Oier Mees

University of Freiburg, Department of Computer Science
Autonomous Intelligent Systems
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Technical Expertise

- Robot Learning
- Robotics
- Deep Learning
- Self-Supervised/Unsupervised Learning
- Language Grounding
- Human-Robot Interaction

Education

Ph.D. Candidate in Computer Science — *Freiburg, Germany*
University of Freiburg — *2017 - current*
Advisor: Prof. Dr. Wolfram Burgard

MSc in Computer Science — *Freiburg, Germany*
University of Freiburg – Grade: 1.1 (Excellent) — *2016*
Thesis: *Metric Learning for Generalizing Spatial relations to New Objects*
Advisor: Prof. Dr. Wolfram Burgard

Diploma in Computer Science — *Donostia, Spain*
University of Basque Country — *2013*
Thesis: *Visual SLAM using straight lines*
Developed at Fraunhofer IPA in Stuttgart, Germany

Work Experience

Robotics Research Intern — *Remote*
NVIDIA, Robotics Lab - Seattle — *Fall 2022*

Doctoral Researcher — *Freiburg, Germany*
University of Freiburg, Department of Computer Science, Autonomous Intelligent Systems Lab — *2017 - current*

Student Research Intern — *Freiburg, Germany*
University of Freiburg, Department of Computer Science, Autonomous Intelligent Systems Lab — *2014 - 2016*

Student Research Intern — *Stuttgart, Germany*
Fraunhofer IPA — *Spring 2013*

Research Intern — *Eibar, Spain*
Tekniker-IK4 Research Center — *Summer 2011*

Research Intern — *Donostia, Spain*
Vicomtech Research Center — *Summer 2010*

Teaching

Deep Learning Laboratory — *2020, 2021*
University of Freiburg
- Introduction to Deep Learning, optimization, projects on robot learning.

Robot Navigation — *WS 2019*
University of Freiburg
- Seminar course on advanced robot navigation research.

Deep Learning for Autonomous Driving — *SS 2018*
University of Freiburg
- Introduction to Deep Learning and ADAS, working with TensorFlow, projects on various self-driving car tasks.

KI im Alltag — *WS 2018*
University of Freiburg
- Seminar course on artificial intelligence.

Introduction to Mobile Robotics *SS 2017*

University of Freiburg

- Introduction of basic concepts and techniques for autonomous intelligent systems.

Supervision

2022	**Erick Rosete-Beas**, Skill-Chaining Latent Behaviors with Offline Reinforcement Learning	*Master Thesis*
2022	**Jessica Borja-Diaz**, Language-conditioned Affordances for Sample-Efficient Policy Learning	*Master Thesis*
2021	**Mikel Martinez**, Self-supervised Control with Vision and Language	*Master Project*
2021	**Jessica Borja-Diaz**, Affordance Learning from Play for Sample-Efficient Policy Learning	*Master Project*
2021	**Jens Rahnfeld**, Action-Conditioned Video Prediction with 3D Images	*Bachelor Thesis*
2021	**Leonhard Sommer**, Towards Unsupervised Scene Decomposition	*Master Project*
2020	**Alexander Goltz, Jens Rahnfeld, Julian Weidhase**, Virtual-Reality Data Collection	*Bachelor Project*
2020	**Nico Bühler**, (Fraunhofer IPM) Multi-view Pose Estimation of Falling Objects	*Master Thesis*
2020	**Manav Madan**, (Fraunhofer IPM) Unsupervised Anomaly Detection in Multi-view Perspective Images	*Master Thesis*
2019	**Markus Merklinger**, Unsupervised Transferable Skill Learning from Video	*Master Thesis*
2019	**Alp Emek**, Understanding Spatial Relations for Robot Manipulation	*Master Thesis*
2019	**Ilia Dobrusin**, Grounding Relationships for Arbitrary Objects with Unconstrained Speech Instructions	*Master Project*

Professional Service

Organizer Workshops

2022	**Workshop on Language and Robot Learning** Conference on Robot Learning (CoRL)
2022	**2nd Workshop on Scaling Robot Learning** Robotics: Science and Systems Conference (RSS)
2022	**Scaling Robot Learning** IEEE International Conference on Robotics and Automation (ICRA)
2021	**Semantic Representations for Robotics through Continuous Interaction and Incremental Learning** IEEE International Conference on Robotics and Automation (ICRA)
2020	**Self-supervised Robot Learning** Robotics: Science and Systems Conference (RSS)

Reviewing

Conferences

Conference on Robot Learning (CoRL), IEEE International Conference on Robotics and Automation (ICRA), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

Journals

IEEE Robotics and Automation Letters (RA-L)

Honors & Awards

2022	**RSS Pioneers**, for world's top early career researcher in robotics	*New York, USA*
2020	**Finalist for Best Paper Award in Cognitive Robotics**, International Conference on Robotics and Automation	*Paris, France*

