

Dr. Pavel Dvurechensky

Curriculum Vitae

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Date of birth: April 10, 1987

Academic Vitae

- 2023 **Habilitation in mathematics**, *Humboldt University Berlin*, Berlin, Germany.
Title: “Large-Scale Numerical Optimization: Inexact Oracle, Primal-Dual Analysis, Ill-Conditioned Problems”, defense on 20.11.2023.
- 2015–now **Research fellow**, *Weierstrass Institute for Applied Analysis and Stochastics, Research Group 6 “Stochastic Algorithms and Nonparametric Statistics”*, Berlin, Germany.
Research topics: algorithms for continuous optimization problems, saddle-point problems and variational inequalities (convex and non-convex problems, zeroth-, first-, second-, and higher-order methods, stochastic and deterministic settings, inexact oracle, randomized methods, such as random coordinate descent), their application to machine learning problems, optimal transport distances and barycenters, Nash games, resource allocation, congested traffic modeling, web-page ranking, distributed optimization, gas networks equilibrium models.
- 2014–2015 **Researcher (PostDoc)**, *Institute for Information Transmission Problems, sector 7 of Mathematical Methods of Predictive Modeling*, Moscow, Russia.
Developing algorithms for convex optimization problems and differential games.
- 2012–2015 **Junior researcher**, *Moscow Institute of Physics and Technology (MIPT), Laboratory of Structural Methods of Data Analysis in Predictive Modeling (PreMoLab)*, Moscow, Russia.
Developing algorithms for convex optimization problems (including saddle-point and stochastic optimization problems) and differential games. Experience of administrating an industry contract with an international telecom company.
- 2010–2013 **PhD in mathematics**, *Moscow Institute of Physics and Technology (MIPT)*, Moscow, Russia.
PhD Thesis “Algorithms for constructing epsilon-optimal strategies for nonlinear differential games on a plane”, defense on 19.12.2013.
- 2009–2013 **Junior researcher**, *Moscow Institute of Physics and Technology (MIPT), Department of Mathematics*, Moscow, Russia.
Developing and programming algorithms for linear and nonlinear differential games.
- 2008–2014 **Assistant lecturer**, *Moscow Institute of Physics and Technology (MIPT), Chair of mathematical foundations of control*, Moscow, Russia.
Exercise lessons on optimization theory and methods for third-year students.
- 2008–2010 **Master’s Diploma**, *Moscow Institute of Physics and Technology (MIPT)*, Moscow, Russia.
Grade 4.9/5.0 (Graduated with honors/distinction)

2004–2008 **Bachelor's Diploma**, *Moscow Institute of Physics and Technology (MIPT)*, Moscow, Russia.
Grade 4.9/5.0 (Graduated with honors/distinction)

Non-Academic Vitae

2009–2011 **Project manager in IT**, *COMPETENTUM GROUP*, Moscow, Russia.
Management of the project team consisting of software developers, analysts, QA engineers, and designers for developing web-based Learning Management Systems in corporate and academic segments. Experience with SCRUM. Certificate of company's PMBOK courses. Account management experience.

2008–2009 **IT-analyst**, *COMPETENTUM GROUP*, Moscow, Russia.
Aggregation and analysis of client's demands, searching for proposals to the client, preparation of solution presentation to the client. Preparation of requirements specification for Learning Management Systems and Information Management Systems, survey reports on processes to be automated, market surveys. Technical support for clients on implemented solutions.

Habilitation

title *Large-Scale Numerical Optimization: Inexact Oracle, Primal-Dual Analysis, Ill-Conditioned Problems*

university Humboldt University Berlin

PhD Thesis

title *Algorithms for constructing epsilon-optimal strategies for nonlinear differential games on a plane*

supervisor Prof. Dr. Grigory E. Ivanov, Moscow Institute of Physics and Technology (MIPT)

Funding acquisition

- Equilibria for Distributed Multi-Modal Energy Systems under Uncertainty (co-PI with C. Geiersbach, M. Hintermüller, and A. Kannan), 2023-2025, Germany's Excellence Strategy – The Berlin Mathematics Research Center MATH⁺, Funded by German Research Foundation.
- Analysis of brain signals by Bayesian Optimal Transport (co-PI with K.-R. Müller, S. Nakajima, V. Spokoiny), 2021-2024, Germany's Excellence Strategy – The Berlin Mathematics Research Center MATH⁺, Funded by German Research Foundation.
- Optimal Transport for Imaging (co-PI with M. Hintermüller and V. Spokoiny), 2019-2022, Germany's Excellence Strategy – The Berlin Mathematics Research Center MATH⁺, Funded by German Research Foundation.

