

Dmitry Kovalev

PERSONAL DATA

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POSITIONS

2021-Now	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
2022-2023	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 Students**, given for prize-winning at final round of All-Russian School Olympiads, 2012-2014
10. **Moscow Governor's Scholarship for High School Students**, 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. **Is Consensus Acceleration Possible in Decentralized Optimization over Slowly Time-Varying Networks?** ([Dmitriy Metev](#), [Alexander Rogozin](#), [Dmitry Kovalev](#), [Alexander Gasnikov](#)), *ICML 2023*
2. **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*
3. **Communication Acceleration of Local Gradient Methods via an Accelerated Primal-Dual Algorithm with Inexact Prox** ([Abdurakhmon Sadiev](#), [Dmitry Kovalev](#), [Peter Richtarik](#)), *NeurIPS 2022*
4. **Optimal Gradient Sliding and its Application to Distributed Optimization Under Similarity** ([Dmitry Kovalev](#), [Aleksandr Beznosikov](#), [Ekaterina Borodich](#), [Alexander Gasnikov](#), [Gesualdo Scutari](#)), *NeurIPS 2022*
5. **The First Optimal Acceleration of High-Order Methods in Smooth Convex Optimization** ([Dmitry Kovalev](#), [Alexander Gasnikov](#)), *NeurIPS 2022*
6. **The First Optimal Algorithm for Smooth and Strongly-Convex-Strongly-Concave Minimax Optimization** ([Dmitry Kovalev](#), [Alexander Gasnikov](#)), *NeurIPS 2022*

7. **Optimal Algorithms for Decentralized Stochastic Variational Inequalities** (Dmitry Kovalev, Aleksandr Beznosikov, Abdurakhmon Sadiev, Michael Pershianov, Peter Richtarik, Alexander Gasnikov), *NeurIPS 2022*
8. **Accelerated Primal-Dual Gradient Method for Smooth and Convex-Concave Saddle-Point Problems with Bilinear Coupling** (Dmitry Kovalev, Alexander Gasnikov, Peter Richtarik), *NeurIPS 2022*
9. **Near-Optimal Decentralized Algorithms for Saddle Point Problems over Time-Varying Networks** (Aleksandr Beznosikov, Alexander Rogozin, Dmitry Kovalev, Alexander Gasnikov), *OPTIMA 2021*
10. **Lower Bounds and Optimal Algorithms for Smooth and Strongly Convex Decentralized Optimization Over Time-Varying Networks** (Dmitry Kovalev, Elnur Gasanov, Peter Richtarik, Alexander Gasnikov), *NeurIPS 2021*
11. **An Optimal Algorithm for Strongly Convex Minimization under Affine Constraints** (Adil Salim, Laurent Condat, Dmitry Kovalev, Peter Richtarik), *AISTATS 2022*
12. **ADOM: Accelerated Decentralized Optimization Method for Time-Varying Networks** (Dmitry Kovalev, Egor Shulgin, Peter Richtarik, Alexander Rogozin, Alexander Gasnikov), *ICML 2021*
13. **IntSGD: Floatless Compression of Stochastic Gradients** (Konstantin Mishchenko, Bokun Wang, Dmitry Kovalev, Peter Richtarik), *ICLR 2022*
14. **Accelerated Methods for Saddle-Point Problem** (Mohammad Alkousa, Darina Dvinskikh, Alexander Gasnikov, Dmitry Kovalev, Fedor Stonyakin), *Computational Mathematics and Mathematical Physics*
15. **A Linearly Convergent Algorithm for Decentralized Optimization: Sending Less Bits for Free!** (Dmitry Kovalev, Anastasia Koloskova, Martin Jaggi, Peter Richtarik, Sebastian U. Stich), *AISTATS 2021*
16. **Linearly Converging Error Compensated SGD** (Eduard Gorbunov, Dmitry Kovalev, Dmitry Makarenko, Peter Richtarik), *NeurIPS 2020*
17. **Towards Accelerated Rates for Distributed Optimization over Time-varying Networks** (Alexander Rogozin, Vladislav Lukoshkin, Alexander Gasnikov, Dmitry Kovalev, Egor Shulgin), *OPTIMA 2021*
18. **Optimal and Practical Algorithms for Smooth and Strongly Convex Decentralized Optimization** (Dmitry Kovalev, Adil Salim, Peter Richtarik), *NeurIPS 2020*
19. **From Local SGD to Local Fixed Point Methods for Federated Learning** (Grigory Malinovsky, Dmitry Kovalev, Elnur Gasanov, Laurent Condat, Peter Richtarik), *ICML 2020*
20. **Acceleration for Compressed Gradient Descent in Distributed and Federated Optimization** (Zhize Li, Dmitry Kovalev, Xun Qian, Peter Richtarik), *ICML 2020*
21. **Variance Reduced Coordinate Descent with Acceleration: New Method With a Surprising Application to Finite-Sum Problems** (Filip Hanzely, Dmitry Kovalev, Peter Richtarik), *ICML 2020*
22. **Stochastic Newton and Cubic Newton Methods with Simple Local Linear-Quadratic Rates** (Dmitry Kovalev, Konstantin Mishchenko, Peter Richtarik), *NeurIPS 2019 Workshop*
23. **Stochastic Proximal Langevin Algorithm: Potential Splitting and Nonasymptotic Rates** (Adil Salim, Dmitry Kovalev, Peter Richtarik), *NeurIPS 2019*
24. **Revisiting Stochastic Extragradient** (Konstantin Mishchenko, Dmitry Kovalev, Egor Shulgin, Peter Richtarik, Yura Malitsky), *AISTATS 2020*

