

# IGOR SOKOLOV

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## SUMMARY

Applied Scientist / ML Researcher (PhD candidate, KAUST) with 6+ years of experience in **optimization for deep learning** and publications in top venues (NeurIPS/ICML/JMLR). Recent work includes **asynchronous stochastic optimization beyond Euclidean geometry**, motivated by **geometry-aware, matrix-preconditioned training methods** for large neural networks. Specialized in **efficient training at scale**: distributed/federated optimization, compression and error feedback, variance reduction, and **reproducible large-scale experimentation**. Strong **Python/PyTorch** engineering with **reproducible Slurm-based GPU experimentation** and open-source releases; eager to deliver rapid **proofs-of-concept** with applied/product teams.

## SKILLS

**OPTIMIZATION FOR DL:** Algorithm design and analysis; convergence guarantees; theory-driven method development

**EFFICIENT TRAINING:** Distributed/federated optimization; compression/quantization; local updates; error feedback; variance reduction

**ADVANCED OPTIMIZATION:** Non-Euclidean / geometry-aware optimization; asynchronous stochastic methods; matrix-preconditioned training methods

**ENGINEERING:** Python/PyTorch; Slurm GPU experimentation; sweeps/ablations; benchmarking; Git/Linux

**ML STACK:** NumPy, SciPy, Pandas, scikit-learn, Matplotlib, SQL

**LANGUAGES:** Russian (Native), English (Fluent)

## EDUCATION

AUG 2020 – DEC 2026 | **MS/PhD** in APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE, **KAUST**, Saudi Arabia  
Advisor: [PETER RICHTÁRIK](#) (expected Dec 2026)

SEPT 2014 – AUG 2021 | **BS/MS** in APPLIED MATHEMATICS AND PHYSICS, **MIPT**, Russia

## RESEARCH AND WORK EXPERIENCE

AUG 2020 – PRESENT | **Graduate Student Researcher** at [KAUST](#). Thuwal, Saudi Arabia  
Optimization and Machine Learning Lab.

- Research on **efficient training algorithms** for distributed/federated deep learning; co-authored **6 publications** in NeurIPS/ICML/JMLR and 4 preprints.
- Developed and validated **communication/computation-efficient methods** (compression, error feedback, variance reduction) with theory + reproducible GPU experiments; maintained PyTorch/Slurm pipelines and open-source code.

JUNE 2025 – SEPT 2025 | **Research Intern** at [Artificial Intelligence Research Institute \(AIRI\)](#). Moscow, Russia  
Optimization in Machine Learning Lab.

- Led a **first-author project on asynchronous stochastic optimization beyond Euclidean geometry**, motivated by **geometry-aware, matrix-preconditioned training methods** for large neural networks.
- Derived convergence and **wall-clock guarantees** for a semi-asynchronous distributed optimization method (**Rennala-NSGD**); resulted in a **manuscript under review**.

JAN 2019 – FEB 2019 | **Research Intern** at [KAUST](#). Thuwal, Saudi Arabia  
Optimization and Machine Learning Lab. Completed a theoretical project on coordinate descent that culminated in my bachelor's thesis.

AUG 2018 – OCT 2019 | **Junior Researcher** at [MIPT](#). Moscow, Russia  
Laboratory of Advanced Combinatorics and Network Applications. Conducted research on **randomized algorithms for distributed optimization**, building foundations for scalable training and large-scale experimentation.

## SELECTED PUBLICATIONS AND MANUSCRIPTS (FULL LIST ON [GOOGLE SCHOLAR](#))

Research focus: **efficient training algorithms** for modern machine learning, including **communication-efficient distributed/federated optimization**, **geometry-aware non-Euclidean methods**, and **theoretical foundations of parameter-efficient model adaptation**.

1. "Rennala-NSGD: Asynchronous Stochastic Optimization Beyond Euclidean Geometry" [I. Sokolov](#), A. Tyurin, P. Richtárik. UNDER REVIEW, 2026.
2. "Improved Convergence in Parameter-Agnostic Error Feedback through Momentum" A. Sadiev, Y. Demidovich, [I. Sokolov](#), G. Malinovsky, S. Khirirat, P. Richtárik. UNDER REVIEW, 2025. [ARXIV:2511.14501](#). [Code](#).