Research Interests

- First- and second-order algorithms for convex and non-convex large-scale optimization problems.
- Randomized algorithms: random coordinate descent, random (zero-order/derivative-free) directional search.
- Algorithms for stochastic optimization.
- Optimization under inexact information and with adaptivity to unknown smoothness parameters.
- Second-order and higher-order (tensor) optimization methods.
- Numerical and complexity aspects of Optimal Transport distances and barycenters.

- Algorithms for saddle-point problems and variational inequalities.
- Distributed optimization (parallel and decentralized).
- Applications to Nash games, resource allocation, congested traffic modeling, web-page ranking, machine learning, gas networks equilibrium models.

Selected Scientific Talks

- Workshop on Nonsmooth Optimization and Applications (NOPTA 2024), Antwerp, Belgium, 2024 (semi-plenary)
- TES Conference on Mathematical Optimization for Machine Learning, Berlin, 2023
- 6th European Conference on Computational Optimization (EUCCO), Heidelberg, 2023 (invited)
- Participation in the ESGI 175 - the Berlin Studygroup with Industry, Berlin, 2023
- 20th EUROPT Workshop on Continuous Optimization (EUROPT 2023), Budapest, 2023 (invited)
- Optimization and Statistical Learning, Les Houches, 2023 (poster)
- French-German-Portugal Conference on Optimization, Porto, 2022 (invited)
- SIAM Conference on Imaging Science (IS22), online, 2022 (invited)
- Information Technologies and Systems (ITaS), online, 2021 (invited plenary talk)
- INFORMS Annual Meeting 2021, Anaheim, USA, 2021 (invited)
- Optimization without borders (dedicated to Yurii Nesterov's 65th and Valdimir Protasov's 50th burthday), Sochi, Russia, 2021 (invited)
- International Conference on Machine Learning, online, 2021
- EUROPT 2021 18th Workshop on Advances in Continuous Optimization, online, 2021 (invited)
- Moscow conference on combinatorics and applications, online, 2021
- INFORMS Telecommunications and Network Analytics Conference, online, 2020
- Workshop on PDE Constrained Optimization under Uncertainty and Mean Field Games, Berlin, Germany, 2020
- Workshop on Mathematics of Deep Learning, Berlin, Germany, 2019
- HSE-Yandex autumn school on generative models, Moscow, Russia, 2019 (invited lecture)
- Computational and Mathematical Methods in Data Science, Berlin, Germany, 2019 (poster)
- Recent advances in mass transportation, Moscow, Russia, 2019 (invited)
- Worksop on Optimization and applications, Moscow, Russia, 2019 (invited)
- International Conference on Continuous Optimization, Berlin, Germany, 2019
- Conference on Learning Theory, Phoenix, USA, 2019
- International Conference on Machine Learning, Long Beach, USA, 2019
- Optimization and statistical learning, Les Houches, France, 2019 (invited poster)
- Conference on Neural Information Processing Systems (NeurIPS), Montreal, Canada, 2018 (spotlight)
- International Conference on Machine Learning, Stockholm, Sweden, 2018
- International Symposium on Mathematical Programming, Bordeaux, France, 2018
- Games, Dynamics and Optimization, Vienna, Austria, 2018 (invited)
- Mathematics and Image Analysis, Berlin, Germany, 2018 (poster)
- International Matheon Conference on Compressed Sensing and its Applications, Berlin, Germany, 2017 (poster)
- Co-Evolution of Nature and Society Modelling, Problems & Experience. Devoted to Academician Nikita Moiseev centenary (Moiseev-100), Moscow, Russia, 2017
- 18th French-German-Italian Conference on Optimization, Paderborn, Germany, 2017
- Foundations of Computational Mathematics, Barcelona, Spain, 2017 (poster)

