Eduard Gorbunov

Personal Data

Place and Date of Birth:	Rybinsk, Russia | 22 November 1996
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Google Scholar:	https://scholar.google.com/citations?user=QPVriwoAAAAJ&hl=en
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Research Interests

Optimization, Machine Learning, Federated Learning, Variational Inequalities, Derivative-Free Optimization, Randomized Algorithms

Work Experience

April 2024 – Now	Research Scientist at the **ML department**, MBZUAI, Abu Dhabi, UAE (hosted by Samuel Horváth and Martin Takác)
September 2022 – March 2024	Postdoctoral Fellow at the **ML department**, MBZUAI, Abu Dhabi, UAE (hosted by Samuel Horváth and Martin Takác)
May 2020 – August 2022	Junior Researcher at **Laboratory of Advanced Combinatorics and Network Applications**, MIPT, Moscow
February 2022 – May 2022	Research Consultant at **Mila**, Montreal (in the group of Gauthier Gidel)
September 2020 – January 2022	Junior Researcher at **Yandex.Research-MIPT Laboratory**. Moscow
May 2020 – December 2021	Research Assistant at **International Laboratory of Stochastic Algorithms and High-Dimensional Inference**, HSE, Moscow
November 2019 – April 2020	Junior Researcher at IITP RAS, Moscow
February 2020 – December 2020	Junior Researcher at **Joint Research Laboratory of Applied Mathematics**, RANEPA-MIPT, Moscow
February 2020 – December 2020	Junior Researcher at **Laboratory of Numerical Methods of Applied Structural Optimization**, MIPT, Moscow
August 2019 – July 2019	Researcher at **Huawei**–MIPT group, Moscow (research, Python)
May 2019 – August 2019	Intern at **Huawei Media Lab,** Moscow (research, C++)
August 2017 – October 2019	Researcher at **Peter Richtárik's Group,** MIPT, Moscow

Education

September 2020 – December 2021	PhD in Computer Science **Moscow Institute of Physics and Technology**, Moscow Thesis: "Distributed and Stochastic Optimization Methods with Gradient Compression and Local Steps" Advisors: Alexander Gasnikov and Peter Richtárik Links: slides and video of the defense
September 2018 – July 2020	Master of Science in Applied Mathematics **Moscow Institute of Physics and Technology**, Moscow Thesis: "Derivative-free and stochastic optimization methods, decentralized distributed optimization" Advisor: Alexander Gasnikov
September 2014 – July 2018	Bachelor of Science in Applied Mathematics **Moscow Institute of Physics and Technology**, Moscow Thesis: "Accelerated Directional Searches and Gradient-Free Methods with non-Euclidean prox-structure" Advisor: Alexander Gasnikov

Research Visits and Internships

- **8 June 2021 – 30 September 2021**, Mila, Université de Montréal. Internship in the group of Gauthier Gidel
- **1 September 2020 – 28 February 2021**, Visual Computing Center, KAUST, Thuwal, Saudi Arabia. I remotely worked in the group of P. Richtárik
- **2 February – 31 March 2020**, Visual Computing Center, KAUST, Thuwal, Saudi Arabia (worked with P. Richtárik)
- **6 October – 26 October 2019**, SIERRA, INRIA, Paris, France (worked with A. Taylor)
- **13 January – 24 February 2019**, Visual Computing Center, KAUST, Thuwal, Saudi Arabia (worked with P. Richtárik)
- **14 January – 8 February 2018**, Visual Computing Center, KAUST, Thuwal, Saudi Arabia (worked with P. Richtárik)

Languages

Russian:	Mothertongue
English:	Advanced

Computer Skills

Operating Systems:	Microsoft Windows, Linux, Mac OS
Programming Languages:	Python, LaTeX, C, C++

Scholarships, Honors and Awards

- **October 2022.** I got "outstanding reviewer award" at NeurIPS 2022 and a free registration to the conference

- **October 2021.** I got "outstanding reviewer award" at ICML 2022 and a free registration to the conference
- **October 2021.** I got "outstanding reviewer award" at NeurIPS 2021 (top 8% of reviewers) and a free registration to the conference
- **September 2021 - January 2021.** A. M. Raigorodskii Scholarship for Contribution to the Development of Numerical Optimization Methods (main scholarship)
- **July 2021.** I was recognized as one of the top 10% of reviewers for ICML 2021 and got a free registration to the conference
- **19 March 2021.** I was recognized as an "outstanding reviewer" for ICLR 2021 and got a free registration to the conference
- **February 2021 - June 2021.** A. M. Raigorodskii Scholarship for Contribution to the Development of Numerical Optimization Methods (main scholarship)
- **21 October, 2020.** I was recognized as one of the top 10% best reviewers for NeurIPS 2020 and got free registration to the conference
- **February 2020 - June 2020.** Increased State Academic Scholarship for 4 year bachelor and master students at MIPT for scientific achievements (14,000 Russian rubles per month instead of the regular scholarship)
- **15 January, 2020.** Huawei scholarship for bachelor and master students at MIPT (125,000 Russian rubles)
- **September 2019 - January 2020.** Increased State Academic Scholarship for 4 year bachelor and master students at MIPT for scientific achievements (10,000 Russian rubles per month in addition to the regular scholarship)
- **10 April, 2019.** The Ilya Segalovich Award — Yandex scientific scholarship, **highly selective: 9 winners from Russia, Belarus and Kazakhstan** (350,000 Russian rubles, internship offer at Yandex.Research, travel grant to attend one international conference; news about award: https://nplus1.ru/news/2019/04/10/ya-awards)
- **February 2019 - June 2019.** Increased State Academic Scholarship for 4 year bachelor and master students at MIPT for scientific achievements (10,000 Russian rubles per month in addition to the regular scholarship)
- **September 2018 - January 2019.** Increased State Academic Scholarship for 4 year bachelor and master students at MIPT for scientific achievements (10,000 Russian rubles per month in addition to the regular scholarship)
- **February 2018 - June 2018.** Increased State Academic Scholarship for 4 year bachelor and master students at MIPT for scientific achievements (10,000 Russian rubles per month in addition to the regular scholarship)
- **September 2017 - January 2018.** Increased State Academic Scholarship for 4 year bachelor and master students at MIPT for scientific achievements (10,000 Russian rubles per month in addition to the regular scholarship)
- **November 2017.** Diploma of winner of the Section of Information Transmission Problems, Data Analysis and Optimization at 60th Scientific Conference of MIPT
- **May 2017.** Third Prize at MIPT's Student Olympiad in Mathematics
- **March 2017.** First Prize at MIPT's Team Mathematical Tournament
- **September 2016 - June 2017.** Abramov scholarship for 1-3 year bachelor students with the best grades at MIPT (12,000 Russian rubles per month)
- **December 2015.** Third Prize at MIPT's Student Olympiad in Mathematics