Scholarships

2017-2020	**Graduate School of Robotics**, Baden-Württemberg Ministry of Science, Research and Arts	*Germany*
2013-2015	**Atzermaster**, from the Basque Government to study abroad a specialized Masters	*Freiburg, Germany*
2012-2013	**Collaboration**, from the Basque Government to research at the Robotics and Autonomous System Group	*Spain*
2010-2011	**Leonardo Da Vinci**, for internship in the EU at T-Systems GmbH	*Berlin, Germany*

Funded Projects

Organic Machine Learning (OML) *University of Freiburg*

Federal Ministry of Education and Reseach (BMBF) *2019-2022*

- Role: Involved in the acquisition and realization. Project and technical leader for AIS; PI: Prof. Wolfram Burgard

Sustainable robotics for part handling in manufacturing automation (STAMINA) *University of Freiburg*

European Commission FP7 *2017*

- Role: Research Scientist: PI: Prof. Wolfram Burgard

Reliable Lifelong Navigation for Mobile Robots (LifeNav) *University of Freiburg*

European Commission FP7-Ideas *2014-2016*

- Role: Research Scientist: PI: Prof. Wolfram Burgard

Publications

Manuscripts Under Review

- Visual Language Maps for Robot Navigation
  Chenguang Huang, **Oier Mees**, Andy Zeng, Wolfram Burgard
  arXiv preprint arXiv:2210.05714 (2022). 2022
- Grounding Language with Visual Affordances over Unstructured Data
  Oier Mees, Jessica Borja-Diaz, Wolfram Burgard
  arXiv preprint arXiv:2210.01911 (2022). 2022

Peer-Reviewed Journal and Conference Articles

- Affordance Learning from Play for Sample-Efficient Policy Learning
  Jessica Borja-Diaz, **Oier Mees**, Gabriel Kalweit, Lukas Hermann, Joschka Boedecker, Wolfram Burgard
  Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2022, Philadelphia, USA
- What Matters in Language Conditioned Robotic Imitation Learning Over Unstructured Data
  Oier Mees, Lukas Hermann, Wolfram Burgard
  IEEE Robotics and Automation Letters (RA-L) 7.4 (2022) pp. 11205–11212. 2022
- CALVIN: A Benchmark for Language-Conditioned Policy Learning for Long-Horizon Robot Manipulation Tasks
  Oier Mees, Lukas Hermann, Erick Rosete-Beas, Wolfram Burgard
  IEEE Robotics and Automation Letters (RA-L) 7.3 (2022) pp. 7327–7334. 2022
- Latent Plans for Task Agnostic Offline Reinforcement Learning
  Erick Rosete-Beas, **Oier Mees**, Gabriel Kalweit, Joschka Boedecker, Wolfram Burgard
  Proceedings of the 6th Conference on Robot Learning (CoRL), 2022
- Composing Pick-and-Place Tasks By Grounding Language
  Oier Mees, Wolfram Burgard
  Proceedings of the International Symposium on Experimental Robotics (ISER), 2021
- Hindsight for Foresight: Unsupervised Structured Dynamics Models from Physical Interaction
  Iman Nematollahi, **Oier Mees**, Lukas Hermann, Wolfram Burgard
  International Conference on Intelligent Robots and Systems (IROS), 2020
- Learning Object Placements For Relational Instructions by Hallucinating Scene Representations
  Oier Mees, Alp Emek, Johan Vertens, Wolfram Burgard
  Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2020, Paris, France
- Adversarial Skill Networks: Unsupervised Robot Skill Learning from Videos
  Oier Mees, Markus Merklinger, Gabriel Kalweit, Wolfram Burgard
  Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2020, Paris, France
  Finalist for the Best Paper Award in Cognitive Robotics
- Self-supervised 3D Shape and Viewpoint Estimation from Single Images for Robotics
  Oier Mees, Maxim Tatarchenko, Thomas Brox, Wolfram Burgard
  Proceedings of the International Conference on Intelligent Robots and Systems (IROS), 2019, Macao, China
- Perspectives on Deep Multimodel Robot Learning
  Wolfram Burgard, Abhinav Valada, Noha Radwan, Tayyab Naseer, Jingwei Zhang, Johan Vertens, **Oier Mees**, Andreas Eitel, Gabriel Oliveira
  Proceedings of the International Symposium on Robotics Research (ISRR), 2017
- Metric Learning for Generalizing Spatial Relations to New Objects
  Oier Mees, Nichola Abdo, Mladen Mazuran, Wolfram Burgard
  Proceedings of the International Conference on Intelligent Robots and Systems (IROS), 2017, Vancouver, Canada
- Choosing Smartly: Adaptive Multimodal Fusion for Object Detection in Changing Environments
  Oier Mees, Andreas Eitel, Wolfram Burgard
  Proceedings of the International Conference on Intelligent Robots and Systems (IROS), 2016, Daejeon, South Korea

