

# Matteo Bettini

Researcher in multi-agent learning

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📄 Matteo Bettini  
ID 0000-0001-8679-0151

Interested and experienced in reinforcement learning, multi-robot systems, and graph neural networks

## Experience

### Work

- Jun–Oct 2023 **Meta, PyTorch, Machine Learning Engineer Intern (PhD)**, London, UK  
Worked in the TorchRL team on PyTorch and facebook-research open-source projects, leading to 2 publications [2, 3]  
○ Integrated multi-agent in the PyTorch reinforcement learning library **TorchRL (2.5k+ stars)**, becoming **2<sup>nd</sup> contributor**  
○ Developed and maintained **BenchMARL (345+ stars)**, a facebook-research multi-agent reinforcement learning library
- Jun–Sep 2021 **Amazon Web Services (AWS), Software Development Engineer Intern**, Cambridge, UK  
Worked in the EC2 team using Rust to implement an interactive serial console for Xen-based EC2 instances  
○ Learned and used the Rust language with cryptographic and asynchronous programming libraries  
○ Implemented an encrypted CoAP client-server and tested on docker rapid development environment

### Teaching

- 2021–2025 **University of Cambridge, Guest lecturer, Teaching Assistant, and Supervisor**, Cambridge, UK  
○ **Guest lecturer** for the “Computing for Collective Intelligence” course [📄](#), delivering a 1h lecture to master students [▶](#)  
○ **Teaching assistant**, demonstrator, and robot manager for “Introduction to Robotics” bachelor and master course [📄](#)  
○ **Thesis supervisor** for MPhil students, guiding them in conducting research and producing a master dissertation  
○ **Supervisor** and material curator for undergraduate courses, tutoring 19 students in small-sized groups

### Outreach

- 2024–present **The Alan Turing Institute, Organizer**, London, UK  
○ Organized the UK Multi-Agent Systems Symposium, a day event in King's College (**200 attendees, 10k budget**) [📄](#)  
○ Managing the multi-agent systems interest group and mailing list with **650+ participants** [📄](#)
- 2024–25 **Lead The Future, Mentor**  
Mentored 5 high-achieving STEM Italian students and professionals in a non-profit organization focused on *Give Back* [📄](#)
- 2023, 2024 **Computer Science Open Day, Volunteer**, University of Cambridge, UK  
Demonstrated multi-robot reinforcement learning to **100+ kids** of all ages via live and interactive experiments [📄](#)
- 2023 **ICRA Workshop on Multi-Robot Learning** [📄](#), *Contributions Committee*, London, UK

## Education

- Oct 2021 **PhD in Computer Science, University of Cambridge**, UK  
–Mar 2025 Thesis: Neural diversity in multi-agent systems, Supervisor: Prof. Amanda Prorok  
○ Published **8 research papers [1–8]** at top conferences (e.g., ICML, ICLR, AAMAS) and journals (JMLR)  
○ Focus on studying [4], measuring [10], and controlling [1] behavioral diversity in multi-agent reinforcement learning  
○ Created and maintained **VMAS [5] (390+ stars)**, a vectorized simulator and task collection written in PyTorch  
○ Deployed and demonstrated research on a fleet of Cambridge Robomaster autonomous mobile ground robots [8] [📄](#)
- 2020–2021 **MPhil in Advanced Computer Science, University of Cambridge**, UK  
*Distinction*, GPA: 87.09/100, Supervisor: Prof. Amanda Prorok  
Thesis on transport network design for multi-agent routing using genetic algorithms and reinforcement learning [📄](#)
- 2017–2020 **BEng in Computer Engineering, Politecnico di Milano**, Italy  
*110 Cum Laude/110 (Honors)*, GPA: 29.16/30  
Project on software engineering: reinvented board game “Santorini” in Java with online multiplayer and 3D graphics [📄](#)

## Awards and recognition

- 2024 Hughes Hall College (University of Cambridge) travel award - 500£
- 2021 Graduated with Distinction from the University of Cambridge
- 2017–2020 Achieved 30 Cum Laude/30 (Honors) for 13 of 25 exams at Politecnico di Milano and graduated Cum Laude
- 2017–2020 Merit-based scholarship at Politecnico di Milano - 50% tuition reduction
- 2017 Best Freshmen of Politecnico di Milano Award - 1500€