- **February 2015 - June 2015.** Abramov scholarship for 1-3 year bachelor students with the best grades at MIPT (12,000 Russian rubles per month)
- **April 2014.** Participant of Final Round of All-Russian Mathematical Olympiad (scored points: 28 out of 56, 59th place)

Supervision & Mentoring

I was supervising/mentoring the work of the following students/interns/research assistants on the listed projects (projects are listed in the reverse chronological order).

- Nazarii Tupitsa, Sayantan Choudhury, Alen Aliev. Project on the convergence of different optimization methods under generalized smoothness assumptions. Led to the preprint: Methods for Convex (L_0, L_1)-Smooth Optimization: Clipping, Acceleration, and Adaptivity, arXiv:2409.14989
- Viktor Moskvoretskii, Nazarii Tupitsa. Project on a new way of training LLMs for low-resource languages. Led to the paper accepted to EMNLP 2024 (Findings): Low-Resource Machine Translation through the Lens of Personalized Federated Learning, arXiv:2406.12564
- Savelii Chezhegov, Yaroslav Klyukin, Andrei Semenov. Project on the high-probability convergence of versions of AdaGrad and Adam with gradient clipping. Led to the preprint: Gradient Clipping Improves AdaGrad when the Noise Is Heavy-Tailed, arXiv:2406.04443
- Sayantan Choudhury, Nazarii Tupitsa. Project on scale-inavriant version of AdaGrad – led to the paper accepted to NeurIPS 2024: Remove that Square Root: A New Efficient Scale-Invariant Version of AdaGrad, arXiv:2403.02648
- Nazarii Tupitsa. Project on Federated Learning – led to the preprint: Federated Learning Can Find Friends That Are Advantageous, arXiv:2402.05050
- Nickolay Kutuzov. Supervision of the work on numerical experiments for a project on high-probability convergence under heavy-tailed noise – led to the paper accepted to AISTATS 2024: Breaking the Heavy-Tailed Noise Barrier in Stochastic Optimization Problems, arXiv:2311.04161
- Grigory Malinovsky. Project on Byzantine-robust learning with partial participation – led to the paper accepted to NeurIPS 2024: Byzantine Robustness and Partial Participation Can Be Achieved At Once: Just Clip Gradient Differences, arXiv:2311.14127
- Nikita Kornilov. Project on relative error in gradients – led to the preprint: Intermediate Gradient Methods with Relative Inexactness, arXiv:2310.00506
- Nazarii Tupitsa, Abdulla Jasem Almansoori, Yanlin Wu. Project on Byzantine-robust methods for distributed variational inequalities – led to the paper accepted to NeurIPS 2023: Byzantine-Tolerant Methods for Distributed Variational Inequalities, arXiv:2311.04611
- Nikita Fedin. Project on Byzantine-robust learning with variance reduction – led to the paper accepted to MOTOR 2023: Byzantine-Robust Loopless Stochastic Variance-Reduced Gradient, arXiv:2303.04560
- Abdurakhmon Sadiev
  1. Project on high-probability convergence without bounded variance assumption – led to the paper accepted to ICML 2023: High-Probability Bounds for Stochastic Optimization and Variational Inequalities: the Case of Unbounded Variance, arXiv:2302.00999
  2. Project on high-probability convergence for composite and distributed optimization problems – led to the paper accepted to ICML 2024: High-Probability Con-

vergence for Composite and Distributed Stochastic Minimization and Variational Inequalities with Heavy-Tailed Noise, arXiv:2310.01860

- Konstantin Burlachenko. Supervision of the work on numerical experiments for a project on distributed non-convex optimization with unbiased compression – led to the paper accepted to ICML 2021: MARINA: Faster Non-Convex Distributed Learning with Compression, arXiv:2102.07845
- Dmitry Makarenko. Supervision of the work on numerical experiments for a project on distributed optimization with biased compression – led to the paper accepted as a spotlight to NeurIPS 2020: Linearly Converging Error Compensated SGD, arXiv:2010.12292
- Aleksandr Beznosikov. Project on zeroth-order composite optimization – led to the paper accepted to IFAC 2020: Derivative-Free Method For Decentralized Distributed Non-Smooth Optimization, arXiv:1911.10645

