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# Curriculum Vitae of Ilyas Fatkhullin

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*Research interests:* non-convex/stochastic/distributed optimization, reinforcement learning, robust statistics

## Education

**ETH Zurich**, Switzerland

Ph.D. in Computer Science, ETH AI Center Fellow

12/2021 – 06/2026

Advisor: Prof. Niao He

(expected)

Research visit: **Georgia Institute of Technology**, USA (with Prof. Guanghai Lan), 03–09/2025

*Dissertation Topic:* From Hidden Convexity to Stochastic Dynamics in Reinforcement Learning

**Technical University of Munich**, Germany

M.Sc. in Mathematics

09/2020 – 11/2021

Advisor: Prof. Peter Richtárik

Formal Reviewer: Prof. Michael Ulbrich

*Thesis Topic:* Error Compensation Method for Compressed Distributed Training

**Moscow Institute of Physics and Technology**, Russia

B.Sc. in Mathematics and Informatics

09/2016 – 08/2020

Advisor: Prof. Boris Polyak

*Thesis Topic:* Optimization Landscape of Linear Quadratic Regulator Problem with Output Feedback

## Publications ([Google Scholar](#))

### Refereed Journal Papers

- [1] [I. Fatkhullin](#), N. He, Y. Hu. *Stochastic Optimization under Hidden Convexity*. [SIAM Journal on Optimization](#), 2025.
- [2] J. Wu, A. Barakat, [I. Fatkhullin](#), N. He. *Learning Zero-Sum Linear Quadratic Games with Improved Sample Complexity and Last-Iterate Convergence*. [SIAM Journal on Control and Optimization](#), 2025 (preliminary version at [CDC](#), 2023).
- [3] [I. Fatkhullin](#), I. Sokolov, E. Gorbunov, Z. Li, P. Richtárik. *EF21 with Bells & Whistles: Six Algorithmic Extensions of Modern Error Feedback*. [Journal of Machine Learning Research](#), 2025.
- [4] [I. Fatkhullin](#), B. Polyak. *Optimizing Static Linear Feedback: Gradient Method*. [SIAM Journal on Control and Optimization](#), 2021.
  - Cited over 100 times.
- [5] B. Polyak., [I. Fatkhullin](#). *Use of Projective Coordinate Descent in the Fekete Problem*. [Computational Mathematics and Mathematical Physics](#), 2020.

### Under Review in Journals

- [1] [I. Fatkhullin](#), F. Hübler, G. Lan. *Can SGD Handle Heavy-Tailed Noise?*, 2025.
  - [Oral Presentation Award](#) at NeurIPS'25 Workshop on "Optimization for Machine Learning".
  - Under review in [SIAM Journal on Optimization](#). Preprint: [arXiv:2508.04860](https://arxiv.org/abs/2508.04860).
- [2] [I. Fatkhullin](#), N. He, G. Lan, F. Wolf. *Global Solutions to Non-Convex Functional Constrained Problems with Hidden Convexity*, 2025.
  - [Oral Presentation Award](#) at NeurIPS'25 Workshop "Constrained Optimization for Machine Learning".
  - Under review in [Mathematical Programming, Series A](#). Preprint: [arXiv:2511.10626](https://arxiv.org/abs/2511.10626).

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## Refereed Machine Learning Conference Papers

- [1] A. Sadiev, P. Richtárik, [I. Fatkhullin](#). *Second-order Optimization under Heavy-Tailed Noise: Hessian Clipping and Sample Complexity Limits*. [NeurIPS](#), 2025.
- [2] F. Sun, [I. Fatkhullin](#), N. He. *Natural Gradient VI: Guarantees for Non-Conjugate Models*. [NeurIPS](#), 2025.
- [3] R. Islamov, Y. As, [I. Fatkhullin](#). *Safe-EF: Error Feedback for Nonsmooth Constrained Optimization*. [ICML](#), 2025.
- [4] F. Hübler\*, [I. Fatkhullin](#)\*, N. He. *From Gradient Clipping to Normalization for Heavy-Tailed SGD*. [AISTATS](#), 2025. \*Equal contribution.
- [5] [I. Fatkhullin](#), N. He. *Taming Nonconvex Stochastic Mirror Descent with General Bregman Divergence*. [AISTATS](#), 2024.
- [6] [I. Fatkhullin](#), A. Tyurin, P. Richtárik. *Momentum Provably Improves Error Feedback!* [NeurIPS](#), 2023.
- [7] J. Yang, X. Li, [I. Fatkhullin](#), N. He. *Two Sides of One Coin: the Limits of Untuned SGD and the Power of Adaptive Methods*. [NeurIPS](#), 2023.
- [8] A. Barakat, [I. Fatkhullin](#), N. He. *Reinforcement Learning with General Utilities: Simpler Variance Reduction and Large State-Action Space*. [ICML](#), 2023.
- [9] [I. Fatkhullin](#), A. Barakat, A. Kireeva, N. He. *Stochastic Policy Gradient Methods: Improved Sample Complexity for Fisher-non-degenerate Policies*. [ICML](#), 2023.
- [10] 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*. [ICML](#), 2022.
  - [Spotlight Presentation at ICML Main Track](#) (top 5% submissions).
- [11] [I. Fatkhullin](#)\*, J. Etesami\*, N. He, N. Kiyavash. *Sharp Analysis of Stochastic Optimization under Global Kurdyka-Lojasiewicz Inequality*. [NeurIPS](#), 2022. \*Equal contribution.
- [12] P. Richtárik, I. Sokolov, [I. Fatkhullin](#). *EF21: A New, Simpler, Theoretically Better, and Practically Faster Error Feedback*. [NeurIPS](#), 2021.
  - [Oral Presentation at NeurIPS Main Track](#) (top 1% submissions).
  - [Cited over 200 times](#).

