Dmitrii Pavlov

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Research interests

Positive geometry and real algebraic geometry. Their applications to physics and optimization.

Academic employment

10/25– **Senior postdoc**, *Max Planck Institute for Physics, Quantum Field Theory group*.

10/24–09/25 **Postdoctoral researcher**, *TU Dresden, Real Algebraic Geometry group*.

08/24–09/24 **Postdoctoral researcher**, *Max Planck Institute for Mathematics in the Sciences, Numerical Nonlinear Algebra group*.

Education

08/22–08/24 **PhD in Mathematics**, *Max Planck Institute for Mathematics in the Sciences*, *Thesis: Real Algebraic Geometry for Physics and Optimization*, *Advisors: Bernd Sturmfels and Simon Telen*.

09/16–06/22 **Specialist (equivalent to Masters) in Fundamental Mathematics**, *Moscow State University*, *Advisors: Yury P. Razmyslov and Gleb Pogudin*.

Research Articles

Parke–Taylor varieties B. Hollering and D. Pavlov, `https://arxiv.org/abs/2509.09323`, 2025.

Adjoints of polytopes: Determinantal representations and smoothness C. Brüser, M. Kummer and D. Pavlov, `https://arxiv.org/abs/2507.01672`, 2025.

Combinatorics of $m = 1$ Grasstopes Y. Mandelshtam, D. Pavlov, and E. Pratt, *Combinatorial Theory*, `https://doi.org/10.5070/C65265411`, 2025.

Algebraic geometry of quantum graphical models E. Duarte, D. Pavlov, and M. Wiesmann, *Advances in Applied Mathematics*, `https://doi.org/10.1016/j.aam.2025.102930`, 2025.

From Feynman diagrams to the amplituhedron: A gentle review S. De, D. Pavlov, M. Spradlin, A. Volovich, *Special volume on Positive Geometry, Le Matematiche*, `https://doi.org/10.4418/2025.80.1.9`, 2025.

Hyperplane arrangements in the Grassmannian E. Mazzucchelli, D. Pavlov and K. Wang, *Special volume on Positive Geometry, Le Matematiche*, `https://doi.org/10.4418/2025.80.1.16`, 2025.

On real and observable rational realizations of input-output equations S. Falkensteiner, D. Pavlov, and J. R. Sendra, *Systems & Control Letters*, https://doi.org/10.1016/j.sysconle.2025.106059, 2025.

Positive Polytopes with Few Facets in the Grassmannian D. Pavlov, K. Ranestad, https://arxiv.org/abs/2503.01652, 2025.

Santaló geometry of convex polytopes D. Pavlov and S. Telen, *SIAM Journal on Applied Algebra and Geometry,* https://doi.org/10.1137/24M1643566, 2025.

Gibbs manifolds D. Pavlov, B. Sturmfels, and S. Telen, *Information Geometry*, https://doi.org/10.1007/s41884-023-00111-2, 2024.

Logarithmically sparse symmetric matrices D. Pavlov, *Beiträge zur Algebra und Geometrie*, https://doi.org/10.1007/s13366-024-00753-y, 2024.

On realizing differential-algebraic equations by rational dynamical systems D. Pavlov and G. Pogudin, *Proceedings of the ACM International Symposium on Symbolic and Algebraic Computation (ISSAC 2022)*, https://doi.org/10.1145/3476446.3535492, 2022.

From algebra to analysis: new proofs of theorems by Ritt and Seidenberg D. Pavlov, G. Pogudin, and Yu. Razmyslov, *Proceedings of the American Mathematical Society*, https://doi.org/10.1090/proc/16065, 2022.