Books

1. A. Gasnikov, E. Gorbunov, S. Guz, E. Chernousova, M. Shirobokov, E. Shulgin. **Lecture Notes on Stochastic Processes**, arXiv:1907.01060 (June 2019)

Publications

57. E. Gorbunov*, N. Tupitsa*, S. Choudhury, A. Aliev, P. Richtárik, S. Horváth, M. Takác (*equal contribution). **Methods for Convex (L_0, L_1)-Smooth Optimization: Clipping, Acceleration, and Adaptivity**, arXiv:2409.14989 (September 2024)[1]

56. V. Moskvoretskii, N. Tupitsa, C. Biemann, S. Horváth, E. Gorbunov, I. Nikishina. **Low-Resource Machine Translation through the Lens of Personalized Federated Learning**, arXiv:2406.12564 (June 2024)
EMNLP 2024 (Findings)

55. S. Chezhegov, Y. Klyukin, A. Semenov, A. Beznosikov, A. Gasnikov, S. Horváth, M. Takác, E. Gorbunov. **Gradient Clipping Improves AdaGrad when the Noise Is Heavy-Tailed**, arXiv:2406.04443 (June 2024)

54. A. Agafonov, P. Ostroukhov, R. Mozhaev, K. Yakovlev, E. Gorbunov, M. Takác, A. Gasnikov, D. Kamzolov. **Exploring Jacobian Inexactness in Second-Order Methods for Variational Inequalities: Lower Bounds, Optimal Algorithms and Quasi-Newton Approximations**, arXiv:2405.15990 (May 2024)
NeurIPS 2024 **(spotlight)**

53. S. Choudhury, N. Tupitsa, N. Loizou, S. Horváth, M. Takác, E. Gorbunov. **Remove that Square Root: A New Efficient Scale-Invariant Version of AdaGrad**, arXiv:2403.02648 (March 2024)
NeurIPS 2024

52. N. Tupitsa, S. Horváth, M. Takác, E. Gorbunov. **Federated Learning Can Find Friends That Are Advantageous**, arXiv:2402.05050 (February 2024)

51. N. Kornilov, Y. Dorn, A. Lobanov, N. Kutuzov, I. Shibaev, E. Gorbunov, A. Gasnikov, A. Nazin **Zeroth-order Median Clipping for Non-Smooth Convex Optimization Problems with Heavy-tailed Symmetric Noise**, arXiv:2402.02461 (February 2024)

50. G. Malinovsky, P. Richtárik, S. Horváth, E. Gorbunov. **Byzantine Robustness and Partial Participation Can Be Achieved at Once: Just Clip Gradient Differences**, arXiv:2311.14127 (November 2023)
NeurIPS 2024

[1]The date when it first appeared online.

49. N. Tupitsa, A. J. Almansoori, Y. Wu, M. Takác, K. Nandakumar, S. Horváth, E. Gorbunov. **Byzantine-Tolerant Methods for Distributed Variational Inequalities**, arXiv:2311.04611 (November 2023)
NeurIPS 2023

48. N. Puchkin*, E. Gorbunov*, N. Kutuzov, A. Gasnikov (*equal contribution). **Breaking the Heavy-Tailed Noise Barrier in Stochastic Optimization Problems**, Proceedings of The 27th International Conference on Artificial Intelligence and Statistics, PMLR 238:856-864, arXiv:2311.04161 (November 2023)
AISTATS 2024

47. N. Kornilov, O. Shamir, A. Lobanov, D. Dvinskikh, A. Gasnikov, I. Shibaev, E. Gorbunov, S. Horváth. **Accelerated Zeroth-order Method for Non-Smooth Stochastic Convex Optimization Problem with Infinite Variance**, arXiv:2310.18763 (October 2023)
NeurIPS 2023

46. A. Rammal, K. Gruntkowska, N. Fedin, E. Gorbunov, P. Richtárik. **Communication Compression for Byzantine Robust Learning: New Efficient Algorithms and Improved Rates**, Proceedings of The 27th International Conference on Artificial Intelligence and Statistics, PMLR 238:1207-1215 arXiv:2310.09804 (October 2023)
AISTATS 2024

45. E. Gorbunov, A. Sadiev, M. Danilova, S. Horváth, G. Gidel, P. Dvurechensky, A. Gasnikov, P. Richtárik. **High-Probability Convergence for Composite and Distributed Stochastic Minimization and Variational Inequalities with Heavy-Tailed Noise**, Proceedings of the 41st International Conference on Machine Learning, PMLR 235:15951-16070, arXiv:2310.01860 (October 2023)
ICML 2024 **(oral)**

44. N. Kornilov, E. Gorbunov, M. Alkousa, F. Stonyakin, P. Dvurechensky, A. Gasnikov. **Intermediate Gradient Methods with Relative Inexactness**, arXiv:2310.00506 (October 2023)

43. S. Khirirat, E. Gorbunov, S. Horváth, R. Islamov, F. Karray, P. Richtárik. **Clip21: Error Feedback for Gradient Clipping**, 2305.18929 (May 2023)

42. K. Mishchenko, R. Islamov, E. Gorbunov, S. Horváth. **Partially Personalized Federated Learning: Breaking the Curse of Data Heterogeneity**, 2305.18285 (May 2023)