## Fellowships and Awards

Oral Presentation Award from OPT 2025 Workshop at NeurIPS'25	11/2025
Oral Presentation Award from COML 2025 Workshop at NeurIPS'25 for the <i>Best fundamental (theoretical or algorithmic) contribution</i>	10/2025
TMLR Expert Reviewer	09/2025
Rising Star in AI Award, KAUST	02/2023
ICCOPT 2022 Travel Grant	05/2022
Spotlight Presentation Award at ICML	07/2022
Oral Presentation Award at NeurIPS	12/2021
ETH AI Center Doctoral Fellowship	02/2021
German Academic Exchange Service (DAAD) Scholarship for MSc in Germany	04/2020
PreDoc Program Fellowship in Mathematics, Technical University of Munich	03/2020

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## Teaching Experience

*Lecturer*, “Data Analysis and Machine Learning”, Ashesi University, Ghana 05/2025  
Part of the [Ashesi–ETH Master in Mechatronic Engineering](#).

- Independently designed and delivered a 3-week intensive graduate-level course, including syllabus, lectures, coding labs, assignments, a final project, and exam.
- Student evaluations (26/34 response rate): overall instructor rating 4.45/5.00.
- Received particularly strong scores in preparation of lessons (4.54), encouraging participation (4.54), accessibility and approachability (4.58), and use of instructional technology (4.50).

*Teaching Assistant*, “[Optimization for Data Science](#)”, ETH Zurich Spring 2023, 2024

- Led weekly tutorials in a core M.Sc.-level optimization course with 100+ students.
- Co-designed homework assignments and contributed exam questions for midterm and final assessments.
- Held office hours and provided individualized support for students.

*Instructor*, Seminar “Advanced Topics in Machine Learning”, ETH Zurich Fall 2023, 2024

- Guided research-paper discussions, coached students on presentations and scientific writing.
- Evaluated student presentations and advised on short research exploration projects.

## Supervision and Mentoring

Since 2022, I have mentored nine Master’s, semester, and research-project students as a primary supervisor. These collaborations have led to publications in prestigious venues (NeurIPS, ICML, AISTATS, SIAM Journal), and mentees have progressed to Ph.D. programs at ETH Zurich, Caltech, Max Planck Institute.

### *Ph.D. Project Supervision*

- Rustem Islamov (University of Basel) — Ph.D. project.
- Yarden As (ETH Zurich) — Ph.D. project.

### *Master’s Theses*

- Harish Rajagopal (ETH Zurich, 2022) — subsequently Software Developer, PQFORCE (Switzerland).
- Jiduan Wu (ETH Zurich, 2023) — subsequently Ph.D. student, Max Planck ETH CLS.
- Florian Wolf (TU Darmstadt, 2025) — subsequently Ph.D. student, Caltech.
- Fangyuan Sun (ETH Zurich, 2026).
- Chung-En Tsai (ETH Zurich, current) — Master’s Thesis.

### *Research Assistants and Interns*

- Florian Hübler (ETH Zurich, 2024) — subsequently Ph.D. student, ETH Zurich.

### *Semester Projects*

- Fangyuan Sun (ETH Zurich, 2025) — continued to Master’s Thesis under my supervision at ETH Zurich.
- Lucas Whitfield (ETH Zurich, 2026).

## Research Internships and Short-term Visits

*Amazon*, Luxembourg 10/2025-02/2026  
Applied Scientist Intern in Forecasting & Optimization Team  
Worked on large-scale capacity management problems of Amazon’s delivery network.

