation C++ 11 (ROS) and IEC-61131-3
- Application software (KUKA Robot Language)

Research Visit
Japan

Robot Learning - Nara Institute of Science and Technology

6/2018 - 8/2018

- Implementation and validation of a statistical Deep Neural Network for deformation modeling for robotics.
- Bachelor's Thesis, Experience in TensorFlow and ROS

Research Assistant / Internship *Germany*

Karlsruhe Institute of Technology - High-Performance Humanoid Technologies *6/2017 - 6/2018*

- Design of a Battery and Power Management System
- Integration into the Humanoid Robot ARMAR-6 (EU SecondHands Project)

Robotics in High-School *Germany*

Simpert-Kraemer-Gymnasium *09/2007 - 07/2015*

- Participation at the International RoboCup Junior.
- 2nd place in Germany 2013.
- Development of autonomous soccer and rescue robots

Teaching

2022	**Teaching Assistance**, Course: Perception and Learning for Robotics (PLR) - Dr. Cesar Cadena	*ETH Zurich*
2022	**Student Supervision**, 8 x Master's Thesis, 15 x Semester Projects, 7 x PLR - Course Projects, 3x Others	*ETH Zurich*
2017	**Teaching Assistance**, Course: Digital Technologies - Prof. Jürgen Becker	*KIT*

Others

Scholarships

2022	**Doctoral Fellowship**, Max Planck ETH Center for Learning Systems (CLS)	*Switzerland*
2019	**Scholarship of the German people**, for Master's Degree ETH Zurich	*Germany*
2019	**Karolina Ruedi Foundation**, for Master's Degree ETH Zurich	*Switzerland*
2018	**Scholarship - Continuous Learning in International Collaborative Studies**, for Bachelor's Thesis	*Japan*

Awards

2024	**Best Paper Finalist - Cognitive Robotics**, ICRA - Resilient Legged Local Navigation	*Yokohama*
2024	**Open Research Data Grant**, 30k CHF - Open-Source Legged Robotic Dataset	*Switzerland*
2023	**Best Paper Finalist**, CoRL - Learning Agile Skills via Adversarial Imitation of Rough Partial Demonstrations	*Yokohama*
2021	**Best Paper Runner-Up**, NeurIPS - 4th Robot Learning Workshop Self-Supervised and Lifelong Learning	*Virtual*
2013	**2th Place**, RoboCup Junior - Germany	*Germany*
2013	**3th Place**, RoboCup Junior - Regional	*Germany*

Invited Talks

2023	**Technical University of Munich**, Smart Robotics Lab - Prof. Stefan Leutenegger	*Germany*
2024	**University of Toronto**, Autonomous Space Robotics Lab - Prof. Tim Barfoot	*Canada*
2024	**Massachusetts Institute of Technology**, SPARKlab CSAIL - Prof. Luca Carlone	*USA*
2024	**Northeastern University**, Prof. Michael Everett	*USA*
2024	**Carnegie Mellon University**, Prof. Sebastian Scherer	*USA*
2024	**Carnegie Mellon University**, Prof. Aaron Johnson	*USA*
2024	**University of California, Berkeley**, Prof. Jitendra Malik	*USA*
2024	**Stanford University**, Autonomous Systems Laboratory - Prof. Marco Pavone	*USA*
2024	**Toyota Research Institute**, Mobile Manipulation - Robotics	*USA*
2025	**Karlsruhe Institute of Technology**, Institute for Anthropomatics and Robotics - Prof. Tamim Asfour and Prof. Rudolf Lioutikov	*Germany*
2024	**Robotic Science and Systems - Workshop Nature-Bots**, Keynote/Panel: Learning Perception and Navigation: Towards autonomous robots in the wild	*Netherlands*
2024	**CoRL - Workshop LocoLearn: From Bioinspired Gait Generation to Active Perception**, Invited Talk: Learning Perception and Navigation: Towards autonomous robots in the wild	*Germany*

Media Coverage

2023	**Forstmesser Lucern**, Robots to Operate within Forest	*Switzerland*
2023	**Newspaper**, Digiforest Holzbau	*Switzerland*
2024	**WIR Holzbauer Special**, Hightech im Forst	*Switzerland*
2024	**Nano**, Digiforest - National TV - 30.10.2024	*Switzerland*
2025	**Pestalozzi Schoolcamp**, Star Guest Science - Demo, Talk - 20.02.2025	*Switzerland*

Services

Reviewing, ICRA, IROS, RA-L, CoRL, T-FR, RSS

Others

2024 **Volunteer**, RoboCup Junior Vöhringen - Refeere (2024) *Germany*

2019 **Volunteer**, RoboCup Junior Vöhringen - Refeere (2019) *Germany*

Publications

Journal Articles

RoadRunner - Learning Traversability Estimation for Autonomous Off-road Driving
Frey, Jonas, Patel Manthan, Atha Deegan, Nubert Julian, Padgett Curtis, Spieler Patrick, Hutter Marco, Shehryar Khattak
IEEE Field Robotics (2024)

Wild Visual Navigation: Fast Traversability Learning via Pre-Trained Models and Online Self-Supervision
Matias Mattamala, **Frey, Jonas**, Piotr Libera, Nived Chebrolu, Georg Martius, Cesar Cadena, Marco Hutter, Maurice Fallon
under review for Autonomous Robots (2024)

SMUG Planner: A Safe Multi-Goal Planner for Mobile Robots in Challenging Environments
Changan Chen, **Frey, Jonas**, Philip Arm, Marco Hutter
IEEE Robot. Autom. Lett. (RA-L) 8.11 (2023) pp. 7170–7177. IEEE