- Optimization and Statistical Learning, Les Houches, France, 2017 (poster)
- Workshop: Shape, Images and Optimization, Münster, Germany, 2017 (poster)
- Conference on Neural Information Processing Systems (NIPS), Barcelona, Spain, 2016 (poster)
- Moscow International Conference on Operations Research (ORM), Moscow, Russia, 2016
- Workshop on Modern Statistics and Optimization, Moscow, Russia, 2016
- 30th annual conference of the Belgian Operation Research Society, ORBEL30, Louvain-la-Neuve, Belgium, 2016
- IITP RAS Conference & School "Information Technology and Systems", Russia, 2014, 2015
- International Conference on Optimization Methods and Applications, Petrovac, Montenegro, 2013, 2014, 2016
- Traditional School for Young Researchers "Control, Information, Optimization", Moscow, Russia, 2012 – 2015

Organizational Activities

- Co-organizer of the Workshop on Optimal Transport from Theory to Applications, HU Berlin, 2024.
- Co-organizer of the seminar “Modern Methods in Applied Stochastics, and Nonparametric Statistics” at WIAS since 2016.
- Mini-symposium organizer at TES Conference on Mathematical Optimization for Machine Learning, 2023.
- Mini-symposium co-organizer at SIAM Conference on Imaging Science (IS22), 2022.
- Co-organizer of WIAS Days 2019.
- Session co-organizer at International Conference on Continuous Optimization, 2019.
- Co-organizer of Workshop Foundations of Modern Statistics, WIAS, 2019
- Co-organizer of a reading group on Deep Learning at WIAS, 2016-2018.

Teaching experience

- Modern Algorithmic Optimization, autumn semester 2021, lectures, Higher School of Economics, Moscow
- Theory of optimization algorithms for large-scale problems motivated by machine learning applications, winter semester 2020/2021, lectures and exercises, Humboldt University, Berlin
- Modern Algorithmic Optimization, autumn semester 2020, lectures, Higher School of Economics, Moscow
- Recent developments in optimization methods and machine learning applications, winter semester 2019/2020, lectures and exercises, Humboldt University, Berlin
- Applied convex optimization, 2012-2014, elective course, lectures and exercises, Moscow Institute of Physics and Technology, Moscow
- Differential games on a plane, 2012-2013, elective course, lectures, Moscow Institute of Physics and Technology, Moscow
- Optimization methods, 2008-2014, exercises, Moscow Institute of Physics and Technology, Moscow

Diploma supervision

- A. Bayandina, Bachelor Thesis, Moscow Institute of Physics and Technology, Moscow, 2017.
- S. Omelchenko, Mater Thesis (co-supervisor), Moscow Institute of Physics and Technology, Moscow, 2017.

- A. Tiurin, Mater Thesis (co-supervisor), Higher School of Economics, Moscow, 2017.
- D. Kamzolov, Mater Thesis (co-supervisor), Moscow Institute of Physics and Technology, Moscow, 2018.
- A. Ivanova, Mater Thesis (co-supervisor), Moscow Institute of Physics and Technology, Moscow, 2020.

Professional activities

Reviewer for

- International Conference on Machine Learning (ICML) 2019, 2020 (top 33% reviewer)
- Neural Information Processing Systems (NeurIPS) 2016, 2019, 2020, 2023
- International Conference on Learning Representations 2021
- Journal of Machine Learning Research
- Foundations of Computational Mathematics
- SIAM Journal on Optimization
- Mathematical Programming
- EURO Journal on Computational Optimization
- Journal of Optimization Theory and Applications
- Optimization Methods and Software
- Operations Research
- Computational Optimization and Applications
- Numerical Algorithms
- Artificial Intelligence
- Journal of Inverse and Ill-Posed problems
- Applied Mathematics and Optimization

Languages

Language 1	Russian	<i>Native</i>
Language 2	English	<i>Fluent</i>
Language 3	German	<i>Basic</i>

Personal Interests

Cycling, traveling, coffee

References

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| ○ Prof. Vladimir Spokoiny | spokoiny@wias-berlin.de |
| ○ Prof. Yurii Nesterov | yurii.nesterov@uclouvain.be |
| ○ Prof. Alexander Gasnikov | gasnikov@yandex.ru |