

Roman Knyazhitskiy

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Summary

Master's student with 2 years of work experience in robotics and AI. Designed control systems for robots with complex physical interactions, utilizing both model-based (MPC) and data-driven (RL) control techniques. Experienced in custom physics simulators in JAX, contributed to various OSS libraries, and conducted some machine learning research. Familiar with ROS.

Education

MPhil in MLMI (Machine Learning), University of Cambridge 10/2025 - 09/2026
BSc Computer Science and Engineering, TU Delft 09/2022 - 07/2025

- GPA: 8.7/10. Distinction (Cum Laude, top 5%) + Honours.

Work Experience

Machine Learning Engineer, Delft Mercurians 05/2023 - 09/2025

- Started as an individual contributor, then grew my own team to 5 people. Then abandoned the team to become an individual contributor in Software department.
- Designed a Model Predictive Control (MPC) system from ground up, vastly improving control performance compared to bang-bang.
- Co-authored a continuous-time differentiable physics simulator in JAX for training control policies via reinforcement learning.
- Worked on integration Python-based ML models with multithreaded Rust codebase.

Research Associate, TU Delft 03/2023 - 08/2025

- Researched applications of transformer-based models (Prior-Data Fitted Networks) for meta-learning.
- Investigated LLM applications in software engineering and contributed to research on diffusion models.

Applied Machine Learning Intern, Central Robotics Institute 06/2021 - 07/2021

- Developed computer vision algorithms for a robotic drawing application, including image segmentation and path optimization.

Publications

- [1] J. Luijmes, A. Gielisse, R. Knyazhitskiy, and J. van Gemert. ARC: Anchored representation clouds for high-resolution INR classification. In *ICLR 2025 Workshop on Weight Space Learning*, 2025. Accepted.
- [2] R. Knyazhitskiy and P. R. Van der Vaart. A simple scaling model for bootstrapped DQN. 2025. Under review.

Selected Projects

Bootstrapped DQN Scaling Laws, JAX, Deep RL Research, HPC 2025

- Conducted a large-scale deep reinforcement learning study (>40,000 experiments), discovering a novel scaling law for bootstrapped exploration methods.

Stack-Associated Beam Tracing, C++20, 3D Graphics, Computational Geometry 2022

- Implemented a 3D rendering engine in C++20 based on sparse voxel octree traversal for efficient beam queries.

Lyapunov-Stabilized Continuous Control, JAX, Deep RL, Robotics Simulation 2024

- Developed an RL framework for continuous control (locomotion) using truncated backpropagation stabilized by Lyapunov factors, enabling stable gradient flow in long-horizon tasks within the Brax physics engine.

Speculative decoding and multi-token prediction, JAX, Equinox, Deep Learning 2023

- Implemented a GPT-style autoregressive transformer from scratch in JAX/Equinox, architected for distributed training and featuring speculative decoding and multi-token prediction.

Honours and Awards

- **Best Software Solution**, RoboCup World Championships, Sydney (2019).
- **1st Place**, RoboCup Junior National Competitions (2017, 2018, 2019).
- **2nd Place & Special Prize**, Epoch AI Hackathon (2024).
- **1st Place**, Bunq Hackathon 6 (2025).
- **Silver Medal**, AIJIC International AI Competition for Juniors – Sign language recognition application.

Open Source Contributions

- Improved **libccd** (**collision detection library in C++**) by fixing a critical infinite loop bug.
- Enhanced functionalities in the JAX ecosystem libraries **jaxtyping** and **Equinox**.
- Contributed to **Gymnax**, a widely used collection of JAX-based RL environments.