Roman Knyazhitskiy

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Summary

Master's student specializing in Robot Learning and Generative AI, with a proven track record in developing novel reinforcement learning algorithms and control systems for robotics. Led ML projects, from research and prototyping in JAX to building complete software systems in Python and C++. Eager to pursue research leading to publications in top-tier robotics conferences.

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 RoboCup Team 05/2023 - 09/2025

- Started out as an individual contributor, grew a team to 5 engineers in developing AI control systems for autonomous soccer robots.
- Designed and implemented a JAX-based differentiable physics simulator for training control models.
- Developed a Model Predictive Control (MPC) system for real-time trajectory optimization.
- Integrated Python-based ML models with a performance-critical Rust codebase.

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

- Researched applications of Large Language Models (LLMs) in software engineering and investigated Prior-Data Fitted Networks (PFNs) for meta-learning.
- Participated in research discussions and delivered talks on diffusion models and advanced optimizers.

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

- Developed a computer vision tool that converts images to line art for a robotic drawing application.

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.

Research & Robotics Projects

Bootstrapped DQN Scaling Laws, JAX, Deep Reinforcement Learning 2025

- Conducted a large-scale empirical study discovering a unified scaling law for ensemble-based exploration in RL, using a high-performance, multi-GPU JAX framework for the research.

Lyapunov-Stabilized Truncated Backpropagation, Python, JAX, Deep Reinforcement Learning 2024

- Implemented a novel RL framework using Lyapunov stability factors to stabilize training in long-horizon continuous control and locomotion tasks (Brax).

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

- Developed a 3D rendering engine in C++ from scratch, implementing sparse voxel octree traversal and GJK collision detection for efficient scene queries, foundational for robotics simulation.

IEFT-PFN for Hyperparameter Optimization, JAX, Equinox, Transformers, AutoML 2025

- Built a Prior-Data Fitted Network (PFN) using a causal transformer for hyperparameter optimization, demonstrating expertise in meta-learning and transformer architectures.

RoboCup Junior OnStage Performance, Robotics, C++, Computer Vision 2019

- Designed and built autonomous wheeled robots for a theatrical performance, developing the vision and control software stack. Awarded Best Software Solution at the World Championships.

Honours and Awards

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

Open Source Contributions

- Contributed to the JAX ecosystem (Equinox, jaxtyping), RL environments (Gymnax), and a C++ collision detection library (libccd), fixing critical bugs and adding new features.