Dmitry Kovalev

Personal Data

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Positions

2023-Now Senior Researcher
Yandex Research, Moscow, Russia

2021-2023 Research Intern
Research Center for Trusted Artificial Intelligence
Ivannikov Institute for System Programming, Moscow, Russia

2022-2023 Postdoctoral Researcher
Université catholique de Louvain, Louvain-la-Neuve, Belgium

2022 Researcher
Laboratory of Advanced Combinatorics and Network Applications
Moscow Institute of Physics and Technology, Dolgoprudny, Russia

Education

2019-2022 PhD in Computer Science
King Abdullah University of Science and Technology, Thuwal, Saudi Arabia
Advisor: Peter Richtárik
Thesis: "Optimal Algorithms for Affinely Constrained, Distributed, Decentralized, Minimax, and High-Order Optimization Problems"
Defense Committee: – External: Yurii Nesterov, Arkadi Nemirovsky
– Internal: David E. Keyes, Di Wang, Matteo Parsani

2018-2021 MS in Applied Mathematics and Physics
Moscow Institute of Physics and Technology, Dolgoprudny, Russia
Advisor: Alexander Gasnikov

2018-2019 MS in Computer Science
King Abdullah University of Science and Technology, Thuwal, Saudi Arabia
Advisor: Peter Richtárik

2014-2018 BS in Applied Mathematics and Physics
Moscow Institute of Physics and Technology, Dolgoprudny, Russia
Advisor: Alexander Gasnikov

Research Interests

Optimization, Federated and Distributed Learning
Machine Learning, Deep Learning

Skills

Programming	C/C++, Python, Algorithms and Data Structures (Codeforces master), JAX, PyTorch; Past experience: Go, C#, VB.NET, SQL, Julia, DirectX, Vulkan, HTML/CSS
Mathematics	Calculus, Linear Algebra, Probability and Statistics, Convex Analysis
Computer	macOS, LaTeX, Git
Languages	English (Advanced), Russian (Native)

Honors and Awards

1. **CEMSE Student Research Excellence Award**, King Abdullah University of Science and Technology, 2021
2. **Best Student Paper Award at FL-ICML 2021 Workshop**
3. **Ilya Segalovich Scientific Prize for Young Researchers 2021**, Yandex (highly selective: only 4 winners from Russia, Belarus, Kazakhstan)
4. **Annual PhD progress marked as Outstanding**, King Abdullah University of Science and Technology, 2019-2021
5. **Ilya Segalovich Scientific Prize for Young Researchers 2020**, Yandex (highly selective: only 9 winners from Russia, Belarus, Kazakhstan)
6. **Dean's Award**, given to top students accepted to King Abdullah University of Science and Technology, 2018
7. **Abramov's Fund Scholarship for Excellence in Study**, Moscow Institute of Physics and Technology, 2015-2017
8. **Asian Physics Olympiad (APhO) 2014, Honourable Mention**, Singapore (participated as a member of Russian national team)
9. **Russian President's Scholarship for High School Sudents**, given for prize-winning at final round of All-Russian School Olympiads, 2012-2014
10. **Moscow Governor's Scholarship for High School Sudents**, given for prize-winning at region and final rounds of All-Russian School Olympiads, 2012-2014
11. **All-Russian School Physics Olympiad, Final Round Prize-Winner**, Saint-Petersburg, 2014
12. **All-Russian School Programming Olympiad, Region Round Winner**, Moscow, 2014
13. **All-Russian School Math Olympiad, Region Round Winner**, Moscow, 2014
14. **All-Russian School Physics Olympiad, Final Round Winner**, Vladivostok, 2013
15. **All-Russian School Physics Olympiad, Final Round Prize-Winner**, Saransk, 2012

