Roman Knyazhitskiy

cv@knyaz.tech — knyaz.tech — knyazer

Summary

Machine learning engineer with a strong background in robotics, deep reinforcement learning, and large language models. Extensive hands-on experience implementing and training autoregressive transformer architectures from scratch in JAX. Proven ability in building AI control systems for robotic platforms, conducting large-scale training experiments, and contributing to performance-critical C++ codebases.

Education

MPhil in MLMI (Machine Learning), University of Cambridge 10/2025 - 07/2026

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

- Led the development of AI control systems for a competitive robotics team (RoboCup).
- Designed and built a continuous-time differentiable physics simulator in JAX for training control policies.
- Integrated Python-based ML models with the main Rust codebase for real-time operation.
- Developed and implemented a Model Predictive Control (MPC) system for real-time trajectory optimization.

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

- Researched applications of transformer-based models (Prior-Data Fitted Networks) for meta-learning.
- Investigated the use of Large Language Models for software engineering tasks like code generation.

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.

Selected Projects

Nano JAX GPT: Scalable Transformer Implementation, JAX, Equinox, Deep Learning 2023

- Implemented a GPT-style autoregressive transformer model from scratch in JAX/Equinox, featuring multi-head causal self-attention.
- Architected for distributed training across multiple accelerators with mixed-precision (bfloat16).
- Researched and implemented inference optimizations including speculative decoding and multi-token prediction.

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

- Conducted a large-scale reinforcement learning study (¿40,000 experiments) finding a novel scaling law for ensemble-based exploration methods.
- Designed and implemented a high-performance JAX pipeline for multi-GPU distributed training and automated statistical analysis.

Stack-Associated Beam Tracing, C++20, Graphics Rendering 2022

- Implemented a 3D rendering engine in C++20 based on sparse voxel octree traversal for efficient ray queries.
- Developed a custom linear algebra library, geometric algorithms for collision detection (GJK), and an interactive rendering pipeline.

Silver-qt: Sign Language Recognition System, Python, Computer Vision, ONNX 2019

- Developed a real-time vision system using a deep learning pipeline (YOLOv5, Autoencoder, LSTM).
- Built a cross-platform GUI and used ONNX Runtime for optimized multi-threaded inference.

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.

Honours and Awards

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

Open Source Contributions

- Enhanced functionalities in jaxtyping and Equinox, resolving multiple issues and enabling IPython runtime type checking.
- Contributed to Gymnax, a widely used JAX RL environments collection.
- Improved **libccd (collision detection library in C++)** fixing a critical corner-case causing an infinite loop.