Eduard Gorbunov

Personal Data

Place and Date of Birth:	Rybinsk, Russia | 22 November 1996
email:	ed-gorbunov@yandex.ru
website:	eduardgorbunov.github.io
WoS Researcher ID:	U-1740-2019
Scopus Author ID:	57207780972
ORCID ID:	0000-0002-3370-4130
DBLP:	https://dblp.org/pid/215/5512.html

Research Interests

Optimization, Randomized Algorithms, Machine Learning

Education

September 2020 – Now	PhD in Computer Science **Moscow Institute of Physics and Technology**, Moscow Advisor: Alexander Gasnikov
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 GPA: 8.9/10
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 GPA: 8.8/10

Work Experience

September 2020 – Now	Junior Researcher at **Yandex.Research-MIPT Laboratory**. Moscow
May 2020 – Now	Junior Researcher at **Laboratory of Advanced Combinatorics and Network Applications**, MIPT, Moscow
May 2020 – Now	Research Assistant at **International Laboratory of Stochastic Algorithms and High-Dimensional Inference**, HSE, Moscow
November 2019 – Now	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

Languages

Russian:	Mothertongue
English:	Advanced

Computer Skills

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

Interests

- Football: 9 years in football school in Rybinsk, Russia. Now I am playing for an amateur team and a student team.
- Table Tennis, Fitness

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

23. E. Gorbunov*, A. Borzunov*, M. Diskin, M. Ryabinin (*equal contribution). **Secure Distributed Training at Scale**, arXiv preprint arXiv:2106.11257 (June 2021)[1]
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**, arXiv preprint arXiv:2103.03239 (March 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 (ICML 2021), arXiv:2102.07845 (February 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)
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)
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 (AISTATS 2021), arXiv:2011.02828 (November 2020)
16. E. Gorbunov, D. Kovalev, D. Makarenko and P. Richtárik. **Linearly Converging Error Compensated SGD**, Advances in Neural Information Processing Systems 33 (NeurIPS 2020), arXiv:2010.12292 (October 2020)

[1] The date when it first appeared online.

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 (NeurIPS 2020), arXiv preprint arXiv:2005.10785 (May 2020)

14. A. Beznosikov, E. Gorbunov and A. Gasnikov. **Derivative-Free Method For Decentralized Distributed Non-Smooth Optimization**, accepted to IFAC World Congress 2020, arXiv preprint arXiv:1911.10645 (November 2019)

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)

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

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)

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)

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)

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)

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)

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

3. E. Gorbunov, P. Dvurechensky and A. Gasnikov. **An Accelerated Method for Derivative-Free Smooth Stochastic Convex Optimization**, arXiv preprint arXiv:1802.09022 (February 2018)

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)

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)

Talks and Posters

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".

Scholarships, Honors and Awards

- **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)
- **21 February, 2019.** I got an offer for Ph.D. in Machine Learning in the H. Milton Stewart School of Industrial and Systems Engineering at Georgia Institute of Technology, Atlanta, USA including graduate assistantship, H. Milton Stewart Fellowship and Georgia Tech Alumnus Fellowship.
- **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)

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)

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) and MIPT (Fall 2020)
- **Organizer of Russian Optimization Seminar**: May 2020 – Now
- **Organizer of research seminar on Optimization at MIPT**: March 2020 – Now
- **Teaching assistant for the courses**
  - Spring 2019: Algorithms and Models of Computation
  - Fall 2018: Probability Theory
  - Spring 2018: Algorithms and Models of Computation

Reviewing

- NeurIPS 2020: 7 papers.
- 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.

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

Last Updated on July 24, 2021