Publications

1. **Decentralized Optimization with Coupled Constraints** (Demyan Yarmoshik, Alexander Rogozin, Nikita Kiselev, Daniil Dorin, Alexander Gasnikov, Dmitry Kovalev). *International Conference on Learning Representations*, 2025.
2. **On Linear Convergence in Smooth Convex-Concave Bilinearly-Coupled Saddle-Point Optimization: Lower Bounds and Optimal Algorithms** (Ekaterina Borodich, Dmitry Kovalev). *International Conference on Machine Learning*, 2025.
3. **An Optimal Algorithm for Strongly Convex Min-Min Optimization** (Dmitry Kovalev, Alexander Gasnikov, Grigory Malinovsky). *Uncertainty in Artificial Intelligence*, 2025.
4. **Lower Bounds and Optimal Algorithms for Non-Smooth Convex Decentralized Optimization over Time-Varying Networks** (Dmitry Kovalev, Ekaterina Borodich, Alexander Gasnikov, Dmitrii Feoktistov). *Advances in Neural Information Processing Systems*, 2024.
5. **Decentralized convex optimization on time-varying networks with application to Wasserstein barycenters** (Olga Yufereva, Michael Persiianov, Pavel Dvurechensky, Alexander Gasnikov, Dmitry Kovalev). *Computational Management Science*, 2024.
6. **Decentralized saddle-point problems with different constants of strong convexity and strong concavity** (Dmitry Metelev, Alexander Rogozin, Alexander Gasnikov, Dmitry Kovalev). *Computational Management Science*, 2024.

7. **Decentralized saddle point problems via non-Euclidean mirror prox** (Alexander Rogozin, Aleksandr Beznosikov, Darina Dvinskikh, Dmitry Kovalev, Pavel Dvurechensky, Alexander Gasnikov). *Optimization Methods and Software*, 2024.
8. **Convex-Concave Interpolation and Application of PEP to the Bilinear-Coupled Saddle Point Problem** (Valery Krivchenko, Alexander Gasnikov, Dmitry Kovalev). *Russian Journal of Nonlinear Dynamics*, 2024.
9. **Non-smooth setting of stochastic decentralized convex optimization problem over time-varying graphs** (Aleksandr Lobanov, Andrew Veprikov, Georgiy Konin, Aleksandr Beznosikov, Alexander Gasnikov, Dmitry Kovalev). *Computational Management Science*, 2023.
10. **Decentralized Convex Optimization over Time-Varying Graphs** (Alexander Rogozin, Alexander Gasnikov, Aleksander Beznosikov, Dmitry Kovalev). *Encyclopedia of Optimization*, 2023.
11. **Smooth monotone stochastic variational inequalities and saddle point problems: A survey** (Aleksandr Beznosikov, Boris Polyak, Eduard Gorbunov, Dmitry Kovalev, Alexander Gasnikov). *European Mathematical Society Magazine*, 2023.
12. **Is consensus acceleration possible in decentralized optimization over slowly time-varying networks?** (Dmitry Metelev, Alexander Rogozin, Dmitry Kovalev, Alexander Gasnikov). *International Conference on Machine Learning*, 2023.
13. **Stochastic distributed learning with gradient quantization and double-variance reduction** (Samuel Horvath, Dmitry Kovalev, Konstantin Mishchenko, Peter Richtarik, Sebastian Stich). *Optimization Methods and Software*, 2023.
14. **Accelerated primal-dual gradient method for smooth and convex-concave saddle-point problems with bilinear coupling** (Dmitry Kovalev, Alexander Gasnikov, Peter Richtarik). *Advances in Neural Information Processing Systems*, 2022.
15. **Communication acceleration of local gradient methods via an accelerated primal-dual algorithm with an inexact prox** (Abdurakhmon Sadiev, Dmitry Kovalev, Peter Richtarik). *Advances in Neural Information Processing Systems*, 2022.
16. **Optimal algorithms for decentralized stochastic variational inequalities** (Dmitry Kovalev, Aleksandr Beznosikov, Abdurakhmon Sadiev, Michael Persiianov, Peter Richtarik, Alexander Gasnikov). *Advances in Neural Information Processing Systems*, 2022.
17. **Optimal gradient sliding and its application to optimal distributed optimization under similarity** (Dmitry Kovalev, Aleksandr Beznosikov, Ekaterina Borodich, Alexander Gasnikov, Gesualdo Scutari). *Advances in Neural Information Processing Systems*, 2022.
18. **The first optimal acceleration of high-order methods in smooth convex optimization** (Dmitry Kovalev, Alexander Gasnikov). *Advances in Neural Information Processing Systems*, 2022.
19. **The first optimal algorithm for smooth and strongly-convex-strongly-concave minimax optimization** (Dmitry Kovalev, Alexander Gasnikov). *Advances in Neural Information Processing Systems*, 2022.
20. **Accelerated variance-reduced methods for saddle-point problems** (Ekaterina Borodich, Vladislav Tominin, Yaroslav Tominin, Dmitry Kovalev, Alexander Gasnikov, Pavel Dvurechensky). *EURO Journal on Computational Optimization*, 2022.
21. **An optimal algorithm for strongly convex minimization under affine constraints** (Adil Salim, Laurent Condat, Dmitry Kovalev, Peter Richtarik). *International Conference on Artificial Intelligence and Statistics*, 2022.