## Skills

**Programming** Python, Java, Rust, C, JavaScript, VHDL

**Systems** Linux, MacOS, ROS, SLURM, HPC, Docker

## Selected projects

- **BenchMARL**: created the facebook-research BenchMARL library (**345+ stars, 9k+ downloads**) to uniform benchmarking in multi-agent reinforcement learning, published at JMLR, presented at NeurIPS [2] [↗](#)
- **Controlling behavioral diversity**: introduced the **first method able to control behavioral diversity in multi-agent learning**, showing the emergence of unprecedented and more efficient diverse strategies [1] [↗](#)
- **TorchRL**: second contributor of the PyTorch reinforcement learning library (**2.5k+ stars, 468k+ downloads**), spanning multiple domains of data-driven decision-making (model-based/free, LLM RLHF, POMDPs) [3] [↗](#)
- **Heterogeneous robot learning**: studied the role of heterogeneity in multi-robot reinforcement learning through simulations and real-world experiments, showing the **intrinsic resilience of diverse robots** [4] [↗](#)
- **Vectorized multi-agent simulator (VMAS)**: implemented and maintained VMAS (**390+ stars, 40k+ downloads**), a batched PyTorch multi-agent simulator and task collection for collective learning [5] [↗](#)
- **Multi-robot navigation**: deployed and demonstrated collective learning in a **zero-shot sim-to-real** setting on a fleet of custom Cambridge Robomaster holonomic ground robots equipped with NVIDIA Jetsons [8] [↗](#)

## Selected publications

- [1] **Matteo Bettini**, Ryan Kortvelesy, and Amanda Prorok. Controlling Behavioral Diversity in Multi-Agent Reinforcement Learning [↗](#). In *International Conference on Machine Learning (ICML)*, 2024.
- [2] **Matteo Bettini**, Amanda Prorok, and Vincent Moens. BenchMARL: Benchmarking Multi-Agent Reinforcement Learning [↗](#). *Journal of Machine Learning Research (JMLR)*, 25, 2024.
- [3] Albert Bou, **Matteo Bettini**, Sebastian Dittert, Vikash Kumar, Shagun Sodhani, Xiaomeng Yang, Gianni De Fabritiis, and Vincent Moens. TorchRL: A data-driven decision-making library for PyTorch [↗](#). In *International Conference on Learning Representations (ICLR)* - **Spotlight (top 5%)**, 2024.
- [4] **Matteo Bettini**, Ajay Shankar, and Amanda Prorok. Heterogeneous Multi-Robot Reinforcement Learning [↗](#). In *Autonomous Agents and Multiagent Systems (AAMAS)*, 2023.
- [5] **Matteo Bettini**, Ryan Kortvelesy, Jan Blumenkamp, and Amanda Prorok. VMAS: A Vectorized Multi-Agent Simulator for Collective Robot Learning [↗](#). In *Distributed Autonomous Robotic Systems (DARS)*, 2022.
- [6] Amanda Prorok and **Matteo Bettini**. Heterogeneous Teams [↗](#). *Encyclopedia of Robotics*, 2024.
- [7] Steven Morad, Ryan Kortvelesy, **Matteo Bettini**, Stephan Liwicki, and Amanda Prorok. POPGym: Benchmarking Partially Observable Reinforcement Learning [↗](#). In *International Conference on Learning Representations (ICLR)*, 2023.
- [8] Jan Blumenkamp, Ajay Shankar, **Matteo Bettini**, Joshua Bird, and Amanda Prorok. The Cambridge RoboMaster: An Agile Multi-Robot Research Platform [↗](#). In *Distributed Autonomous Robotic Systems (DARS)*, 2024.
- [9] **Matteo Bettini**, Ryan Kortvelesy, and Amanda Prorok. The impact of behavioral diversity in multi-agent reinforcement learning [↗](#). *arXiv preprint arXiv:2412.16244*, 2024.
- [10] **Matteo Bettini**, Ajay Shankar, and Amanda Prorok. System Neural Diversity: Measuring Behavioral Heterogeneity in Multi-Agent Learning [↗](#). *arXiv preprint arXiv:2305.02128*, 2023.

## Invited talks

### Controlling Behavioral Diversity in Multi-Agent Reinforcement Learning, [▶](#)

- 2025 ○ Laboratory for Artificial Intelligence and Learning Algorithms [↗](#) - *Università degli Studi di Milano*
- 2024 ○ Seminar on Combinatorics, Games and Optimisation [↗](#) - *London School of Economics and Political Science*
- 2024 ○ Artificial Intelligence Research Group Talks (Computer Laboratory) [↗](#) - *University of Cambridge*

### BenchMARL: Benchmarking Multi-Agent Reinforcement Learning, [▶](#)

- 2024 ○ Distributed and Collaborative Intelligent Systems and Technology (DCIST) Collaborative Research Alliance (CRA)
- 2023 ○ InstaDeep knowledge sharing session [↗](#) - *InstaDeep*

### Multi-Agent Simulation and Learning in TorchRL, [▶](#)

- 2023 ○ Artificial Intelligence Research Group Talks (Computer Laboratory) [↗](#) - *University of Cambridge*
- 2023 ○ Multi-agent Reinforcement Learning Reading Group [↗](#) - *University of Maryland, College Park*

### Heterogeneous Multi-Robot Reinforcement Learning, [▶](#)

- 2022 ○ Distributed and Collaborative Intelligent Systems and Technology (DCIST) Collaborative Research Alliance (CRA)