Dmitry Kovalev

Personal Data

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Positions

2022-Now	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
2021-2022	Research Intern Research Center for Trusted Artificial Intelligence **Ivannikov Institute for System Programming**, Moscow, 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, 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 Knowledge
Russian	Mothertongue

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. **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 Persiianov, 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

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 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

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)

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