# Julen Urain

*Robotics & Machine Learning Researcher*

*Intelligent Autonomous Systems Lab*
*Technische Universitat Darmstadt*
*julen@robot-learning.de*
*robotgradient* *Julen Urain*
*Google Scholar* *Personal Website*


***Robotics & Machine Learning Research Scientist***
*My research interests are in the interplay of generative modeling, geometry, optimization, robotics, planning & control.*

## Technical Expertises

- Robot Learning
- Robotics
- Deep Learning
- Optimization
- Generative Models/ Unsupervised Learning
- 3D Computer Vision

## Education

2019-2023 **PhD. in Computer Science. Advisor: Jan Peters**, *Technische Universität Darmstadt - TUDA*, Darmstadt (Germany), *GPA – 1 (Suma Cum Laude)*.

2017 **M.Sc. Thesis. Advisor: Auke Ijspeert**, *École Polytechnique Fédérale de Lausanne - EPFL*, Lausanne (Switzerland), *GPA – 5.5/6*.

2015-2017 **M.Sc. in Automatic Control and Robotics**, *Universitat Politècnica de Catalunya - UPC*, Barcelona (Spain), *GPA – 8.71/10 , Top 3%*.

2011-2015 **B.Sc. in Electronical Engineering. Advisor: Josu Jugo**, *Universidad del Pais Vasco - UPV*, Bilbao (Spain), *GPA – 7.3/10*.

## Work Experience

01/01/2024-Present **Postdoctoral Researcher**, IAS & DFKI, Darmstadt (Germany).
Research in Machine Learning and Robotics.

10/31/2022-06/09/2023 **Research Intern**, NVIDIA, Robotics Lab, Seattle (US), Fully Remote.
**Responsabilities:** Research and code in Robot Learning
**Projects:** Internal NVIDIA project
**Particular Accomplishments:** Internal code development.

01/15/2019-12/31/2023 **Scientific Researcher Staff**, IAS - TU Darmstadt, Darmstadt (Germany).
**Responsabilities:** Research and publish scientific papers in Robot Learning, Teaching, Mentoring Bachelor and Master students.
**Projects:** Sharework EU Project, Smart-Assistant for Image-guided Needle Insertion (Hessian.AI).
**Particular Accomplishments:** Selected R:SS Pioneer, Selected finalist for George Girault Ph.D. award, Best Workshop Paper, published papers in top-tier robotic conferences (ICRA, IROS, IJRR, RA-L, R:SS), GitHub open repositories (GraspDiffusion/Stable Vector Fields on Lie Groups)

12/01/2017-12/31/2018 **Robotics Researcher**, IK4 Research Alliance - Tekniker, Eibar, (Spain).
**Responsabilities:** Research in Robot Learning, code programming for EU Projects.
**Projects:** PICK-PLACE EU Project.
**Particular Accomplishments:** Develop force control for KUKA arm, develop a potential field-based human avoidance model.

## Honors and Awards

2024 **Best paper award in Structural Priors as Inductive Biases for Learning Robot Dynamics Workshop at RSS 2024**.
ActionFlow: Efficient, Accurate, and Fast Policies with Spatially Symmetric Flow Matching

2024 **Selected Finalist for the George Girault Ph.D. award**.
Award to the best robotics Ph.D. in Europe (only 5 finalist)

2023 **Best paper award in Geometric Representations Workshop at ICRA 2023**.
Award earned for the work on SE(3)-Diffusion Models for 6DoF Grasp Generative Models

2023 **R:SS Pioneers**.
Selected as a 30 member strong-cohort of top early robotics researchers (%22 acceptance)

2020 **Dexterous Manipulation Real Robot Challenge**.
3rd place in the Max Planck Institute (MPI) Real Robot Dexterous Manipulation Challenge

2017 **Deep Learning and Robotic Challenge**.
1st place of the jury in the VW:DataLab Deep Learning and Robotic Challenge

2017 **MSc. Graduated top of class**.
Top 3% in the MSc. in Automatic Control and Robotics at UPC

2015 **Hilbert-Bernays Fellowship**.
in relation with Hilbert-Bernays Summer School on Logic and Computation

## Funded Projects

2023 **Smart Assistant for Image-guided Needle Insertion**, Hessian.AI.
- Role: Project and Technical Leader for TU Darmstadt. PI: Jan Peters

2019-2022 **Safe and effective human robot cooperation towards a better competiveness on current automation lack manufacturing processes(SHAREWORK)**, EU Project - HORIZON 2020.
- Role: Project and Technical Leader for TU Darmstadt. PI: Jan Peters

2018-2019 **Flexible, safe and dependable robotic part handling in industrial environments (PICK-PLACE)**, EU Project - HORIZON 2020.
- Role: Research Scientist for Tekniker. PI: Iñaki Maurtua

## Invited Talks

2023 **An introduction to Energy Based Models and Diffusion Models**, International Workshop of Intelligent Autonomous Learning Systems 2023, Darmstädter Haus, Kleinwalsertal (Austria).

2023 **Robot Motion Generative Models**, Dyson Robot Learning Lab, London (UK).

2023 **Robot Motion Generative Models**, The Robot Learning Lab at Imperial College, London (UK).

## Teaching Experience

2020-2022 **Robot Learning**, TU Darmstadt.
Teaching Assistant

2020-2021 **Robotics Integrated Projects**, TU Darmstadt.
Teaching Assistant

## Mentoring and Supervision

2022 **Mark Baierl**, *Score-Based Generative Models as Trajectory Priors for Motion Planning*, Master Thesis.