41. Y. Dorn, N. Kornilov, N. Kutuzov, A. Nazin, E. Gorbunov, A. Gasnikov. **Implicitly normalized forecaster with clipping for linear and non-linear heavy-tailed multi-armed bandits**, Computational Management Science, 2305.06743 (May 2023)
Computational Management Science 2024

40. E. Gorbunov. **Unified analysis of SGD-type methods**, 2303.16502 (March 2023)

39. N. Fedin, E. Gorbunov. **Byzantine-Robust Loopless Stochastic Variance-Reduced Gradient**, MOTOR 2023, 2303.04560 (March 2023)
MOTOR 2023

38. S. Choudhury, E. Gorbunov, N. Loizou. **Single-Call Stochastic Extragradient Methods for Structured Non-monotone Variational Inequalities: Improved Analysis under Weaker Conditions**, arXiv:2302.14043 (February 2023)
NeurIPS 2023

37. A. Sadiev, M. Danilova, E. Gorbunov, S. Horváth, G. Gidel, P. Dvurechensky, A. Gasnikov, P. Richtárik. **High-Probability Bounds for Stochastic Optimization and Variational Inequalities: the Case of Unbounded Variance**, arXiv:2302.00999 (February 2023)
ICML 2023

36. A. Gasnikov, D. Dvinskikh, P. Dvurechensky, E. Gorbunov, A. Beznosikov, A. Lobanov. **Randomized gradient-free methods in convex optimization**, Encyclopedia of Optimiza-

tion, arXiv:2211.13566 (November 2022)
Encyclopedia of Optimization 2023

35. E. Gorbunov, A. Taylor, S. Horváth, G. Gidel. **Convergence of Proximal Point and Extragradient-Based Methods Beyond Monotonicity: the Case of Negative Comonotonicity**, arXiv:2210.13831 (October 2022)
ICML 2023

34. A. Beznosikov, B. Polyak, E. Gorbunov, D. Kovalev, A. Gasnikov. **Smooth Monotone Stochastic Variational Inequalities and Saddle Point Problems – Survey**, European Mathematical Society Magazine, (127), 15-28, arXiv:2208.13592 (August 2022)
European Mathematical Society Magazine 2023

33. A. Sadiev, G. Malinovsky, E. Gorbunov, I. Sokolov, A. Khaled, K. Burlachenko, P. Richtárik. **Federated Optimization Algorithms with Random Reshuffling and Gradient Compression**, arXiv:2206.07021 (June 2022)
NeurIPS 2024

32. E. Gorbunov*, M. Danilova*, D. Dobre*, P. Dvurechensky, A. Gasnikov, G. Gidel (*equal contribution). **Clipped Stochastic Methods for Variational Inequalities with Heavy-Tailed Noise**, arXiv:2206.01095 (June 2022)
NeurIPS 2022

31. E. Gorbunov, S. Horváth, P. Richtárik, G. Gidel. **Variance Reduction is an Antidote to Byzantines: Better Rates, Weaker Assumptions and Communication Compression as a Cherry on the Top**, arXiv:2206.00529 (June 2022)
ICLR 2023

30. E. Gorbunov, A. Taylor, G. Gidel. **Last-Iterate Convergence of Optimistic Gradient Method for Monotone Variational Inequalities**, arXiv:2205.08446 (May 2022)
NeurIPS 2022

29. M. Danilova, E. Gorbunov. **Distributed Methods with Absolute Compression and Error Compensation**, arXiv:2203.02383 (March 2022)
MOTOR 2022

28. A. Beznosikov*, E. Gorbunov*, H. Berard*, N. Loizou (*equal contribution). **Stochastic Gradient Descent-Ascent: Unified Theory and New Efficient Methods**, Proceedings of The 26th International Conference on Artificial Intelligence and Statistics, PMLR 206:172-235, arXiv:2202.07262 (February 2022)
AISTATS 2023

27. P. Richtárik, I. Sokolov, I. Fatkhullin, E. Gasanov, Z. Li, E. Gorbunov. **3PC: Three Point Compressors for Communication-Efficient Distributed Training and a Better Theory for Lazy Aggregation**, Proceedings of the 39th International Conference on Machine Learning, PMLR 162:18596-18648, 2202.00998 (February 2022)
ICML 2022

26. E. Gorbunov, H. Berard, G. Gidel, N. Loizou. **Stochastic Extragradient: General Analysis and Improved Rates**, Proceedings of The 25th International Conference on Artificial Intelligence and Statistics, PMLR 151:7865-7901, arXiv:2111.08611 (November 2021)
AISTATS 2022

25. E. Gorbunov, N. Loizou, G. Gidel. **Extragradient Method: $\mathcal{O}(1/K)$ Last-Iterate Convergence for Monotone Variational Inequalities and Connections With Cocoercivity**, Proceedings of The 25th International Conference on Artificial Intelligence and Statistics, PMLR 151:366-402, arXiv:2110.04261 (October 2021)
AISTATS 2022

24. I. Fatkhullin, I. Sokolov, E. Gorbunov, Z. Li, P. Richtárik. **EF21 with Bells & Whistles: Practical Algorithmic Extensions of Modern Error Feedback**, arXiv preprint arXiv:2110.03294

(October 2021)

23. E. Gorbunov*, A. Borzunov*, M. Diskin, M. Ryabinin (*equal contribution). **Secure Distributed Training at Scale**, Proceedings of the 39th International Conference on Machine Learning, PMLR 162:7679-7739, arXiv:2106.11257 (June 2021)
ICML 2022