*Georgia Institute of Technology*, Atlanta, USA  
H. Milton Stewart School of Industrial and Systems Engineering 03–09/2025

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with Prof. Guanghui (George) Lan Studied properties of stochastic gradient descent under infinite variance.	
<b>King Abdullah University of Science and Technology</b> , Saudi Arabia (remote) with Prof. Peter Richtárik Worked on federated learning algorithms with momentum and quantization.	03–09/2021
<b>École Polytechnique Fédérale de Lausanne</b> , Switzerland (remote) with Prof. Sebastian Stich and Prof. Martin Jaggi Studied accelerated methods for convex optimization.	06–10/2020
<b>German Electron Synchrotron (DESY)</b> , Hamburg; with Prof. Judith Katzy Applied adversarial learning methods to the detection of events in high-energy physics.	07–09/2019
<b>Helmholtz-Zentrum Berlin</b> , Germany; with Prof. Ji Li Developed numerical solvers for physical simulations in materials science.	07–08/2018

## Professional Activities

*Journal Reviewer:* Mathematical Programming; Operations Research; SIAM Journal on Optimization; SIAM Journal on Control and Optimization; Journal of Machine Learning Research; IEEE Transactions on Automatic Control; Transactions on Machine Learning Research.

*Conference Reviewer:* ICML (2022-2024); AISTATS 2023; NeurIPS (2023-2025); ICLR 2024.

<i>Session Organizer</i> at INFORMS Optimization Society Conference Location: Rice University, Houston, USA Cluster and Session Title: “Optimization in Data Science”; “Recent Advances in Min-Max Optimization”	07/2024
<i>Session Organizer</i> at International Conference on Continuous Optimization Location: University of Southern California, Los Angeles, USA Cluster and Session Title: “Optimization for Data Science”; “Adaptive Methods in Optimization”	07/2025
<i>Session Organizer</i> at INFORMS Optimization Society Conference Location: Atlanta, USA Session Title: “Methods for Multi-stage Decision Making”	03/2026
<i>Session Organizer</i> at SIAM Optimization Conference Location: Edinburgh, United Kingdom Session Title: “Optimization under Data-driven Constraints”	06/2026

## Selected Talks

I. Fatkhullin. <i>Natural Gradient Variational Inference: Guarantees for Non-conjugate Models.</i> <a href="#">SlidesLive</a> <a href="#">NeurIPS 2025</a> , San Diego, USA	11/2025
I. Fatkhullin. <i>Can SGD Handle Heavy-Tailed Noise?</i> H. Milton Stewart School of ISyE, Georgia Institute of Technology, Atlanta, USA	08/2025
I. Fatkhullin. <i>Safe Error Feedback with Applications in Humanoid Robot Fleet Training.</i> International Conference on Stochastic Programming (ICSP 2025), Paris, France	08/2025
I. Fatkhullin. <i>Nonconvex Stochastic Mirror Descent with Implications in Machine Learning.</i> International Conference on Continuous Optimization (ICCOPT 2025), Los Angeles, USA	07/2025
I. Fatkhullin. <i>Heavy-Tailed Gradients in AI Models.</i> ETH AI Center Seminar, Zurich, Switzerland	12/2024
I. Fatkhullin. <i>Stochastic Optimization under Hidden Convexity.</i> European Conference on Advances in Continuous Optimization (EUROPT 2024), Lund, Sweden	07/2024

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I. Fatkhullin. <i>Momentum Provably Improves Error Feedback!</i> <a href="#">SlidesLive NeurIPS 2023</a> , New Orleans, USA	12/2023
I. Fatkhullin. <i>Stochastic Policy Gradient Methods for Fisher-non-degenerate Policies.</i> <a href="#">SlidesLive ICML 2023</a> , Honolulu, USA	07/2023
I. Fatkhullin. <i>Policy Gradient Methods in Reinforcement Learning.</i> Rising Star in AI Symposium, KAUST, Saudi Arabia	02/2023
I. Fatkhullin. <i>Stochastic Optimization under Kurdyka-Lojasiewicz Condition.</i> Institute of Machine Learning Seminar, Zurich, Switzerland	10/2022
I. Fatkhullin. <i>Stochastic Optimization under Kurdyka-Lojasiewicz Condition.</i> ETH AI Center Doctoral Seminar, Zurich, Switzerland	06/2022
I. Fatkhullin. <i>Practical Algorithmic Extensions of Modern Error Feedback.</i> <a href="#">Federated Learning One World (FLOW) Seminar</a>	10/2021

## References

### Prof. Niao He

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ETH Zurich, Switzerland  
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### Prof. Peter Richtárik

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King Abdullah University of Science and Technology (KAUST), Saudi Arabia  
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### Prof. Guanghui (George) Lan

A. Russell Chandler III Chair and Professor, ISyE  
Georgia Institute of Technology, Atlanta, USA  
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### Prof. Yifan Hu

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Rutgers University, New Brunswick, New Jersey, USA  
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### Prof. Sebastian U. Stich

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