Egor Petrov

Machine Learning Researcher

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Education

Moscow Institute of Physics and Technology (MIPT) *Moscow, 2022 – 2026 (Expected)*
B.S. in Applied Mathematics and Informatics | Current GPA: 8.0/10.0

Data Science Track (MIPT & Yandex School of Data Analysis) *Moscow, 2024 – 2026*
Specialized curriculum in ML, DL, RL, CV, NLP, RecSys, and Time Series Analysis.

Research & Engineering Experience

Yandex Research *Jul 2025 – Present*
ML Researcher, ML Research Residency, Moscow

- Spearheading research on asynchronous pipeline parallelism for efficient large-scale model training.
- Designing and analyzing novel algorithms for highly distributed systems to enhance scalability and performance.

Laboratory of Mathematical Methods for Optimization, MIPT *Feb 2024 – Present*
ML Researcher, Moscow

- Pioneered memory-efficient zeroth-order optimization methods for fine-tuning LLMs, achieving a **50% reduction in memory footprint**.
- Developed and theoretically analyzed novel stochastic and zeroth-order algorithms for decentralized optimization, validated on variety of domains.

Yandex *Aug 2024 – Jan 2025*
ML Engineer, Personalization Quality R&D Group, Moscow

- Engineered a production pipeline integrating Vowpal Wabbit-based online features into a large-scale CatBoost model, achieving a **0.1% uplift in core ranking metrics** (AUC, nDCG).
- Implemented a parallelized, MapReduce-style data converter that **accelerated data processing by 20x** and reduced model training time from hours to minutes.

Publications

- **Leveraging Coordinate Momentum in SignSGD and Muon: Memory-Optimized Zero-Order LLM Fine-Tuning**
  E. Petrov, *G. Evseev, A. Antonov, A. Veprikov, P. Plyusnin, N. Bushkov, et al.*
  ICML Workshop on Tiny Titans, 2025. [Paper]
- **Sign-SGD is the Golden Gate between Multi-Node to Single-Node Learning...**
  D. Medyakov, S. Stanko, G. Molodtsov, P. Zmushko, G. Evseev, ***E. Petrov****, et al.*
  Submitted to *ICLR* 2026 [Paper]
- **When Extragradient Meets PAGE: Bridging Two Giants to Boost Variational Inequalities**
  G. Molodtsov, V. Parfenov, ***E. Petrov****, E. Grigoriy, D. Medyakov, A. Beznosikov.*
  Conference on Uncertainty in Artificial Intelligence (UAI), 2025. [Paper]
- **Shuffling Heuristic in Variational Inequalities: Establishing New Convergence Guarantees**
  D. Medyakov, G. Molodtsov, E. Grigoriy, ***E. Petrov****, A. Beznosikov.*
  ICOMP 2024. Submited to Q1 Journal JOTA. Awarded ***1st place*** *at Neuroinformatics 2024.* [Paper]
- **Zero Order Algorithm for Decentralized Optimization Problems**
  A. Veprikov, ***E. Petrov****, G. Evseev, A. Beznosikov.*
  AI Journey 2024. Published in Doklady Mathematics. [Paper]
- **Sampling of Semi-Orthogonal Matrices for the Muon Algorithm**
  E. D. Petrov*, G. V. Evseev, A. V. Antonov, A. S. Veprikov, N. A. Bushkov, S. V. Moiseev, A. N. Beznosikov.*
  Submitted to Q2 Journal *Doklady Mathematics*.
- **Full Transformer Analysis: Loss Landscape via Hessian-based approach**
  Egor Petrov*, Nikita Kiselev, Vladislav Meshkov, Artem Nikitin, Andrey Grabovoy.*
  Submitted to *ICLR* 2026.

Projects & Leadership

- **Lead Developer, ZO-Library** *[GitHub & Publication Forthcoming]*
  Engineered a comprehensive open-source library for zeroth-order (ZO) optimization, implementing a wide range of state-of-the-art algorithms. Designed with a user-friendly, `torch.optim`-style API for seamless integration into existing ML pipelines.

- **Teaching Assistant & Mentor** *[2024 – Present]*
  Mentored undergraduate students in Algorithms, Data Structures (MIPT), and Introduction to AI (Central University), leading project-based learning and providing technical guidance.

Technical Skills

- **Programming:** Python, C++, SQL
- **ML/DL Frameworks:** PyTorch, TensorFlow, NumPy, Pandas, Scikit-learn, Transformers
- **Tools & Infrastructure:** Git, Docker, Apache Hadoop, Kafka, Airflow, Vowpal Wabbit, CMake
- **Languages:** Russian (Native), English (Professional Working Proficiency)