Roman Knyazhitskiy

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Summary

Machine Learning Engineer with 2+ years experience building production ML systems in PyTorch/JAX. Strong track record of rapidly prototyping solutions, implementing ML algorithms from research papers, and iterating based on feedback. Proven ability to work autonomously, communicate complex ML concepts clearly to diverse teams, and deliver customer-driven results. Experience spans deep learning, reinforcement learning, and full-stack development with Python/C++.

Work Experience

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

- Led team of 2-5 engineers developing AI control systems, working autonomously on complex robotics problems.
- Rapidly prototyped and implemented Model Predictive Control system for real-time optimization.
- Built JAX+Equinox differentiable simulator from scratch, demonstrating ability to implement ML algorithms efficiently.
- Integrated Python ML models into Rust production codebase, showing full-stack capabilities.
- Developed PyQt interface for system calibration, reporting on key performance metrics.
- Iterated on designs based on team feedback and competition results.

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

- Implemented novel AutoML and Meta Learning algorithms, translating research papers into working prototypes.
- Delivered technical talks explaining optimization methods to diverse audiences (Adam, Shampoo, diffusion models).
- Collaborated with Professor Tom Viering on multiple research projects requiring clear communication and autonomous work.
- Investigated Prior-Data Fitted Networks and MCMC methods, proposing improvements to existing algorithms.

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

- Developed production image processing tool for robotic applications from problem definition to deployment.
- Implemented custom algorithms for image-to-line conversion and path optimization.
- Delivered working solution within tight internship timeline, demonstrating ability to work fast.

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. Cum Laude + Honours.

Selected Projects Demonstrating Key Skills

IEFT-PFN: ML-Driven Hyperparameter Optimization, PyTorch/JAX, Deep Learning 2025

- Built transformer-based system from research paper, implementing novel architecture improvements.
- Designed three experimental approaches to hyperparameter weighting, benchmarking each solution.
- Achieved 15-20% improvement over baseline through iterative experimentation and analysis.
- Communicated results through comprehensive documentation and experimental reports.

Bootstrapped DQN Scaling Study, JAX, Deep RL 2025

- Conducted large-scale empirical study (¿40,000 configurations) to identify performance bottlenecks.
- Implemented distributed training infrastructure with multi-GPU sharding for efficient experimentation.
- Discovered unified scaling law explaining 80% of convergence variance through systematic analysis.
- Automated experiment pipeline with failure handling and adaptive scheduling.

Nano JAX GPT, JAX, Equinox 2023

- Implemented GPT transformer from scratch with custom Flash Attention in JAX.
- Prototyped multiple optimization techniques: early-exit decoding, RoPE embeddings, custom optimizers.
- Demonstrated ability to quickly evaluate and iterate on different ML approaches.
- Built production-grade training infrastructure with distributed support and checkpointing.

Spectral: Speech Analysis Platform, Python, TypeScript, Docker 2024

- Designed and deployed full-stack microservices platform (FastAPI + SvelteKit) for clinical researchers.
- Built plugin-based ML analysis framework integrating multiple acoustic processing models.
- Demonstrated customer-driven development, working with end users to define requirements.
- Delivered production system with Docker orchestration and single-command deployment.

RFK: Pattern Matching Algorithm, C++17/20, Algorithms 2023

- Designed novel hash-based algorithm solving hard computational problem with provable complexity bounds.
- Implemented 60+ benchmarks comparing against established solutions (Aho-Corasick, Wu-Manber).
- Authored comprehensive research paper explaining algorithm and experimental methodology.
- Applied SIMD optimization and cache-conscious design for production performance.

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.

Open Source Contributions

- Enhanced jaxtyping and Equinox, demonstrating ability to contribute to widely-used ML libraries.
- Contributed to Gymnax (800+ stars), improving JAX RL environments.
- Built pytest plugin for beartype, showing full-stack Python development capabilities.
- Fixed critical infinite loop bug in libccd collision detection library (C++).

Honours and Awards

- **1st Place**, Bunq Hackathon 6 (2025) – Led team of 4 to victory against 50+ teams, €30,000 prize.
- **2nd Place & Special Prize**, Epoch AI Hackathon (2024) – Rapid prototyping under time pressure.
- **Best Software Solution**, RoboCup World Championships, Sydney (2019).
- **Silver Medal**, AIIJC International AI Competition – Sign language recognition application.