

# Julen Urain

Robotics & Machine Learning Research Scientist

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🤖 robotgradient in 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

- 01/01/2025-  
now **Research Scientist**, META, Montreal (Canada).  
**Responsibilities:** Research, paper writting, Ph.D. & master student advisor.  
**Projects:**  
**Particular Accomplishments:**
- 01/12/2024-  
31/12/2024 **Postdoctoral Researcher**, PEARL, TU Darmstadt (Germany).  
**Responsibilities:** Research, paper writting, Ph.D. & master student advisor.  
**Projects:** **Grounding Robotics in the 3D world**  
**Particular Accomplishments:** worked on an R:SS submission under Georgia Chalvatzaki's advice.
- 01/01/2024-  
31/07/2024 **Postdoctoral Researcher**, IAS & DFKI, Darmstadt (Germany).  
**Responsibilities:** Research, paper writting, Ph.D. & master student advisor.  
**Projects:** DFKI internal  
**Particular Accomplishments:** three paper submitted. one CoRL paper. two master thesis supervision. One master student starting his Ph.D. in Imperial College.
- 10/31/2022-  
06/09/2023 **Research Intern**, NVIDIA, ROBOTICS LAB, Seattle (US), Fully Remote.  
**Responsibilities:** 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).  
**Responsibilities:** 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- **Robotics Researcher**, IK4 RESEARCH ALLIANCE - TEKNIKER, Eibar, (Spain).  
12/31/2018 **Responsibilities:** 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.

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## 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 in whole Europe)
- 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

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## 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 competitiveness 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

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## Invited Talks

- 2024 **Deep Generative Models in Robotics**, META AI READING GROUP, Remote.
- 2024 **Deep Generative Models meet Geometry meet Robotics**, READING GROUP AT ECOLE CENTRALE DE LYON, Remote.
- 2023 **An introduction to Energy Based Models and Diffusion Models**, INTERNATIONAL WORKSHOP OF INTELLIGENT AUTONOMOUS LEARNING SYSTEMS 2023, Darmstädter Haus, Kleinwalsertal (Austria).
- 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

- 2024 **Anish Diwan**, *NEAR: A Generative Framework for Imitation Learning from Observation*, Master Thesis.
- 2024 **Chen Qian**, *Pianomime: Learning a generalist piano playing agent from Internet demonstrations*, Master Thesis.
- 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

- 2024 Cheng Qian, **Julen Urain**, Kevin Zakka, and Jan Peters. Pianomime: Learning a generalist, dexterous piano player from internet demonstrations. *Conference on Robot Learning (CoRL)*, 2024.

- 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.

#### Preprints and Technical reports

- 2024 **Julen Urain**, Ajay Mandlekar, Yilun Du, Mahi Shafiullah, Danfei Xu, Katerina Fragkiadaki, Georgia Chalvatzaki, and Jan Peters. Deep generative models in robotics: A survey on learning from multimodal demonstrations. <https://arxiv.org/abs/2408.04380>, 2024.
- 2024 Niklas Funk, **Julen Urain**, Joao Carvalho, Vignesh Prasad, Georgia Chalvatzaki, and Jan Peters. Actionflow: Equivariant, accurate, and efficient policies with spatially symmetric flow matching. <https://arxiv.org/abs/2409.04576>, 2024.

## 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 Statistics 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](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**

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