3. "Bernoulli-LoRA: A Theoretical Framework for Randomized Low-Rank Adaptation" I. Sokolov, A. Sadiev, Y. Demidovich, F. S. Al-Qahtani, P. Richtárik. [ARXIV:2508.03820](https://arxiv.org/abs/2508.03820), 2025.
4. "A Guide Through the Zoo of Biased SGD" Y. Demidovich, G. Malinovsky, I. Sokolov, P. Richtárik. [NEURIPS](#), 2023. [Code](#).
5. "3PC: Three Point Compressors for Communication-Efficient Distributed Training and a Better Theory for Lazy Aggregation" P. Richtárik, I. Sokolov, I. Fatkhullin, E. Gasanov, Z. Li, E. Gorbunov. [ICML](#), 2022. [Code](#).
6. "EF21 with Bells & Whistles: Practical Algorithmic Extensions of Modern Error Feedback" I. Fatkhullin, I. Sokolov, E. Gorbunov, Z. Li, P. Richtárik. [JMLR](#), 2025. [Code](#).
7. "EF21: A New, Simpler, Theoretically Better, and Practically Faster Error Feedback" P. Richtárik, I. Sokolov, I. Fatkhullin. [NEURIPS](#), 2021. [Code](#).

## SELECTED APPLIED ML PROJECTS

NOV 2022	<b>Recent Advances in Policy Gradient Methods.</b> Reinforcement Learning PhD course project, KAUST Surveyed state-of-the-art policy-gradient RL. <a href="#">Report</a> , <a href="#">Slides</a> .
NOV 2022	<b>Recent Advances in Non-convex Private Communication-Efficient Federated Optimization.</b> Private Data Analysis PhD course project, KAUST Literature review of non-convex DP federated optimization under communication constraints. <a href="#">Report</a> , <a href="#">Slides</a> .
OCT 2021 – DEC 2021	<b>Algorithmic Complexity and Practical Performance of Top-k Compression.</b> Design and Analysis of Algorithms MS course project, KAUST Proposed and led MS group project; implemented and benchmarked Top-k gradient compression in a federated pipeline (Python/PyTorch); compared convergence vs. communication across settings; released code. <a href="#">GitHub</a> , <a href="#">Report</a> , <a href="#">Slides</a> .
AUG 2020	<b>On Local Methods for Non-Convex Federated Optimization.</b> Summer school project: Modern Methods of Info. Theory, Opt. and Control, Sirius University Implemented baselines and compared local-update schemes for FL. <a href="#">GitHub</a> , <a href="#">Slides</a> .
JAN 2020	<b>Background and Foreground Estimation via Robust PCA.</b> Geometric Data Analysis Methods MS course project, MIPT Compared robust-PCA approaches for background/foreground separation. <a href="#">GitHub</a> .
JULY 2019	<b>Forecasted sales impact of marketing strategies across device lines.</b> Industrial project at Summer School on Machine Learning in Business Analytics, Samsung Research, Moscow, Russia <a href="#">Event Website</a> .

## HONORS AND AWARDS

MAY 2026	<b>Gold Reviewer Award.</b> ICML 2026
APR 2026	<b>Top 200 Reviewer Award.</b> ICLR 2026
JUNE 2025	<b>CEMSE Dean's List</b> (Top 20% of KAUST students). Thuwal, Saudi Arabia
OCT 2022	<b>Top Reviewer Award.</b> NeurIPS 2022
JULY 2022	<b>Outstanding Reviewer</b> (Top 10%), <b>Session Chair Nomination.</b> ICML 2022
AUG 2020	<b>IDEX Master's Scholarship</b> (declined). Université Grenoble Alpes, Grenoble, France
AUG 2018 – AUG 2019	<b>Increased Academic Scholarship</b> for Scientific Achievement. MIPT, Moscow, Russia

## ACADEMIC SERVICE AND TEACHING

2022 – 2026	<b>Reviewer</b> for ICML (2022–2023, 2025–2026), ICLR (2024–2026), NeurIPS (2022, 2024–2026), TMLR (2023–2025), Numerische Mathematik (2025), JMLR (2026)
FALL 2025	<b>Teaching Assistant</b> , Graduate Seminar (CS 398). KAUST Checked weekly attendance, reports, conducted Q&A. Class size: 66 students.
FALL 2022, SUMMER & FALL 2025	<b>Teaching Assistant</b> , Data Science MS program for Saudi Aramco. Remote & On-site Courses: Intro to ML, Intro to Optimization. Checked solutions, created exercises, held practical sessions. Class size: 27 students.
JUNE 2023	<b>Minisymposium Organizer</b> , SIAM Conference on Optimization (OP 23). Seattle, USA Organized and chaired a minisymposium " <a href="#">Communication-Efficient Federated Optimization</a> ".
FALL 2022	<b>Teaching Assistant</b> , Stochastic Gradient Descent Methods (CS 331). KAUST Checked biweekly homeworks, conducted Q&A. Class size: 17 students.
SUMMER 2022	<b>Co-supervisor</b> , Undergraduate Visiting Researcher. KAUST Mentored an undergraduate visiting student from the University of Washington.
2021 – 2022	<b>Seminar Co-organizer</b> , Optimization & Machine Learning Lab. KAUST Co-organized weekly lab seminars (speaker invites, scheduling, announcements, moderation).