22. **IntSGD: Adaptive floatless compression of stochastic gradients** (Konstantin Mishchenko, Bokun Wang, Dmitry Kovalev, Peter Richtarik). *International Conference on Learning Representations*, 2022.

23. **Lower bounds and optimal algorithms for smooth and strongly convex decentralized optimization over time-varying networks** (Dmitry Kovalev, Elnur Gasanov, Alexander Gasnikov, Peter Richtarik). *Advances in Neural Information Processing Systems*, 2021.

24. **A linearly convergent algorithm for decentralized optimization: Sending less bits for free!** (Dmitry Kovalev, Anastasia Koloskova, Martin Jaggi, Peter Richtarik, Sebastian Stich). *International Conference on Artificial Intelligence and Statistics*, 2021.

25. **ADOM: accelerated decentralized optimization method for time-varying networks** (Dmitry Kovalev, Egor Shulgin, Peter Richtarik, Alexander V Rogozin, Alexander Gasnikov). *International Conference on Machine Learning*, 2021.

26. **Near-optimal decentralized algorithms for saddle point problems over time-varying networks** (Aleksandr Beznosikov, Alexander Rogozin, Dmitry Kovalev, Alexander Gasnikov). *Optimization and Applications: 12th International Conference, OPTIMA 2021, Petrovac, Montenegro, September 27–October 1, 2021, Proceedings 12*, 2021.

27. **Towards accelerated rates for distributed optimization over time-varying networks** (Alexander Rogozin, Vladislav Lukoshkin, Alexander Gasnikov, Dmitry Kovalev, Egor Shulgin). *Optimization and Applications: 12th International Conference, OPTIMA 2021, Petrovac, Montenegro, September 27–October 1, 2021, Proceedings 12*, 2021.

28. **Linearly converging error compensated SGD** (Eduard Gorbunov, Dmitry Kovalev, Dmitry Makarenko, Peter Richtarik). *Advances in Neural Information Processing Systems*, 2020.

29. **Optimal and practical algorithms for smooth and strongly convex decentralized optimization** (Dmitry Kovalev, Adil Salim, Peter Richtarik). *Advances in Neural Information Processing Systems*, 2020.

30. **Don't jump through hoops and remove those loops: SVRG and Katyusha are better without the outer loop** (Dmitry Kovalev, Samuel Horvath, Peter Richtarik). *Algorithmic Learning Theory*, 2020.

31. **Accelerated methods for saddle-point problem** (Mohammad S Alkousa, Alexander Vladimirovich Gasnikov, Darina Mikhailovna Dvinskikh, Dmitry A Kovalev, Fedor Sergeevich Stonyakin). *Computational Mathematics and Mathematical Physics*, 2020.

32. **Revisiting stochastic extragradient** (Konstantin Mishchenko, Dmitry Kovalev, Egor Shulgin, Peter Richtarik, Yura Malitsky). *International Conference on Artificial Intelligence and Statistics*, 2020.

33. **Acceleration for compressed gradient descent in distributed and federated optimization** (Zhize Li, Dmitry Kovalev, Xun Qian, Peter Richtarik). *International Conference on Machine Learning*, 2020.

34. **From local SGD to local fixed-point methods for federated learning** (Grigory Malinovskiy, Dmitry Kovalev, Elnur Gasanov, Laurent Condat, Peter Richtarik). *International Conference on Machine Learning*, 2020.

35. **Variance reduced coordinate descent with acceleration: New method with a surprising application to finite-sum problems** (Filip Hanzely, Dmitry Kovalev, Peter Richtarik). *International Conference on Machine Learning*, 2020.

