# Lorenzo Mazza

PhD Candidate • Computer Science, TU Dresden
Dresden, Germany

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PhD candidate and machine learning engineer focused on robot learning, predictive modeling, and generative models: I have published at top ML and robotics conferences (NeurIPS, RSS, IROS), developed open-source software for policy learning, robot control, and multimodal data acquisition, and have professional Python/C++ software engineering experience. My domain expertise spans physical AI, surgical robotics, and predictive modeling in quantitative finance.

## Selected Publications and Preprints

**Understanding Multimodality in Generative Behavioral Cloning**
Main author • NeurIPS 2026 arXiv:2605.22493
Theoretical and empirical investigation of action multimodality in generative robot policies, providing information-theoretic and Lipschitz bounds for mode preservation.

**ANCHOR: Safe Diffusion Planning via Analytic Approximation of Doob's $h$-function**
Co-main author • Under review
Training-free safety guidance for pretrained diffusion planners under test-time constraints, evaluated on navigation, locomotion, and manipulation.

**Supervised Mixture of Experts for Surgical Grasping and Retraction**
Co-main author • Robotics: Science and Systems 2026 arXiv:2601.21971
Supervised Mixture-of-Experts for efficient, lightweight surgical BC policies.

**An Open-Source Robotics Research Platform for Autonomous Laparoscopic Surgery**
Co-main author • IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2026 arXiv:2603.08490
Open-source surgical robotics platform with real-time control, remote-center-of-motion solver, and full-stack ROS infrastructure.

## Research and Technical Expertise

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| **Robot Learning** | Imitation learning (BC, GAIL, IRL), generative policy learning, online/offline reinforcement learning (PPO, SAC, CQL, IQL, Flow-QL), reward and preference learning (DPO, Bradley-Terry), trajectory planning, multimodality, test-time safety, covariate shift, sim-to-real transfer. |
| **Edge Deployment** | BF16, FP8, quantization-aware training, post-training quantization (SmoothQuant, GPTQ), structured/unstructured pruning, edge hardware. |
| **Deep Learning** | Transformers, multimodal vision/language models, VAEs, GANs, diffusion, flow matching, Mixture-of-Experts, VLMs/VLAs, Grad-CAM, SHAPLEY. |
| **Domain** | Physical AI, surgical robotics, manipulation, real-time control, sensor and data recording, predictive modeling, cross-sectional asset predictions, time-series analysis. |
| **Stack** | Python, C/C++, Agentic AI, ROS, IsaacSim, IsaacLab, PyTorch, scikit-learn, HuggingFace, TorchAO, Executorch, OpenCV, Hydra, Pydantic, Polars, multi-GPU training, Asyncio, Slurm, Docker, Kubernetes, GCP. |

## Education

**PhD Candidate** Sep 2024 – Present
Computer Science, TU Dresden • NCT • Dresden, Germany
Expected completion: Summer 2027. "Towards safe, expressive, and efficient robot learning." Translational Surgical Oncology group, led by Prof. Stefanie Speidel.

**Master of Science in Machine Learning** Fall 2020 – Spring 2024
KTH Royal Institute of Technology, Sweden

**Bachelor of Science in Engineering of Computing Systems** Fall 2017 – Spring 2020
Politecnico di Milano, Italy

## Selected Portfolio Projects

**VersatIL: Imitation Learning for Any Robot Policy**
Author GitHub

Open-source PyTorch library for modular imitation learning (BC). Composable input modalities, policy architectures, dataset inputs, processing and inference, and comprehensive testing/CI/CD infrastructure.

**TSO-Sensorium**
Main author • GenAI4Health workshop, NeurIPS 2026 GitHub

Open-source Python/ROS framework with a browser-based UI for recording, monitoring, synchronizing, annotating, and processing multimodal sensor data into episodic robot-learning datasets.

**Edge Device Inference for Surgical Robot Learning**
Demonstrator gAIn project

Ongoing development of a physical demonstrator for gAIn – Next Generation AI Computing, executing surgical VLA policies on resource-constrained edge hardware for privacy-sensitive operating-room deployment. Target hardware: Raspberry Pi 5, Axelera METIS AIPU, CUDA.

**NVIDIA Open-H Embodiment Dataset**
Contributor GitHub • arXiv:2604.21017

Contributed to developing the data collection pipeline and acquiring 200 in vivo surgical trajectories for an open community-driven healthcare robotics dataset.

## Selected Professional Experience

**Teaching Assistant and Thesis Supervisor** Sep 2024 – Present
TU Dresden • Dresden, Germany

Supervision of 5 MSc theses and 2 team projects at the Computer Science faculty: online reinforcement learning for surgical soft body deformation (IsaacSim, IsaacLab), 3D perception in BC, FAST tokenization, Gaussian versus autoregressive action factorization, stochastic interpolants and action-action flow matching, post-training quantization, Bradley-Terry reward modeling.

**Machine Learning Engineer Intern** Jul 2023 – Aug 2024
Ultramarin GmbH • Berlin, Germany

Full-time member of the Machine Learning Research and Development team.

- Deployment of neural-network ensemble models for cross-sectional stock returns, with focus on explainability (SHAPLEY, feature attribution).
- Development of infrastructure for concurrent local CPU-bound experiments interfacing with I/O-bound tasks running in remote Docker containers using Asyncio.
- Development of a multiprocessing portfolio-computation package optimizing memory footprint and runtime.

## Training and Interests

**Schools.** Reinforcement Learning Summer School 2026, Politecnico di Milano (offline/online RL, bandits, robotics). Hamlyn Winter School 2024, Imperial College London (surgical deep learning and robotics). ScaDS.AI Summer School on AI and Big Data 2023, Leipzig (deep learning, LLMs).

**Music.** Electronic music composer and producer under the artist name “Lo.Flaco”. Released tracks under several European music labels.

**Sports.** Hiking, tennis, football, Brazilian jiu-jitsu.

## Language skills

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| Italian | ● ● ● ● ● | Spanish | ● ● ● ○ ○ |
| English | ● ● ● ● ● | German | ● ● ○ ○ ○ |