22. E. Gorbunov, M. Danilova, I. Shibaev, P. Dvurechensky, A. Gasnikov. **Near-Optimal High Probability Complexity Bounds for Non-Smooth Stochastic Optimization with Heavy-Tailed Noise**, arXiv preprint arXiv:2106.05958 (June 2021)

21. M. Ryabinin*, E. Gorbunov*, V. Plokhotnyuk, G. Pekhimenko (*equal contribution). **Moshpit SGD: Communication-Efficient Decentralized Training on Heterogeneous Unreliable Devices**, Advances in Neural Information Processing Systems, 34, arXiv:2103.03239 (March 2021)
NeurIPS 2021

20. E. Gorbunov, K. Burlachenko, Z. Li, P. Richtárik. **MARINA: Faster Non-Convex Distributed Learning with Compression**, Proceedings of the 38th International Conference on Machine Learning, PMLR 139:3788-3798, arXiv:2102.07845 (February 2021)
ICML 2021

19. M. Danilova, P. Dvurechensky, A. Gasnikov, E. Gorbunov, S. Guminov, D. Kamzolov, I. Shibaev. **Recent Theoretical Advances in Non-Convex Optimization**, arXiv preprint arXiv:2012.06188 (December 2020)
High-Dimensional Optimization and Probability 2022

18. E. Gorbunov, A. Rogozin, A. Beznosikov, D. Dvinskikh and A. Gasnikov. **Recent theoretical advances in decentralized distributed convex optimization**, arXiv preprint arXiv:2011.13259 (November 2020)
High-Dimensional Optimization and Probability 2022

17. E. Gorbunov, F. Hanzely and P. Richtárik. **Local SGD: Unified Theory and New Efficient Methods**, Proceedings of The 24th International Conference on Artificial Intelligence and Statistics, PMLR 130:3556-3564, arXiv:2011.02828 (November 2020)
AISTATS 2021

16. E. Gorbunov, D. Kovalev, D. Makarenko and P. Richtárik. **Linearly Converging Error Compensated SGD**, Advances in Neural Information Processing Systems 33, arXiv:2010.12292 (October 2020)
NeurIPS 2020 **(spotlight)**

15. E. Gorbunov, M. Danilova and A. Gasnikov. **Stochastic Optimization with Heavy-Tailed Noise via Accelerated Gradient Clipping**, Advances in Neural Information Processing Systems 33, arXiv preprint arXiv:2005.10785 (May 2020)
NeurIPS 2020

14. A. Beznosikov, E. Gorbunov and A. Gasnikov. **Derivative-Free Method For Decentralized Distributed Non-Smooth Optimization**, IFAC-PapersOnLine, Volume 53, Issue 2, 2020, Pages 4038-4043, DOI: https://doi.org/10.1016/j.ifacol.2020.12.2272, arXiv preprint arXiv:1911.10645 (November 2019)
IFAC 2020

13. E. Gorbunov, D. Dvinskikh, A. Gasnikov. **Optimal Decentralized Distributed Algorithms for Stochastic Convex Optimization**, arXiv preprint arXiv:1911.07363 (November 2019)

12. E. Vorontsova, A. Gasnikov, E. Gorbunov and P. Dvurechensky. **Accelerated Gradient-Free Optimization Methods with a Non-Euclidean Proximal Operator**, Automation and Remote Control, August 2019, Volume 80, Issue 8, pp 1487–1501, https://doi.org/10.1134/S0005117919080095 (August 2019)
Automation and Remote Control 2019

11. E. Gorbunov, A. Bibi, O. Sener, E. Bergou and P. Richtárik. **A Stochastic Derivative Free Optimization Method with Momentum**, ICLR 2020, arXiv:1905.13278 (May 2019)
ICLR 2020

10. E. Gorbunov, F. Hanzely and P. Richtárik. **A unified theory of SGD: variance reduction, sampling, quantization and coordinate descent**, Proceedings of the Twenty Third International Conference on Artificial Intelligence and Statistics, PMLR 108:680-690, 2020, arXiv:1905.11261 (May 2019)
AISTATS 2020

9. D. Dvinskikh, E. Gorbunov, A. Gasnikov, P. Dvurechensky and César A. Uribe. **On Dual Approach for Distributed Stochastic Convex Optimization over Networks**, 58th Conference on Decision and Control, arXiv preprint arXiv:1903.09844 (March 2019)
CDC 2019

8. E. Bergou, E. Gorbunov and P. Richtárik. **Stochastic Three Points Method for Unconstrained Smooth Minimization**, SIAM Journal on Optimization 30, no. 4 (2020): 2726-2749, arXiv:1902.03591 (February 2019)
SIAM Journal on Optimization 2020

7. K. Mishchenko, E. Gorbunov, M. Takác and P. Richtárik. **Distributed Learning with Compressed Gradient Differences**, arXiv preprint arXiv:1901.09269 (January 2019)

6. A. Gasnikov, E. Gorbunov, D. Kovalev, A. Mohammed, E. Chernousova. **The global rate of convergence for optimal tensor methods in smooth convex optimization**, Computer Research and Modeling, 2018, Vol. 10:6, https://doi.org/10.20537/2076-7633-2018-10-6-737-753, arXiv:1809.00382 (September 2018)
Computer Research and Modeling 2018

5. E. Gorbunov, E. Vorontsova and A. Gasnikov. **On the upper bound for the mathematical expectation of the norm of a vector uniformly distributed on the sphere and the phenomenon of concentration of uniform measure on the sphere**, Mathematical Notes, 2019, Volume 106, Issue 1, Pages 13–23, https://doi.org/10.4213/mzm12041, arXiv:1804.03722 (April 2018)
Mathematical Notes 2019