Peer-Reviewed Workshop Papers

- Language-conditioned Policy Learning for Long-Horizon Robot Manipulation Tasks
  Oier Mees, Wolfram Burgard
  RSS Pioneers at Robotics: Science and Systems (RSS), 2022
- What Matters in Language Conditioned Imitation Learning over Unstructured Data
  Oier Mees, Lukas Hermann, Wolfram Burgard
  Workshop on Overlooked Aspects of Imitation Learning: Systems, Data, Tasks, and Beyond at RSS, 2022
- Affordance Learning from Play for Sample-Efficient Policy Learning
  Jessica Borja-Diaz, **Oier Mees**, Gabriel Kalweit, Lukas Hermann, Joschka Boedecker, Wolfram Burgard
  Workshop on Robot Learning: Self-Supervised and Lifelong Learning at NeurIPS, 2021
- Hindsight for Foresight: Unsupervised Structured Dynamics Models from Physical Interaction
  Iman Nematollahi, **Oier Mees**, Lukas Hermann, Wolfram Burgard

Workshop on Machine Learning in Planning and Control of Robot Motion, International Conference on Robotics and Automation (ICRA), 2020

- Hindsight for Foresight: Unsupervised Structured Dynamics Models from Physical Interaction
  Iman Nematollahi, **Oier Mees**, Lukas Hermann, Wolfram Burgard
  Workshop on Structured Approaches to Robot Learning for Improved Generalization at Robotics: Science and Systems (RSS), 2020
- Adversarial Skill Networks: Unsupervised Robot Skill Learning from Videos
  Oier Mees, Markus Merklinger, Gabriel Kalweit, Wolfram Burgard
  Workshop on Learning from Unlabeled Videos, IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2020
- Adversarial Skill Networks: Unsupervised Skill Learning from Videos
  Markus Merklinger, **Oier Mees**, Gabriel Kalweit, Wolfram Burgard
  Workshop on Combining Learning and Reasoning – Towards Human-Level Robot Intelligence, Robotics: Science and Systems (RSS), 2019
- Adaptive Sensor Fusion for RGB-D Object Detection
  Oier Mees, Andreas Eitel, Wolfram Burgard
  Deutsche Gesellschaft für Robotik - Tage 2016 (DGR-Tage 2016), 2016, Leipzig, Germany

Software & Datasets

Visual Language Maps for Robot Navigation *https://vlmaps.github.io/*

- A spatial map representation that fuses pretrained visual-language features with a 3D reconstruction of the physical world

Grounding Language with Visual Affordances over Unstructured Data *http://hulc2.cs.uni-freiburg.de/*

- Efficient language-conditioned model that learns long-horizon, multi-tier tasks from purely offline, reset-free and unstructured data in the real world.

Task Agnostic Offline Reinforcement Learning *http://tacorl.cs.uni-freiburg.de*

- Hierarchical policy that combines the strengths of imitation learning and offline reinforcement learning by skill-chaining latent behavior priors.

Hierarchical Universal Language Conditioned Policies *http://hulc.cs.uni-freiburg.de*

- Language conditioned policy model that sets a new state of the art on the CALVIN benchmark.

Visual Affordances for Sample-Efficient Policy Learning *http://vapo.cs.uni-freiburg.de*

- State-of-the-art Visual Affordance-guided Policy Optimization models to learn robot manipulation tasks
- Real-world and simulation teleoperated play data to extract human priors for how to approach objects.

Language Conditioned Policy Learning for Long-Horizon Robot Manipulation Tasks *http://calvin.cs.uni-freiburg.de*

- Benchmark of instruction following that combines: 7-DOF continuous control from pixels and long-horizon robotic object manipulation
- 24 hours of teleoperated unstructured play data together with 20K language directives.

Learning of Intuitive Physics from Interaction *http://hind4sight.cs.uni-freiburg.de*

- State-of-the-art Hind4Sight models that learn dynamics of the real-world from unlabeled physical interaction.
- Freiburg Poking Dataset - over 40K poke interactions with a KUKA LBR iiwa manipulator and over 30 objects.

Unsupervised Robot Skill Learning from Video *http://robotskills.cs.uni-freiburg.de*

- State-of-the-art ASN models that learn transferable skills from unlabeled interaction videos and compose them for new tasks in a RL setting.
- Block Tasks Dataset - over 60 multi-view videos of real-world human executions of block manipulation tasks.

Teaching Robots to Generalize Spatial Relations *http://spatialrelations.cs.uni-freiburg.de*

- Code for our spatial relations descriptor and metric learning approach.
- Freiburg Spatial Relations Dataset - over 546 annotated scenes depicting spatial relations with point clouds.

Deep Adaptive Multimodal Fusion *http://adaptivefusion.cs.uni-freiburg.de*

- Pretrained models for our adaptive multimodal fusion approach, based on a mixture of deep experts.
- InOutDoorPeople Dataset - over 8000 annotated RGB-D frames from a mobile robot that drives indoors and outdoors.

Media Coverage

Training robots to identify object placements by 'hallucinating' scenes *TechXplore, 2020*

Interview on spanish TV *EiTB, 2019*