

Roman Knyazhitskiy

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Summary

Master's student with a strong focus on Generative AI, specializing in transformer-based models and implicit neural representations. Extensive hands-on experience in JAX and PyTorch, demonstrated by building a GPT language model and an INR-based image compressor from scratch. Experienced in designing and running large-scale ML experiments, researching diffusion models, and prototyping end-to-end applications.

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.

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.

Work Experience

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

- Started out as an individual contributor, grew the team to 5 people over two years.
- Built a JAX-based continuous-time differentiable simulator for training control models.
- Designed and implemented a Model Predictive Control (MPC) system for real-time optimization.

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

- Researched applications of generative models, including LLMs for code generation and transformer-based Prior-Data Fitted Networks (PFNs) for meta-learning.
- Participated in academic discussions on diffusion models and advanced optimization methods.

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

- Developed computer vision algorithms for a robotic drawing application, converting images to line art.

Selected Projects

Nano JAX GPT, JAX, Equinox, Deep Learning 2023

- Implemented a high-performance GPT language model from scratch in JAX and Equinox, architected for distributed training with mixed precision and memory-efficient gradient accumulation.
- Explored speculative decoding, multi-token prediction, and structured embedding sparsity for optimized inference.

Nano JAX Implicit Neural Representations, Python, JAX, Equinox, Computer Vision 2024

- Developed an INR framework for image compression, learning continuous neural functions that map 2D coordinates to pixel values.
- Implemented adaptive latent point sampling based on image gradients and a multi-stage training pipeline with JIT compilation and multi-GPU sharding for efficiency.

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

- Built a Prior-Data Fitted Network (PFN) using a causal transformer to predict ML training curves, accelerating hyperparameter optimization through in-context learning.
- Designed a probabilistic histogram decoder for uncertainty-aware predictions and a multi-stage curriculum for training on synthetic and real benchmark data.

Weather Forecasting with Normalizing Flows, Python, JAX/Equinox, Generative Models 2025

- Developed an end-to-end system for probabilistic weather forecasting using Continuous Normalizing Flow (CNF) models in JAX, a type of generative model, for uncertainty-calibrated predictions.

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

- Developed an end-to-end prototype for real-time sign language recognition using a multi-stage vision pipeline (YOLOv5, Autoencoder, LSTM) and built a cross-platform GUI with PyQt.

Open Source Contributions

- Enhanced functionalities in the JAX ecosystem, contributing to [jaxtyping](#), [Equinox](#), and [Gymnax](#).
- Improved libccd (C++ collision detection library) by fixing a critical infinite loop bug.

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).
- **Silver Medal**, AIJC International AI Competition for Juniors for Sign Language recognition app.