Alexander Tyurin

Curriculum Vitae

Education

2017–2020 **PhD in Computer Science**, *Higher School of Economics*, Moscow, Faculty of Computer Science.
PhD thesis: Development of a method for solving structural optimization problems
Supervisor: Alexander Gasnikov
Committee: Yurii Nesterov, Anatoli Juditsky, Boris Mordukhovich, Katya Scheinberg, Alexander Nazin

2015–2017 **Masters of Computer Science**, *Higher School of Economics*, Moscow, Faculty of Computer Science, *GPA – 9.84 / 10*.
Master's programme 'Mathematical Methods of Optimization and Stochastics'

2011–2015 **Bachelor of Computer Science**, *Lomonosov Moscow State University*, Moscow, Faculty of Computational Mathematics and Cybernetics, *GPA – 4.97 / 5*.

Work experience

2021–present **Postdoctoral fellow**, KAUST, Visual Computing Center, Saudi Arabia.
Working on modern optimization tasks with Professor Peter Richtárik.

2018–2021 **Research and development engineer**, Yandex Self-Driving Cars, Moscow.
Using lidar (3D point clouds) and cameras (images) sensors, we develop real-time algorithms for dynamic and static objects detection in a perception team for self-driving cars. Primary responsibilities: from creating datasets and research (Python, SQL, MapReduce) to implementation of proposed algorithms (C++).

2018–2021 **Junior research fellow**, Higher School of Economics, Moscow, Part time.
Working on PhD thesis that is based on 8 publications in Scopus indexed journals.

2017–2020 **Teaching assistant**, Higher School of Economics, Moscow.
Course: Continuous Optimization. Responsibilities: conduct seminars, preparing theoretical and practical homeworks.

2018 **Research engineer**, Alterra.ai, Moscow.
Developed NLP assistant algorithms for generic business tasks.

2015–2018 **Research engineer**, VisionLabs, Moscow.
Developed a face recognition algorithm that showed top 2 result in an international competition FRVT NIST. Primary responsibilities: metric learning with CNN backbone, preparing a large scale face recognition dataset.

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Teaching experience

2018 **Teaching Assistant in Continuous Optimization**, Higher School of Economics, Russia.
Instructed by Dmitry Kropotov

2019 **Teaching Assistant in Continuous Optimization**, Higher School of Economics, Russia.
Instructed by Prof. Alexander Gasnikov

2020 **Teaching Assistant in Continuous Optimization**, Higher School of Economics, Russia.
Instructed by Yurii Dorn

2023 **Teaching Assistant in Machine Learning**, KAUST & ARAMCO, Saudi Arabia.
Instructed by Prof. Peter Richtárik

Grants

Principal Investigator (P.I.) (under review), *Baseload Applied Grant (BAG) at the Research, Development and Innovation Authority (RDIA)*, Saudi Arabia.

2019–2021 **Principal Investigator (P.I.)**, *Russian Foundation for Basic Research grant, project number 19-31-90062*, Russia, with Prof. Alexander Gasnikov. Total amount: ≈ 30K$.

2018–2020 **Participant**, *Russian Foundation for Basic Research project 18-31-20005 mol-a-ved*.

2019–2021 **Participant**, *Russian Foundation for Basic Research grant, project number 19-31-90062*.

2017–2019 **Participant**, *Russian Science Foundation, project number 17-11-01027*.

Awards

2018 **The Ilya Segalovich Award**, Russia.

2016 **The "Lukoil" Award**, Russia.

Computer skills

Python, C++, LaTeX, Matlab, SQL, MapReduce, Git, ...

Languages

Russian **Native**

English **Advanced**

Profiles

Personal website: `https://k3nfalt.github.io`

ORCID: `https://orcid.org/0000-0003-4963-8227`

Google Scholar: Es8-xocAAAAJ

H-index: 12 (Google Scholar, May 2024)

Review Duties

International Conference on Machine Learning (ICML): 2022*, 2023, 2024

Advances in Neural Information Processing Systems (NeurIPS): 2022*, 2023

International Conference on Learning Representations (ICLR): 2023

Transactions on Machine Learning Research (TMLR): 2023, 2024

Journal of Machine Learning Research (JMLR)

Machine Learning (journal)

(*) = Best Reviewer Award

Mentoring

I was honored to mentor the following students:

1. *Rafal Szlendak*, MS/PhD Student at KAUST. This work resulted in the paper "Permutation Compressors for Provably Faster Distributed Nonconvex Optimization // In International Conference on Learning Representations. 2022. (ICLR 2022)"