25. **RSN: Randomized Subspace Newton** (Robert M. Gower, Dmitry Kovalev, Felix Lieder, Peter Richtarik), *NeurIPS 2019*
26. **Stochastic Distributed Learning with Gradient Quantization and Double Variance Reduction** (Samuel Horvath, Dmitry Kovalev, Konstantin Mishchenko, Peter Richtarik, Sebastian U. Stich), *Optimization Methods and Software*
27. **Don't Jump Through Hoops and Remove Those Loops: SVRG and Katyusha are Better Without the Outer Loop** (Dmitry Kovalev, Samuel Horvath, Peter Richtarik), *ALT 2020*
28. **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*
29. **Stochastic Spectral and Conjugate Descent Methods** (Dmitry Kovalev, Eduard Gorbunov, Elnur Gasanov, Peter Richtarik), *NeurIPS 2018*

PREPRINTS

1. **Decentralized Optimization over Time-varying Graphs: a Survey** (Alexander Rogozin, Alexander Gasnikov, Aleksander Beznosikov, Dmitry Kovalev), *arXiv preprint (October 2022)*
2. **Smooth Monotone Stochastic Variational Inequalities and Saddle Point Problems - Survey** (Aleksandr Beznosikov, Boris Polyak, Eduard Gorbunov, Dmitry Kovalev, Alexander Gasnikov), *arXiv preprint (August 2022)*
3. **On Scaled Methods for Saddle Point Problems** (Aleksandr Beznosikov, Aibek Alanov, Dmitry Kovalev, Martin Takac, Alexander Gasnikov), *arXiv preprint (June 2022)*
4. **Decentralized Saddle-Point Problems with Different Constants of Strong Convexity and Strong Concavity** (Dmitriy Metelev, Alexander Rogozin, Alexander Gasnikov, Dmitry Kovalev), *arXiv preprint (May 2022)*
5. **Decentralized Computation of Wasserstein Barycenter over Time-Varying Networks** (Olga Yufereva, Michael Pershianov, Pavel Dvurechensky, Alexander Gasnikov, Dmitry Kovalev), *arXiv preprint (May 2022)*
6. **Decentralized Distributed Optimization for Saddle Point Problems** (Alexander Rogozin, Alexander Beznosikov, Darina Dvinskikh, Dmitry Kovalev, Pavel Dvurechensky, Alexander Gasnikov), *arXiv preprint (February 2021)*
7. **Fast Linear Convergence of Randomized BFGS** (Dmitry Kovalev, Robert M. Gower, Peter Richtarik, Alexander Rogozin), *arXiv preprint (February 2020)*
8. **Distributed Fixed Point Methods with Compressed Iterates** (Selim Chraibi, Ahmed Khaled, Dmitry Kovalev, Peter Richtarik, Adil Salim, Martin Takac), *arXiv preprint (December 2019)*
9. **Accelerated methods for composite non-bilinear saddle point problem** (Mohammad Alkousa, Darina Dvinskikh, Fedor Stonyakin, Alexander Gasnikov, Dmitry Kovalev), *arXiv preprint (December 2019)*

CONFERENCE POSTERS AND TALKS

1. **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)
2. **Talk/Poster: Lower Bounds and Optimal Algorithms for Smooth and Strongly Convex Decentralized Optimization Over Time-Varying Networks**, *NeurIPS 2021*, Online (December 2021)

3. **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)
4. **Talk/Poster: ADOM: Accelerated Decentralized Optimization Method for Time-Varying Networks**, *ICML 2021*, Online (July 2021)
5. **Poster: ADOM: Accelerated Decentralized Optimization Method for Time-Varying Networks**, *Conference «Optimization Without Borders»*, Sirius University, Sochi, Russia (July 2021)
6. **Talk/Poster: A Linearly Convergent Algorithm for Decentralized Optimization: Sending Less Bits for Free!**, *AISTATS 2021*, Online (April 2021)
7. **Poster: Linearly Converging Error Compensated SGD**, *NeurIPS 2020*, Online (December 2020)
8. **Talk/Poster: Optimal and Practical Algorithms for Smooth and Strongly Convex Decentralized Optimization**, *NeurIPS 2020*, Online (December 2020)
9. **Talk: Variance Reduced Coordinate Descent with Acceleration: New Method With a Surprising Application to Finite-Sum Problems**, *ICML 2020*, Online (July 2020)
10. **Poster: RSN: Randomized Subspace Newton**, *NeurIPS 2019*, Vancouver, Canada (December 2019)
11. **Poster: Stochastic Proximal Langevin Algorithm: Potential Splitting and Nonasymptotic Rates**, *NeurIPS 2019*, Vancouver, Canada (December 2019)
12. **Talk: Revisiting Stochastic Extragradient Method**, *International Conference on Continuous Optimization 2019*, Technical University, Berlin, Germany (August 2019)
13. **Poster: Stochastic Distributed Learning with Gradient Quantization and Variance Reduction**, *Data Science Summer School 2019*, Ecole Polytechnique, Paris, France (June 2019)
14. **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)
15. **Talk: Stochastic Spectral Descent Methods**, *Weekly Seminar «Automatic control and Optimization Theory»*, Institute for Control Problems, Moscow, Russia (March 2019)
16. **Talk: Stochastic Distributed Learning with Gradient Quantization and Variance Reduction**, *Seminar «Modern Optimization Methods»*, Moscow Institute of Physics and Technology, Moscow, Russia (March 2019)
17. **Poster: Stochastic Spectral Descent Methods**, *NeurIPS 2018*, Montreal, Canada (December 2018)
18. **Poster: Stochastic Spectral Descent Methods**, *Optimization and Big Data Workshop*, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia (June 2018)
19. **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)**

Last Updated on October 15, 2023