4. P. Dvurechensky, E. Gorbunov and A. Gasnikov. **An Accelerated Directional Derivative Method for Smooth Stochastic Convex Optimization**, European Journal of Operational Research, https://doi.org/10.1016/j.ejor.2020.08.027, arXiv:1804.02394 (April 2018)
European Journal of Operational Research 2020

3. E. Gorbunov, P. Dvurechensky and A. Gasnikov. **An Accelerated Method for Derivative-Free Smooth Stochastic Convex Optimization**, SIAM Journal on Optimization, 32(2), 1210-1238, arXiv:1802.09022 (February 2018)
SIAM Journal on Optimization 2022

2. D. Kovalev, E. Gorbunov, E. Gasanov and P. Richtárik **Stochastic Spectral and Conjugate Descent Methods**, Advances in Neural Information Processing Systems 31, arXiv:1802.03703 (February 2018)
NeurIPS 2019

1. E. Vorontsova, A. Gasnikov and E. Gorbunov. **Accelerated Directional Search with non-Euclidean prox-structure**, Automation and Remote Control, April 2019, Volume 80, Issue 4, pp 693–707, https://doi.org/10.1134/S0005117919040076, arXiv:1710.00162 (September 2017)
Automation and Remote Control 2019

Talks and Posters

56. 25 July, 2024. ICML 2024, Vienna, Austria. Oral Talk and Poster: "High-Probability Convergence for Composite and Distributed Stochastic Minimization and Variational Inequalities with Heavy-Tailed Noise". Links: slides, poster
55. 3 July, 2024. EURO 2024, Copenhagen, Denwmark. Talk: "Byzantine Robustness and Partial Participation Can Be Achieved Simultaneously: Just Clip Gradient Differences". Links: slides
54. 26 June, 2024. EUROPT 2024, Lund, Sweden. Talk: "Last-Iterate Convergence of Extragradient-Based Methods". Links: slides
53. 24 June, 2024. Invited talk at INSAIT: "Byzantine Robustness and Partial Participation Can Be Achieved Simultaneously: Just Clip Gradient Differences". Links: slides
52. 21 June, 2024. Principles of Distributed Learning, Nantes, France. Talk: "Byzantine Robustness and Partial Participation Can Be Achieved Simultaneously: Just Clip Gradient Differences". Links: slides
51. 29 May, 2024. NETYS 2024, online. **Keynote talk** "Byzantine Robustness and Partial Participation Can Be Achieved Simultaneously: Just Clip Gradient Differences". Links: slides
50. 3 May, 2024. AISTATS 2024, Valencia, Spain. Poster: "Communication Compression for Byzantine Robust Learning: New Efficient Algorithms and Improved Rates". Links: poster
49. 3 May, 2024. AISTATS 2024, Valencia, Spain. Poster: "Breaking the Heavy-Tailed Noise Barrier in Stochastic Optimization Problems". Links: poster
48. 7 February, 2024. Federated Learning One-World Seminar, online. Talk "Variance Reduction is an Antidote to Byzantines: Better Rates, Weaker Assumptions and Communication Compression as a Cherry on the Top". Links: slides, video
47. 10 December - 16 December, 2023. NeurIPS 2023, New Orleans, USA. Poster: "Single-Call Stochastic Extragradient Methods for Structured Non-monotone Variational Inequalities: Improved Analysis under Weaker Conditions". Links: poster
46. 10 December - 16 December, 2023. NeurIPS 2023, New Orleans, USA. Poster: "Accelerated Zeroth-order Method for Non-Smooth Stochastic Convex Optimization Problem with Infinite Variance". Links: poster
45. 10 December - 16 December, 2023. NeurIPS 2023, New Orleans, USA. Poster: "Byzantine-Tolerant Methods for Distributed Variational Inequalities". Links: poster
44. 15 September, 2023. TES Conference on Mathematical Optimization for Machine Learning, Berlin, Germany. Talk: "Clipped Methods for Stochastic Optimization with Heavy-Tailed Noise". Links: slides
43. 27 July, 2023. ICML 2023, Honolulu, USA. Poster: "High-Probability Bounds for Stochastic Optimization and Variational Inequalities: the Case of Unbounded Variance". Links: poster
42. 25 July, 2023. ICML 2023, Honolulu, USA. Poster: "Convergence of Proximal Point and Extragradient-Based Methods Beyond Monotonicity: the Case of Negative Comonotonicity". Links: poster
41. 6 June, 2023. Oberseminar at LT Group, University of Hamburg, Hamburg, Germany. Talk: "Algorithms for Stochastic Optimization with Heavy-Tailed Noise and Connections with the Training of Large Language Models". Links: slides

40. 2 May, 2023. ICLR 2023, Kigali, Rwanda. Poster: "Variance Reduction is an Antidote to Byzantines: Better Rates, Weaker Assumptions and Communication Compression as a Cherry on the Top". Links: poster

39. 27 April, 2023. AISTATS 2023, Valencia, Spain. Poster: "Stochastic Gradient Descent-Ascent: Unified Theory and New Efficient Methods". Links: poster

38. 13 February, 2023. PEP talks, UCLouvain, Belgium. Talk "Convergence of Proximal Point and Extragradient-Based Methods Beyond Monotonicity: the Case of Negative Comonotonicity". Links: video, slides