2. *Kaja Gruntkowska*, Research Intern at KAUST. This work resulted in the paper "EF21-P and Friends: Improved Theoretical Communication Complexity for Distributed Optimization with Bidirectional Compression // In International Conference on Machine Learning. 2023. (ICML 2023)"

3. *Lukang Sun*, PhD student at KAUST. This work resulted in the paper "Sharper Rates and Flexible Framework for Nonconvex SGD with Client and Data Sampling // Transactions on Machine Learning Research. 2023. (TMLR 2023)"

4. *Marta Pozzi*, Research Intern at KAUST.

5. *Ivan Ilin*, PhD student at KAUST.

Preprints

2. *Gruntkowska K., Tyurin A., Richtárik P.* Improving the Worst-Case Bidirectional Communication Complexity for Nonconvex Distributed Optimization under Function Similarity // arXiv:2402.06412

1. *Tyurin A., Pozzi M., Ilin I., Richtárik P.* Shadowheart SGD: Distributed Asynchronous SGD with Optimal Time Complexity Under Arbitrary Computation and Communication Heterogeneity // arXiv:2402.04785

Publications

19. *Fatkhullin I., Tyurin A., Richtárik P.* Momentum Provably Improves Error Feedback! // In Advances in Neural Information Processing Systems 37 (NeurIPS 2023)

18. *Tyurin A., Richtárik P.* Optimal Time Complexities of Parallel Stochastic Optimization Methods Under a Fixed Computation Model // In Advances in Neural Information Processing Systems 37 (NeurIPS 2023)

17. *Tyurin A., Richtárik P.* 2Direction: Theoretically Faster Distributed Training with Bidirectional Communication Compression // In Advances in Neural Information Processing Systems 37 (NeurIPS 2023)

16. *Gruntkowska K., Tyurin A., Richtárik P.* EF21-P and Friends: Improved Theoretical Communication Complexity for Distributed Optimization with Bidirectional Compression // In International Conference on Machine Learning. 2023. (ICML 2023)

15. *Tyurin A., Sun L., Burlachenko K., Richtárik P.* Sharper Rates and Flexible Framework for Nonconvex SGD with Client and Data Sampling // Transactions on Machine Learning Research. 2023. (TMLR 2023)

14. *Tyurin A., Richtárik P.* A Computation and Communication Efficient Method for Distributed Nonconvex Problems in the Partial Participation Setting // In Advances in Neural Information Processing Systems 37 (NeurIPS 2023)

13. *Tyurin A., Richtárik P.* DASHA: Distributed nonconvex optimization with communication compression, optimal oracle complexity, and no client synchronization // In International Conference on Learning Representations. 2023. (ICLR 2023) (oral presentation, notable-top-25%)

12. *Dvurechensky P., Gasnikov A., Tyurin A., Zholobov V.* Unifying Framework for Accelerated Randomized Methods in Convex Optimization // In Foundations of Modern Statistics, 2023

11. *Szlendak R., Tyurin A., Richtárik P.* Permutation Compressors for Provably Faster Distributed Nonconvex Optimization // In International Conference on Learning Representations. 2022. (ICLR 2022)

10. *Ivanova A., Dvurechensky P., Vorontsova E., Pasechnyuk D., Gasnikov A., Dvinskikh D., Tyurin A.* Oracle complexity separation in convex optimization // Journal of Optimization Theory and Applications. 2022.

9. *Stonyakin F., Tyurin A., Gasnikov A., Dvurechensky P., Agafonov A., Dvinskikh D., Alkousa M., Pasechnyuk D., Artamonov S., Piskunova V.* Inexact model: a framework for optimization and variational inequalities // Optimization Methods and Software. 2021. P. 1–47.

8. *Dvurechensky P., Gasnikov A., Omelchenko A., Tyurin A.* A stable alternative to Sinkhorn's algorithm for regularized optimal transport // Lecture Notes in Computer Science. 2020. V. 12095. P. 406–423.

7. *Dvinskikh D., Omelchenko A., Gasnikov A., Tyurin A.* Accelerated gradient sliding for minimizing the sum of functions // Doklady Mathematics. 2020. V. 101. N. 3. P. 244–246.