36. **RSN: randomized subspace Newton** (Robert Gower, Dmitry Kovalev, Felix Lieder, Peter Richtarik). *Advances in Neural Information Processing Systems*, 2019.

37. **Stochastic proximal Langevin algorithm: Potential splitting and nonasymptotic rates** (Adil Salim, Dmitry Kovalev, Peter Richtarik). *Advances in Neural Information Processing*

Systems, 2019.

38. **Stochastic spectral and conjugate descent methods** (Dmitry Kovalev, Peter Richtarik, Eduard Gorbunov, Elnur Gasanov). *Advances in Neural Information Processing Systems*, 2018.

39. **A hypothesis about the rate of global convergence for optimal methods (Newton's type) in smooth convex optimization** (Alexander Gasnikov, Dmitry Kovalev). *Computer research and modeling*, 2018.

Preprints

1. **SGD with Adaptive Preconditioning: Unified Analysis and Momentum Acceleration** (Dmitry Kovalev). *arXiv preprint arXiv:2506.23803*, 2025.

2. **Understanding gradient orthogonalization for deep learning via non-euclidean trust-region optimization** (Dmitry Kovalev). *arXiv preprint arXiv:2503.12645*, 2025.

3. **On Solving Minimization and Min-Max Problems by First-Order Methods with Relative Error in Gradients** (Artem Vasin, Valery Krivchenko, Dmitry Kovalev, Fedyor Stonyakin, Nazari Tupitsa, Pavel Dvurechensky, Mohammad Alkousa, Nikita Kornilov, Alexander Gasnikov). *arXiv preprint arXiv:2503.06628*, 2025.

4. **Decentralized finite-sum optimization over time-varying networks** (Dmitry Metelev, Savelii Chezhegov, Alexander Rogozin, Aleksandr Beznosikov, Alexander Sholokhov, Alexander Gasnikov, Dmitry Kovalev). *arXiv preprint arXiv:2402.02490*, 2024.

5. **Optimal algorithm with complexity separation for strongly convex-strongly concave composite saddle point problems** (Ekaterina Borodich, Georgiy Kormakov, Dmitry Kovalev, Aleksandr Beznosikov, Alexander Gasnikov). *arXiv preprint arXiv:2307.12946*, 2023.

6. **On scaled methods for saddle point problems** (Aleksandr Beznosikov, Aibek Alanov, Dmitry Kovalev, Martin Takac, Alexander Gasnikov). *arXiv preprint arXiv:2206.08303*, 2022.

7. **Decentralized distributed optimization for saddle point problems** (Alexander Rogozin, Aleksandr Beznosikov, Darina Dvinskikh, Dmitry Kovalev, Pavel Dvurechensky, Alexander Gasnikov). *arXiv preprint arXiv:2102.07758*, 2021.

8. **Fast linear convergence of randomized BFGS** (Dmitry Kovalev, Robert M Gower, Peter Richtarik, Alexander Rogozin). *arXiv preprint arXiv:2002.11337*, 2020.

9. **Distributed fixed point methods with compressed iterates** (Selim Chraibi, Ahmed Khaled, Dmitry Kovalev, Peter Richtarik, Adil Salim, Martin Takac). *arXiv preprint arXiv:1912.09925*, 2019.

10. **Stochastic Newton and cubic Newton methods with simple local linear-quadratic rates** (Dmitry Kovalev, Konstantin Mishchenko, Peter Richtarik). *arXiv preprint arXiv:1912.01597*, 2019.

Conference Posters and Talks

1. **Talk: Understanding Gradient Orthogonalization for Deep Learning via Non-Euclidean Trust-Region Optimization**, *Traditional School (Control, Information and Optimization)*, Innopolis University, Kazan, Russia (June 2025)

2. **Talk: Understanding Gradient Orthogonalization for Deep Learning via Non-Euclidean Trust-Region Optimization**, *Data Fusion 2025 Conference*, Moscow, Russia (April 2025)

3. **Talk: Lower Bounds and Optimal Algorithms for Smooth and Strongly Convex Decentralized Optimization Over Time-Varying Networks**, *Rising Stars in AI Symposium 2022*, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia (March 2022)