37. 28 November - 9 December, 2022. NeurIPS 2022, New Orleans, USA. Poster: "Clipped Stochastic Methods for Variational Inequalities with Heavy-Tailed Noise". Links: poster

36. 28 November - 9 December, 2022. NeurIPS 2022, New Orleans, USA. Poster: "Last-Iterate Convergence of Optimistic Gradient Method for Monotone Variational Inequalities". Links: poster

35. 8 October, 2022. MBZUAI Workshop on Collaborative Learning: From Theory to Practice, Abu Dhabi, UAE. Talk "Variance Reduction is an Antidote to Byzantines: Better Rates, Weaker Assumptions and Communication Compression as a Cherry on the Top". Links: slides

34. 9 September, 2022. All-Russian Optimization Seminar, online. Talk "Methods with Clipping for Stochastic Optimization and Variational Inequalities with Heavy-Tailed Noise" (in Russian). Links: video, slides

33. 21 July, 2022. ICML 2022, Baltimore, USA. Poster: "Secure Distributed Training at Scale". Links: poster

32. 21 July, 2022. ICML 2022, Baltimore, USA. Poster: "3PC: Three Point Compressors for Communication-Efficient Distributed Training and a Better Theory for Lazy Aggregation". Links: poster

31. 3 July, 2022. MOTOR 2022, Petrozavodsk, Russia. Talk: "Distributed Methods with Absolute Compression and Error Compensation". Links: slides

30. 25 April, 2022. Lagrange Workshop on Federated Learning, online. Talk: "Secure Distributed Training at Scale". Links: slides

29. 29 March, 2022. AISTATS 2022, online. Poster "Extragradient Method: $\mathcal{O}(1/K)$ Last-Iterate Convergence for Monotone Variational Inequalities and Connections With Cocoercivity". Links: poster

28. 28 March, 2022. AISTATS 2022, online. Poster "Stochastic Extragradient: General Analysis and Improved Rates". Links: poster

27. 13 March, 2022. Rising Stars in AI Symposium 2022, KAUST, Saudi Arabia. Talk "Extragradient Method: $\mathcal{O}(1/K)$ Last-Iterate Convergence for Monotone Variational Inequalities and Connections With Cocoercivity". Links: slides, video

26. 16 February, 2022. Vector Institute Endless Summer School session "NeurIPS 2021 Highlights", online. Talk "Moshpit SGD: Communication-Efficient Decentralized Training on Heterogeneous Unreliable Devices" (jointly with Max Ryabinin). Links: slides

25. 20 December, 2021. MLO EPFL internal seminar, online. Talk "Moshpit SGD: Communication-Efficient Decentralized Training on Heterogeneous Unreliable Devices". Links: slides

24. 10 December, 2021. NeurIPS 2021, online. Poster "Moshpit SGD: Communication-Efficient Decentralized Training on Heterogeneous Unreliable Devices". Links: poster

23. 1 December, 2021. MTL MLOpt (internal seminar), online. Talk "Extragradient Method: $\mathcal{O}(1/K)$ Last-Iterate Convergence for Monotone Variational Inequalities and Connections With Cocoercivity". Links: slides

22. 17 November, 2021. All-Russian Optimization Seminar, online. Talk "Extragradient Method: $\mathcal{O}(1/K)$ Last-Iterate Convergence for Monotone Variational Inequalities and Connections With Cocoercivity" (in Russian). Links: video, slides

21. 3 November, 2021. Federated Learning One-World Seminar, online. Talk "Secure Distributed Training at Scale". Links: video, slides

20. 21 July, 2021. ICML 2021, online. Poster "MARINA: Faster Non-Convex Distributed Learning with Compression". Links: poster

19. 14 April, 2021. AISTATS 2021, online. Poster "Local SGD: Unified Theory and New Efficient Methods". Links: poster

18. 10 March, 2021, Federated Learning One-World Seminar, online. Talk "MARINA: Faster Non-Convex Distributed Learning with Compression". Links: video, slides

17. 19 January, 2021. NeurIPS New Year AfterParty at Yandex. Talk "Linearly Converging Error Compensated SGD". Links: video

16. 9 December, 2020. NeurIPS 2020, online. Poster "Stochastic Optimization with Heavy-Tailed Noise via Accelerated Gradient Clipping" (presented by M. Danilova). Links: video, poster

15. 9 December, 2020. NeurIPS 2020, online. Poster "Linearly Converging Error Compensated SGD". Links: video, poster

14. 7 October, 2020, Federated Learning One-World Seminar and Russian Optimization Seminar, online. Talk "Linearly Converging Error Compensated SGD". Links: video, slides

13. 26 – 28 August, 2020, 23rd International Conference on Artificial Intelligence and Statistics (AISTATS 2020), online. I have presented our joint work with Filip Hanzely and Peter Richtárik called "A Unified Theory of SGD: Variance Reduction, Sampling, Quantization and Coordinate Descent". Links: video

12. 8 July, 2020, Russian Optimization Seminar, online. Talk "On the convergence of SGD-like methods for convex and non-convex optimization problems" (in Russian). Links: video, slides

11. 28 June – 10 July, 2020, Machine Learning Summer School, online. I have presented our joint work with Dmitry Kovalev, Dmitry Makarenko and Peter Richtárik called "Linearly Converging Error Compensated SGD". Links: video, slides

10. 27 – 30 April, 2020, 8-th International Conference on Learning Representations (ICLR 2020), online. I have presented our joint work with Adel Bibi, Ozan Sener, El Houcine Bergou and Peter Richtárik called "A Stochastic Derivative Free Optimization Method with Momentum". Links: video