6. *Tyurin A.* Primal–dual fast gradient method with a model // Computer Research and Modeling. 2020. V. 12, N. 2. P. 263–274. (in russian)

5. *Dvinskikh D., Tyurin A., Gasnikov A., Omelchenko S.* Accelerated and nonaccelerated stochastic gradient descent with model conception // Mathematical Notes. 2020. V. 108. N. 4. P. 511–522 (main co-author).

4. *Gasnikov A., Tyurin A.* Fast gradient descent for convex minimization problems with an oracle producing a (δ, L)-model of function at the requested point // Computational Mathematics and Mathematical Physics. 2019. V. 59. N. 7. P. 1085–1097. (main co-author; alphabetical order).

3. *Stonyakin F., Dvinskikh D., Dvurechensky P., Kroshnin A., Kuznetsova O., Agafonov A., Gasnikov A., Tyurin A., Uribe C., Pasechnyuk D., Artamonov S.* Gradient methods for problems with

inexact model of the objective // Lecture Notes in Computer Science. 2019. V. 11548. P. 97–114.

2. *Ogaltsov A., Tyurin A.* A heuristic adaptive fast gradient method in stochastic optimization problems // Computational Mathematics and Mathematical Physics. 2019. V. 60. N. 7. P. 1108–1115 (main co-author, alphabetical order).

1. *Anikin A., Gasnikov A., Dvurechensky P., Tyurin A., Chernov A.* Dual approaches to the minimization of strongly convex functionals with a simple structure under affine constraints // Computational Mathematics and Mathematical Physics. 2017. V. 57. N. 8. P. 1262–1276.

Selected talks and presentations

Conference publications (at NeurIPS, ICML, ICLR) come with poster presentations, which I have not listed here.

16. London School of Economics, London, England. (2024). Invited talk with the topic "New Theoretical Results in Distributed Optimization: Compressed Communication, Asynchronous Computations, and Beyond."

15. Flatiron Institute, New York City, USA. (2024). Invited talk with the topic "New Theoretical Results in Distributed Optimization: Compressed Communication, Asynchronous Computations, and Beyond."

14. RIKEN AIP, Tokyo, Japan. (2024). Invited talk with the topic "New Theoretical Results in Distributed Optimization: Compressed Communication, Asynchronous Computations, and Beyond."

13. The Workshop on Nonsmooth Optimization and Applications, Antwerp, Belgium. (NOPTA 2024), Poster presentation of the work "Optimal Time Complexities of Parallel Stochastic Optimization Methods Under a Fixed Computation Model"

12. International Conference on Learning Representations, Kigali, Rwanda. (ICLR 2023). Oral presentation of the work "DASHA: Distributed nonconvex optimization with communication compression, optimal oracle complexity, and no client synchronization"

11. KAUST Graduate Seminar. (2023). "EF21-P and Friends: Improved Theoretical Communication Complexity for Distributed Optimization with Bidirectional Compression"

10. Federated Learning Seminar (FLOW). (2022). "EF21-P and Friends: Improved Theoretical Communication Complexity for Distributed Optimization with Bidirectional Compression"

9. EURO 2022, Espoo, Finland. (2022). "Permutation Compressors for Provably Faster Distributed Nonconvex Optimization"

8. Rising Stars in AI Symposium, Saudi Arabia. (2022). "Permutation Compressors for Provably Faster Distributed Nonconvex Optimization"

7. 62th MIPT Scientific Conference, Russia, Dolgoprudny. (18.11.2019 - 23.11.2019). "Primal–dual fast gradient method with a model"

6. The 23rd International Symposium on Mathematical Programming, France, Bordeaux. (1.7.2018 - 6.7.2018). “Universal Nesterov’s gradient method in general model conception”

5. 60th MIPT Scientific Conference, Russia, Dolgoprudny. (20.11.2017 - 25.11.2017). “The mirror triangle method with a generalized inexact oracle”

4. Scientific conference "Modeling the Co-evolution of Nature and Society: problems and experience" devoted to the 100-th anniversary of N. N. Moiseev, Russia, Moscow. (7.11.2017 - 10.11.2017). “Adaptive similar triangles method and its application in calculation of regularized optimal transport”

3. Workshop “Three oracles”, Russia, Skolkovo. (28.12.2016). “On several extensions of similar triangles method”

2. 59th MIPT Scientific Conference, Russia, Dolgoprudny. (21.11.2016 - 26.11.2016). “Adaptive fast gradient method for convex min–max problems”

1. 8th Moscow International Conference on Operations Research, Russia, Moscow. (17.10.2016 - 22.10.2016). “Dual fast gradient method for entropy–linear programming problems”