

Matteo Bettini

Researcher in multi-agent learning

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

Education

- 2021–Mar **PhD in Computer Science**, *University of Cambridge*, UK
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 [9], and controlling [1] behavioral diversity in multi-agent reinforcement learning
○ Created and maintained [VMAS](#) [5] (320+ 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 ↗

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](#) (2.2k+ stars), becoming 2nd contributor
○ Developed and maintained [BenchMARL](#) (250+ 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–present **University of Cambridge, Teaching Assistant and Supervisor**, Cambridge, UK
○ *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 one-day event in King’s College London with 200 attendees ↗
○ 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

Awards and recognition

- 2024 Hughes Hall College (University of Cambridge) travel grant - 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
AI Libraries PyTorch, scikit-learn, NumPy, SciPy, TorchRL, TorchGeometric, TensorFlow, Pandas, matplotlib

Selected projects

- **BenchMARL**: created the facebook-research BenchMARL library (250+ stars, 5k+ downloads) to standardize benchmarking in multi-agent reinforcement learning, published at JMLR and 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 (2.2k+ stars, 340k+ downloads), spanning multiple domains of data-driven decision-making (model-based/free, LLM RLHF, POMDPs) [3] [↗](#)
- **Heterogeneous robot learning**: crystallized the role of heterogeneity in multi-robot reinforcement learning through simulations and real-world experiments, demonstrating the intrinsic resilience of diverse robots [4] [↗](#)
- **Vectorized multi-agent simulator (VMAS)**: implemented and maintained VMAS (320+ stars, 31k+ 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**, 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, [▶](#)

- 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)

Courses taught

- 2021-22, **Introduction to Robotics** [↗](#), *MPhil, Part III, Part II in Computer Science*, University of Cambridge
- 2022-23 Teaching assistant, grader, demonstrator, mini-project supervisor, and robot fleet manager
- 2021-22, **Concepts in Programming Languages** [↗](#), *Part IB in Computer Science*, University of Cambridge
- 2022-23 Creation & grading of personalized supervision sessions for 19 undergraduate students in groups of 2