Seeing Through the Grass: Semantic Pointcloud Filter for Support Surface Learning
Anqiao Li, Chenyu Yang, **Frey, Jonas**, Joonho Lee, Cesar Cadena, Marco Hutter
IEEE Robot. Autom. Lett. (RA-L) 8.11 (2023) pp. 7687–7694. IEEE

Continual Adaptation of Semantic Segmentation using Complementary 2D-3D Data Representations
Frey, Jonas, Hermann Blum, Francesco Milano, Roland Siegwart, Cesar Cadena
IEEE Robot. Autom. Lett. (RA-L) 7.4 (2022) pp. 11665–11672. IEEE

Conference Proceedings

Identifying Terrain Physical Parameters from Vision-Towards Physical-Parameter-Aware Locomotion and Navigation
Jiaqi Chen, **Frey, Jonas***, Ruyi* Zhou, Takahiro* Miki, Georg Martius, Marco Hutter
IEEE Robot. Autom. Lett. (RA-L) (2025). IEEE

Offline vs. Online Learning in Model-based RL: Lessons for Data Collection Strategies
Jiaqi Chen, Ji Shi*, Cansu Sancaktar*, **Frey, Jonas***, Georg Martius
under review for Reinforcement Learning Conference (RLC) (2025)

Boxi: Design Decisions in the Context of Algorithmic Performance for Robotics
Jonas Frey, Turcan Tuna, Lanke Frank Tarimo Fu, Cedric Weibel, Katharine Patterson, Benjamin Krummenancher, Matthias Müller, Julian Nubert, Maurice Fallon, Cesar Cadena, Marco Hutter
under review for Robotics: Science and Systems (RSS) (2025)

TotalRecon: Metrically Accurate Visual Reconstruction using a Survey-grade Total Station
Lanke Frank Tarimo Fu, **Frey, Jonas**, Turcan Tuna, Mattamala Matías, Cesar Cadena, Marco Hutter, Maurice Fallon
under review for Robotics: Science and Systems (RSS) (2025)

Diffusion Based Robust LiDAR Place Recognition
Benjamin Krummenacher, **Frey, Jonas**, Turcan Tuna, Olga Vysotska, Marco Hutter
IEEE Int. Conf. Robot. Autom. (ICRA), 2025

Learned Perceptive Forward Dynamics Model for Safe and Platform-aware Robotic Navigation
Roth Pascal, **Frey Jonas**, Cadena Cesar, Hutter Marco
under review for Robotics: Science and Systems (RSS) (2025)

Zero-Shot Offline Imitation Learning via Optimal Transport
Thomas Rupf, Marco Bagatella, Nico Gürtler, **Frey, Jonas**, Georg Martius
under review for Intl. Conf. on Machine Learning (ICML) (2025)

Learning with 3D rotations, a hitchhiker's guide to SO(3)
A. René Geist, **Frey, Jonas**, Zobro Mikel, Levina Anna, Georg Martius
Intl. Conf. on Machine Learning (ICML), 2024

Learning risk-aware quadrupedal locomotion using distributional reinforcement learning
Lukas Schneider, **Frey, Jonas**, Takahiro Miki, Marco Hutter
IEEE Int. Conf. Robot. Autom. (ICRA), 2024

Resilient Legged Local Navigation: Learning to Traverse with Compromised Perception End-to-End
Chong Zhang, Jin Jin, **Frey, Jonas**, Nikita Rudin, Matias Mattamala, Cesar Cadena, Marco Hutter
IEEE Int. Conf. Robot. Autom. (ICRA), 2024

MEM: Multi-Modal Elevation Mapping for Robotics and Learning
Gian Erni, **Frey, Jonas**, Takahiro Miki, Matias Mattamala, Marco Hutter
IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems (IROS), 2023

Fast Traversability Estimation for Wild Visual Navigation

Frey, Jonas, Matias Mattamala, Nived Chebrolu, Cesar Cadena, Maurice Fallon, Marco Hutter
Robotics: Science and Systems (RSS), 2023, Daegu, Republic of Korea

Versatile skill control via self-supervised adversarial imitation of unlabeled mixed motions
Chenhao Li, Sebastian Blaes, Pavel Kolev, Marin Vlastelica, **Frey, Jonas**, Georg Martius
IEEE Int. Conf. Robot. Autom. (ICRA), 2023

Unsupervised Continual Semantic Adaptation through Neural Rendering
Zhizheng Liu, Francesco Milano, **Frey, Jonas**, Roland Siegwart, Hermann Blum, Cesar Cadena
IEEE Int. Conf. Computer Vision and Pattern Recognition, 2023

Locomotion policy guided traversability learning using volumetric representations of complex environments
Frey, Jonas, David Hoeller, Shehryar Khattak, Marco Hutter
IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems (IROS), 2022

Learning Agile Skills via Adversarial Imitation of Rough Partial Demonstrations
Chenhao Li, Marin Vlastelica, Sebastian Blaes, **Jonas Frey**, Felix Grimminger, Georg Martius
Conf. on Robot Learning (CoRL), 2022

Workshops

Zero-Shot Offline Imitation Learning via Optimal Transport
Thomas Rupf, Marco Bagatella, Nico Gürtler, **Frey, Jonas**, Georg Martius
CoRL'24 - Learning Effective Abstractions for Planning (LEAP), 2024

Fast Traversability Estimation for Wild Visual Navigation
Frey, Jonas, Matias Mattamala, Nived Chebrolu, Cesar Cadena, Maurice Fallon, Marco Hutter
ICRA'23 - Workshop on Pretraining4Robotics, 2023

Continual Learning of Semantic Segmentation using Complementary 2D-3D Data Representations
Frey, Jonas, Hermann Blum, Francesco Milano, Roland Siegwart, Cesar Cadena
NeurIPS'21 - 4th Robot Learning Workshop: Self-Supervised and Lifelong Learning, 2021