

# Dmitry Kovalev

## PERSONAL DATA

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EMAIL	<a href="mailto:dakovalev1@gmail.com">dakovalev1@gmail.com</a>
WEBSITE	<a href="http://www.dmitry-kovalev.com">www.dmitry-kovalev.com</a>
PHONE	+32 499 34 93 21 (Belgium)
PHONE	+7 905 719 06 98 (Russia)
GOOGLE SCHOLAR ID	<a href="https://scholar.google.com/citations?user=qHFA5z4AAAAJ">qHFA5z4AAAAJ</a>
ORCID ID	<a href="https://orcid.org/0000-0003-1467-2994">0000-0003-1467-2994</a>
LINKEDIN	<a href="#">dakovalev1</a>

## POSITIONS

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2022-Now	Postdoctoral Researcher <b>Université catholique de Louvain</b> , Louvain-la-Neuve, Belgium
2022	Researcher Laboratory of Advanced Combinatorics and Network Applications <b>Moscow Institute of Physics and Technology</b> , Dolgoprudny, Russia
2021-2022	Research Intern Research Center for Trusted Artificial Intelligence <b>Ivannikov Institute for System Programming</b> , Moscow, Russia

## EDUCATION

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2019-2022	PhD in Computer Science <b>King Abdullah University of Science and Technology</b> , Thuwal, Saudi Arabia Advisor: <a href="#">Peter Richtárik</a>
2018-2021	MS in Applied Mathematics and Physics <b>Moscow Institute of Physics and Technology</b> , Dolgoprudny, Russia Advisor: <a href="#">Alexander Gasnikov</a>
2018-2019	MS in Computer Science <b>King Abdullah University of Science and Technology</b> , Thuwal, Saudi Arabia Advisor: <a href="#">Peter Richtárik</a>
2014-2018	BS in Applied Mathematics and Physics <b>Moscow Institute of Physics and Technology</b> , Dolgoprudny, Russia Advisor: <a href="#">Alexander Gasnikov</a>

## RESEARCH INTERESTS

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Optimization  
Federated and Distributed Learning  
Machine Learning

## SKILLS

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PROGRAMMING	C/C++, Python, Algorithms and Data Structures, Jax, Pytorch PAST EXPERIENCE: Go, C#, VB.NET, SQL, Julia, HTML/CSS
MATHEMATICS	Calculus, Linear Algebra, Probability and Statistics, Convex Analysis
COMPUTER	macOS, LaTeX, Git

## LANGUAGES

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ENGLISH	Advanced Knowledge
RUSSIAN	Mothertongue

## HONORS AND AWARDS

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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

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1. **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*
2. **Communication Acceleration of Local Gradient Methods via an Accelerated Primal-Dual Algorithm with Inexact Prox** ([Abdurakhmon Sadiev](#), [Dmitry Kovalev](#), [Peter Richtarik](#)), *NeurIPS 2022*
3. **Optimal Gradient Sliding and its Application to Distributed Optimization Under Similarity** ([Dmitry Kovalev](#), [Aleksandr Beznosikov](#), [Ekaterina Borodich](#), [Alexander Gasnikov](#), [Gesualdo Scutari](#)), *NeurIPS 2022*
4. **The First Optimal Acceleration of High-Order Methods in Smooth Convex Optimization** ([Dmitry Kovalev](#), [Alexander Gasnikov](#)), *NeurIPS 2022*
5. **The First Optimal Algorithm for Smooth and Strongly-Convex-Strongly-Concave Minimax Optimization** ([Dmitry Kovalev](#), [Alexander Gasnikov](#)), *NeurIPS 2022*
6. **Optimal Algorithms for Decentralized Stochastic Variational Inequalities** ([Dmitry Kovalev](#), [Aleksandr Beznosikov](#), [Abdurakhmon Sadiev](#), [Michael Persianov](#), [Peter Richtarik](#), [Alexander Gasnikov](#)), *NeurIPS 2022*

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

25. **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*
26. **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*
27. **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*
28. **Stochastic Spectral and Conjugate Descent Methods** (Dmitry Kovalev, Eduard Gorbunov, Elnur Gasanov, Peter Richtarik), *NeurIPS 2018*

## PREPRINTS

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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 Metev, Alexander Rogozin, Alexander Gasnikov, Dmitry Kovalev), *arXiv preprint (May 2022)*
5. **Decentralized Computation of Wasserstein Barycenter over Time-Varying Networks** (Olga Yufereva, Michael Persiianov, 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

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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. **Poster: ADOM: Accelerated Decentralized Optimization Method for Time-Varying Networks**, *Conference «Optimization Without Borders»*, Sirius University, Sochi, Russia (July 2021)

4. **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)
5. **Talk/Poster: ADOM: Accelerated Decentralized Optimization Method for Time-Varying Networks**, *ICML 2021*, Online (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

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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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