Talks

11 Jun 2025 **Determinantal representations of adjoints of polytopes**, *UNIVERSE+ Online Seminar*.

10 Apr 2025 **Positive polytopes with few facets in the Grassmannian**, *Nonlinear Algebra Seminar*, MPI MiS, Leipzig.

6 Feb 2025 **Gibbs manifolds**, *Numerical (Nonlinear) Algebra in the Sciences*, MPI CBG, Dresden.

29 Nov 2024 **From Feynman diagrams to the amplituhedron**, *Positive Geometry Seminar*, MPI MiS, Leipzig.

20 Nov 2024 **Hyperplane arrangements in the Grassmannian**, *Statistics and Data Science Seminar*, TU Munich.

12 Nov 2024 **Santaló geometry of convex polytopes**, *Geometry Seminar*, TU Dresden.

25 Sep 2024 **Santaló geometry of convex polytopes**, *Wachspress Geometry Workshop*, Universität Leipzig.

29 Apr 2024 **Santaló geometry of convex polytopes**, *Algebra Seminar*, Brown University, Providence.

17 Apr 2024 **Santaló geometry of convex polytopes**, *Discrete Mathematics and Discrete Geometry Seminar*, TU Berlin.

8 Mar 2024 **What is a Grasstope?**, *What is... talks*, MPI CBG, Dresden.

31 Jan 2024 **Combinatorics of $m = 1$ Grasstopes**, *Quantum Field Theory Group Seminar*, MPI for Physics, Munich.

5 Dec 2023 **Combinatorics of $m = 1$ Grasstopes**, *Geometry Seminar*, TU Dresden.

29 Nov 2023 **Algebraic geometry of quantum graphical models**, *InterCity Seminar*, Universität Konstanz.

20 Oct 2023 **Realizations of input-output equations: rational, observable, and real**, *Kolchin Seminar in Differential Algebra (online)*.

11 Jul 2023 **Gibbs manifolds**, *SIAM AG23, Minisimposium on Geometric and Algebraic Methods in Qunatum Information, Eindhoven*.

10 May 2023 **Real realizations of algebraic differential equations**, *Nonlinear Algebra Seminar, MPI MiS, Leipzig*.

21 Mar 2023 **Gibbs manifolds**, *New Directions in Real Algebraic Geometry, Mathematisches Forschungsinstitut Oberwolfach*.

9 Mar 2023 **What is a Gibbs manifold?**, *Algebra, Geometry and Computation, CWI Amsterdam*.

1 Mar 2023 **What is a Gibbs manifold?**, *Nonlinear Algebra Seminar, MPI MiS*.

5 Oct 2022 **Realizability of algebraic differential equations by rational dynamical systems**, *Nonlinear Algebra Seminar, MPI MiS*.

12 Apr 2022 **Realizability of algebraic differential equations by rational dynamical systems**, *Algebra and Model Theory Seminar, Moscow State University*.

8 Dec 2020 **The analytic spectrum of a differential $\mathbb{C}$-algebra with several commuting derivations**, *Algebra and Model Theory Seminar, Moscow State University*.

8 May 2019 **Differentially flat systems**, *Algebra and Model Theory Seminar, Moscow State University*.

Poster presentations

August 2025 **Santaló Geometry of Convex Polytopes**, *Computations in Algebraic Geometry: Complex, Real and Tropical, ETH Zürich*.

July 2024 **Santaló Geometry of Convex Polytopes**, *MEGA 2024, Leizpig*.

Teaching

SS25 **Funktionentheorie (Complex Analysis)**, *TU Dresden*, Exercise Sessions (in German).

Feb 2025 **Nonlinear Algebra for Physics**, *ICTS Bengaluru, Positive Geometry in Scattering Amplitudes and Cosmological Correlators Program*, Mini-course.

WS24/25 **Differentialgleichungen und Mannigfaltigkeiten (ODEs and Manifolds)**, *TU Dresden*, Exercise Sessions (in German).

Outreach

2019–2021 **Moscow Center for Continuous Mathematical Education**, *Editor of interactive courses and textbooks in mathematics*.

2019–2020 **Yandex.Math**, *Consultant of interactive courses in mathematics*.

2018–2019 **Mathematical Circle of MSU Faculty of Mechanics and Mathematics**, *Tutor*.

Events organized

July 2025 **Mini-symposium "Combinatorial and Computational aspects of Positive Geometry"**, *SIAM AG 2025, Madison*.

May 2024 **Combinatorial Algebraic Geometry from Physics Summer School**, *Leipzig*.

Nov 2023 **1st IMPRS COMBO Autumn School**, *Leipzig*.

Computer skills

Python, Julia, Macaulay2, Sage

Language proficiency

Russian (native), English (C2), German (B2), French (B2)