4. **Talk/Poster: Lower Bounds and Optimal Algorithms for Smooth and Strongly Convex Decentralized Optimization Over Time-Varying Networks**, *NeurIPS 2021*, Online (December 2021)
5. **Talk/Poster: Lower Bounds and Optimal Algorithms for Smooth and Strongly Convex Decentralized Optimization Over Time-Varying Networks**, *International Workshop on Federated Learning for User Privacy and Data Confidentiality in Conjunction with ICML 2021*, Online (July 2021)
6. **Talk/Poster: ADOM: Accelerated Decentralized Optimization Method for Time-Varying Networks**, *ICML 2021*, Online (July 2021)
7. **Poster: ADOM: Accelerated Decentralized Optimization Method for Time-Varying Networks**, *Optimization Without Borders Conference*, Sirius University, Sochi, Russia (July 2021)
8. **Talk/Poster: A Linearly Convergent Algorithm for Decentralized Optimization: Sending Less Bits for Free!**, *AISTATS 2021*, Online (April 2021)
9. **Poster: Linearly Converging Error Compensated SGD**, *NeurIPS 2020*, Online (December 2020)
10. **Talk/Poster: Optimal and Practical Algorithms for Smooth and Strongly Convex Decentralized Optimization**, *NeurIPS 2020*, Online (December 2020)
11. **Talk: Variance Reduced Coordinate Descent with Acceleration: New Method With a Surprising Application to Finite-Sum Problems**, *ICML 2020*, Online (July 2020)
12. **Poster: RSN: Randomized Subspace Newton**, *NeurIPS 2019*, Vancouver, Canada (December 2019)
13. **Poster: Stochastic Proximal Langevin Algorithm: Potential Splitting and Nonasymptotic Rates**, *NeurIPS 2019*, Vancouver, Canada (December 2019)
14. **Talk: Revisiting Stochastic Extragradient Method**, *International Conference on Continuous Optimization 2019*, Technical University, Berlin, Germany (August 2019)
15. **Poster: Stochastic Distributed Learning with Gradient Quantization and Variance Reduction**, *Data Science Summer School 2019*, Ecole Polytechnique, Paris, France (June 2019)
16. **Poster: Stochastic Distributed Learning with Gradient Quantization and Variance Reduction**, *Traditional School (Control, Information and Optimization)*, Higher School of Economics Study Center, Voronovo, Russia (June 2019)
17. **Talk: Stochastic Spectral Descent Methods**, *Automatic control and Optimization Theory Weekly Seminar*, Institute for Control Problems, Moscow, Russia (March 2019)
18. **Talk: Stochastic Distributed Learning with Gradient Quantization and Variance Reduction**, *Modern Optimization Methods Seminar*, Moscow Institute of Physics and Technology, Moscow, Russia (March 2019)
19. **Poster: Stochastic Spectral Descent Methods**, *NeurIPS 2018*, Montreal, Canada (December 2018)
20. **Poster: Stochastic Spectral Descent Methods**, *Optimization and Big Data Workshop*, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia (June 2018)
21. **Poster: Stochastic Spectral Descent Methods**, *Traditional School (Control, Information and Optimization)*, Higher School of Economics Study Center, Voronovo, Russia (February 2018)

Teaching Experience

1. **Mentor for a Research Project with MIPT student Ekaterina Borodich (online, led to NeurIPS 2022 paper "Optimal Gradient Sliding and its Application to Distributed Optimization Under Similarity")**, Moscow Institute of Physics and Technology, Moscow, Russia (March 2022)
2. **Mentor for a Research Project with KAUST Student Abdurakhmon Sadiev (led to NeurIPS 2022 paper "Communication Acceleration of Local Gradient Methods via an Accelerated Primal-Dual Algorithm with Inexact Prox")**, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia (March 2022)
3. **Project Mentor at «Modern Information, Optimization and Control Methods» Student Educational Program**, Sirius University, Sochi, Russia (July-August 2021)
4. **Mentor for a Research Project with Student Grigory Malinovsky (done during his internship at KAUST, led to ICML 2020 paper "From Local SGD to Local Fixed Point Methods for Federated Learning")**, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia (January 2020)

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