2022 **Jascha Hellwig**, *Residual Reinforcement Learning with Stable Priors*, Master Thesis.

2021 **Yifei Wang**, *Bimanual Control and Learning with Composable Energy Policies*, Master Thesis.

2021 **Jiawei Huang**, *Multi-Objective Reactive Motion Planning in Mobile Manipulators*, Master Thesis.

2021 **Hanyu Sun**, *Can we improve time-series classification with Inverse Reinforcement Learning?*, Master Thesis.

2021 **Lanmiao Liu**, *Detection and Prediction of Human Gestures by Probabilistic Modelling*, Master Thesis.

2020 **Zhenhui Zhou**, *Approximated Policy Search in Black-Box Optimization*, Master Thesis.

## Publications

### Journal Articles

2023 **Julen Urain**, Anqi Li, Puze Liu, Carlo D'Eramo, and Jan Peters. Composable energy policies. *International Journal of Robotics Research (IJRR)*, 2023.

2022 **Julen Urain**, Davide Tateo, and Jan Peters. Learning stable vector fields on Lie groups. *IEEE Robotics and Automation Letters (RA-L)*, 2022.

2021 Niklas Funk, Charles Schaff, Rishabh Madan, Takuma Yoneda, **Julen Urain**, Joe Watson, Ethan K Gordon, Felix Widmaier, Stefan Bauer, Siddhartha S Srinivasa, et al. Benchmarking structured policies and policy optimization for real-world dexterous object manipulation. *IEEE Robotics and Automation Letters (RA-L)*, 2021.

2019 Ander Iriondo, Elena Lazkano, Loreto Susperregi, **Julen Urain**, Ane Fernandez, and Jorge Molina. Pick and place operations in logistics using a mobile manipulator controlled with deep reinforcement learning. *Applied Sciences*. Multidisciplinary Digital Publishing Institute, 2019.

2018 Jessica Lanini, Hamed Razavi, **Julen Urain**, and Auke Ijspeert. Human intention detection as a multiclass classification problem: Application in physical human–robot interaction while walking. *IEEE Robotics and Automation Letters (RA-L)*, volume 3, pages 4171–4178. IEEE, 2018.

### In Conference Proceedings

2023 **Julen Urain**, Niklas Funk, Georgia Chalvatzaki, and Jan Peters. SE(3)-Diffusionfields: Learning smooth cost functions for joint grasp and motion optimization through diffusion. *International Conference on Robotics Automation (ICRA).*, 2023.

2023 Kay Hansel, **Julen Urain**, Jan Peters, and Georgia Chalvatzaki. Hierarchical policy blending as inference for reactive robot control. *International Conference on Robotics Automation (ICRA)*, 2023.

2022 **Julen Urain**, An T. Le, Alexander Lambert, Georgia Chalvatzaki, Byron Boots, and Jan Peters. Learning implicit priors for motion optimization. *IEEE International Conference on Intelligent Robots and Systems (IROS)*, 2022.

2021 **Julen Urain**, Anqi Li, Puze Liu, Carlo D'eramo, and Jan Peters. Composable energy policies for reactive motion generation and reinforcement learning. In *2021 Robotics Science and Systems (R:SS)*, 2021.

2020 **Julen Urain**, Michele Ginesi, Davide Tateo, and Jan Peters. Imitationflow: Learning deep stable stochastic dynamic systems by normalizing flows. In *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 5231–5237. IEEE, 2020.

2019 **Julen Urain** and Jan Peters. Generalized multiple correlation coefficient as a similarity measurement between trajectories. In *2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 1363–1369. IEEE, 2019.

### Workshop Papers

2021 **Julen Urain**, Davide Tateo, and Jan Peters. Learning stable vector fields on smooth manifolds. In *R:SS Workshop on on geometry and topology in robotics*, 2021.

2020 **Julen Urain**, Davide Tateo, Tianyu Ren, and Jan Peters. Structured policy representation: Imposing stability in arbitrarily conditioned dynamic systems. In *3rd NeurIPS Workshop on Robot Learning, 2020*, 2020.

## Professional Service and Volunteering

### Workshop Organization

2024 **A Future Roadmap for Sensorimotor Skill Learning for Robot Manipulation**.
https://icra-manipulation-skill.github.io/
IEEE International Conference on Robotics and Automation 2024 (ICRA)

2024 **RSS Pioneers 2024**.
https://sites.google.com/view/rsspioneers2024/
Robotics: Science and Systems 2024 (R:SS)

2024 **Geometric and Algebraic Structure in Robot Learning**.
https://sites.google.com/view/gas-rl-rss2024
Robotics: Science and Systems 2024 (R:SS)

### Reviewing

**Conferences**

International Conference on Intelligent Robots (IROS), Conference on Robot Learning (CORL), International Conference on Robotics and Automation (ICRA), Artificial intelligence and Statitistics Conference (AISTATS)

**Journals**

Robotics and Automation Letters (RA-L), The International Journal of Robotics Research (IJRR)

### Other

**MOOC on Robot Learning**

Design and prepare a MOOC on Robot Learning for the KI-campus platform

## Open-Source Software and Datasets

**SE(3) DiffusionFields for Grasp and Motion Planning**.
- Diffusion Models in SE(3) for training 6DoF Grasp Generative Models.
- https://github.com/TheCamusean/grasp_diffusion

**Stable Vector Fields on Lie Groups**.
- A method to learn data-driven globally stable dynamics in in Lie Groups to represent task-space robot policies.
- https://github.com/TheCamusean/LieFlows

## Languages

Spanish **Mothertongue**

Basque **Mothertongue**

English **Fluent** *C1*