9. 14 December, 2019, NeurIPS 2019 workshop "Optimization Foundations for Reinforcement Learning", Vancouver, Canada. Poster "A Stochastic Derivative Free Optimization Method with Momentum"

8. 13 December, 2019, NeurIPS 2019 workshop "Beyond First Order Methods in ML", Vancouver, Canada. Poster "An Accelerated Method for Derivative-Free Smooth Stochastic Convex Optimization"

7. 18 October, 2019, SIERRA research seminar, INRIA. Talk "A Unified Theory of SGD: Variance Reduction, Sampling, Quantization and Coordinate Descent". Links: slides

6. 1-6 July 2018, 23rd International Symposium on Mathematical Programming, Bordeaux, France. Talk "An Accelerated Directional Derivative Method for Smooth Stochastic Convex Optimization"
5. 10-15 June 2018, Traditional Youth School "Control, Information and Optimization" organized by Boris Polyak and Elena Gryazina, Voronovo, Russia. Poster and Talk "An Accelerated Directional Derivative Method for Smooth Stochastic Convex Optimization"
4. 14 April 2018, Workshop "Optimization at Work", MIPT, Dolgoprudny, Russia. Talk "An Accelerated Method for Derivative-Free Smooth Stochastic Convex Optimization"
3. 5-7 February 2018, KAUST Research Workshop on Optimization and Big Data, KAUST, Thuwal, Saudi Arabia. Joint Poster "Stochastic Spectral Descent Methods" with D. Kovalev and E. Gasanov
2. 25 November 2017, 60th Scientific Conference of MIPT, Section of Information Transmission Problems, Data Analysis and Optimization, IITP, Moscow, Russia. Talk "About accelerated Directional Search with non-Euclidean prox-structure"
1. 27 October 2017, Workshop "Optimization at Work", MIPT, Dolgoprudny, Russia. Talk "Accelerated Directional Search with non-Euclidean prox-structure"

Reviewing

- TMLR Action Editor: July 2024 – Now.
- ICML 2024: 6 papers.
- Mathematical Programming: 1 paper (in 2024)
- Transactions on Machine Learning Research: 1 paper (in 2024)
- Journal Numerische Mathematik: 1 paper (in 2023)
- ICLR 2024: 2 papers
- Journal of Machine Learning Research (JMLR): 1 paper (in 2023)
- SIAM Journal on Mathematics of Data Science (SIMODS): 1 paper (in 2023)
- NeurIPS 2023: 6 papers
- AISTATS 2023: 4 papers
- ICLR 2023: 5 papers
- NeurIPS 2022: 4 papers. I got "outstanding reviewer award" and a free registration to the conference
- Transactions on Machine Learning Research: 1 paper (in 2022)
- Science China Mathematics: 1 paper (in 2021-2022).
- ICML 2022: 4 papers. I got "outstanding reviewer award" and a free registration to the conference
- SIAM Journal on Optimization (SIOPT): 1 paper (in 2021-2022)
- AISTATS 2022: 2 papers
- ICLR 2022: 2 papers
- NeurIPS 2021: 7 papers. I got "outstanding reviewer award" (top 8% of reviewers) and a free registration to the conference

- ICML 2021: 4 papers (**expert reviewer**). I was among the top 10% of reviewers and got a free registration to the conference
- ICLR 2021: 2 papers. I was recognized as an "outstanding reviewer" and got a free registration to the conference
- SIAM Journal on Optimization (SIOPT): 1 paper (in 2020)
- NeurIPS 2020: 6 papers. I was among the top 10% of reviewers and got a free registration to the conference
- Journal of Machine Learning Research (JMLR): 1 paper (in 2020)
- Optimization Methods and Software: 1 paper (in 2019)
- ICML 2019: 4 papers

Teaching

- **Mentor for 2 students' research projects** at the summer school "Modern Methods of Information Theory, Optimization and Control Theory" (Sirius university, Sochi)
- **Co-creator and lecturer of the course** "Optimization Methods for Machine Learning" in MADE, Mail.ru Group (Spring 2020, Spring 2021, Spring 2022) and MIPT (Fall 2020)
- **Organizer of Russian Optimization Seminar**: May 2020 – August 2022
- **Organizer of research seminar on Optimization at MIPT**: March 2020 – June 2020
- **Teaching assistant for the courses**
  - Fall 2022, Spring 2023: ML712: Distributed and Federated Learning (MBZUAI): created and presented lectures on 2 topics (out of 8 topics), replied to the students questions, mentored the projects, checked and created quizes
  - Spring 2019: Algorithms and Models of Computation
  - Fall 2018: Probability Theory
  - Spring 2018: Algorithms and Models of Computation

Summer Schools

- **28 June - 10 July 2020.** Participant of Machine Learning Summer School. I have presented our joint work with Dmitry Kovalev, Dmitry Makarenko and Peter Richtárik called "Linearly Converging Error Compensated SGD". Links: video, slides
- **June 2018.** Participant of Traditional Youth School "Control, Information and Optimization"
- **June 2017.** Participant of Traditional Youth School "Control, Information and Optimization"
- **July 2015.** Participant of Summer School "Contemporary Mathematics" in Dubna
- **July 2014.** Participant of Summer School "Contemporary Mathematics" in Dubna

Interests

- Wakesurfing, Fitness, Hiking
- Football: 9 years in football school in Rybinsk, Russia. I was also playing for an amateur team

Last Updated on October 10, 2024