

Pavel Galashin

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RESEARCH INTERESTS

- Algebraic combinatorics
 - Total positivity
 - Cluster algebras

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA, USA

- Ph.D. in Mathematics Sep 2014 – Jun 2019
 - Advisor: Alexander Postnikov
 - Thesis title: “Totally positive spaces: topology and applications”

St. Petersburg State University, St. Petersburg, Russia

- M.S. in Mathematics Sep 2009 – Jun 2014
 - Advisor: Gaiane Panina
 - Diploma with distinction

EMPLOYMENT

Cornell University, Ithaca, NY, USA

- Associate Professor Jul 2025 – present

University of California, Los Angeles, Los Angeles, CA, USA

- Associate Professor Jul 2023 – Jun 2025
- Assistant Professor Jul 2019 – Jun 2023
- Alfred P. Sloan Research Fellowship 2021–2023
- NSF CAREER Grant DMS-2046915 2021–2026
Statistical mechanics and knot theory in algebraic combinatorics
- NSF Grant DMS-1954121 2020–2023
Totally positive spaces and cluster algebras
- Best Student Paper 2018
30th International Conference on Formal Power Series and Algebraic Combinatorics
- MIT Presidential Fellowship 2014 – 2015
- V. A. Rokhlin Grant 2014 – 2015
- St. Petersburg Mathematical Society prize for students 2013

FELLOWSHIPS AND AWARDS

SUBMITTED PAPERS

42. Amplituhedra and origami, II: loop level. arXiv:2606.03439.
41. Amplituhedra and origami, I: tree level. arXiv:2410.09574.
40. (with R. Casals, M. Gorsky, L. Shen, M. Sherman-Bennett, and J. Simental) Comparing cluster algebras on braid varieties. arXiv:2508.03816
39. (with T. Lam) Monotone links in DAHA and EHA. arXiv:2307.16794.
38. (with T. Lam, M. Sherman-Bennett, and D. Speyer) Braid variety cluster structures, I: 3D plabic graphs. arXiv:2210.04778.

ACCEPTED PAPERS

37. (with T. Lam and M. Sherman-Bennett) Braid variety cluster structures, II: general type. *Invent. Math.*, available online.
36. (with T. Lam) The twist for Richardson varieties. *Rep. Theory*, to appear. arXiv:2204.05935.
35. (with T. Lam) Positroids, knots, and q, t -Catalan numbers. *Duke Math. J.*, 173(11): 2117–2195, 2024.
34. (with T. Lam) Positroid Catalan numbers. *Comm. AMS*, 4: 357–386, 2024.
33. (with T. George) Move-reduced graphs on a torus. *Trans. AMS*, 377(6): 4055–4099, 2024.
32. (with T. Lam) Plabic links, quivers, and skein relations. *Algebr. Comb.*, 7(2): 431–474, 2024.
31. (with T. Lam, M.-T. Trinh, and N. Williams) Rational noncrossing Coxeter–Catalan combinatorics. *Proc. Lond. Math. Soc.*, 129(4): e12643, 2024.
30. Poset associahedra. *Selecta Math. (N.S.)*, 30(6), 2024.

29. Critical varieties in the Grassmannian.
Comm. Math. Phys., 401: 3277–3333, 2023.
28. (with T. Lam) Positroid varieties and cluster algebras.
Ann. Sci. Éc. Norm. Supér., 56(3): 859–884, 2023.
27. (with A. Postnikov) Purity and separation for oriented matroids.
Mem. Amer. Math. Soc., 289, 2023.
26. Totally nonnegative critical varieties.
Int. Math. Res. Not. IMRN, 2024(5): 3649–3689, 2024.
25. (with G. Nenashev and A. Postnikov) Trianguloids and triangulations of root polytopes.
J. Combin. Theory Ser. A, 201: 105802, 2024.
24. (with A. Postnikov and L. Williams) Higher secondary polytopes and regular plabic graphs.
Adv. Math., 407: 108549, 2022.
23. A formula for boundary correlations of the critical Ising model.
Probab. Theory Related Fields, 182: 615–640, 2022.
22. (with S. Karp and T. Lam) The totally nonnegative Grassmannian is a ball.
Adv. Math., 397: 108123, 2022.
21. (with S. Karp and T. Lam) Regularity theorem for totally nonnegative flag varieties.
J. Amer. Math. Soc., 35(2): 513–579, 2021.
20. Symmetries of stochastic colored vertex models.
Ann. Probab., 49(5): 2175–2219, 2021.
19. (with S. Hopkins, T. McConville, and A. Postnikov) Root system chip-firing II: Central-firing.
Int. Math. Res. Not. IMRN, 2021(13): 10037–10072, 2021.
18. (with T. Lam) Parity duality for the amplituhedron.
Compos. Math., 156(11): 2207–2262, 2020.
17. (with P. Pylyavskyy) Ising model and the positive orthogonal Grassmannian.
Duke Math. J., 169(10): 1877–1942, 2020.
16. (with P. Pylyavskyy) Quivers with subadditive labelings: classification and integrability.
Math. Z., 295: 945–992, 2020.
15. (with S. Karp and T. Lam) The totally nonnegative part of G/P is a ball.
Adv. Math., 351: 614–620, 2019.
14. (with P. Pylyavskyy) The classification of Zamolodchikov periodic quivers.
Amer. J. Math., 141(2): 447–484, 2019.
13. (with P. Pylyavskyy) Quivers with additive labelings: classification and algebraic entropy.
Doc. Math., 24: 2057–2135, 2019.
12. (with S. Hopkins, T. McConville, and A. Postnikov) Root system chip-firing I: Interval-firing.
Math. Z., 292: 1337–1385, 2019.
11. Periodicity and integrability for the cube recurrence.
Math. Z., 299: 1533–1563, 2021.
10. (with P. Pylyavskyy) Linear recurrences for cylindrical networks.
Int. Math. Res. Not. IMRN, 2019(13): 4047–4080, 2019.
9. (with P. Pylyavskyy) R -systems.
Selecta Math. (N.S.), 25(22), 2019.
8. (with P. Blagojević, N. Palić, and G. Ziegler) Some more amplituhedra are contractible.
Selecta Math. (N.S.), 25(8), 2019.
7. (with M. Farber) Weak separation, pure domains and cluster distance.
Selecta Math. (N.S.), 24(3): 2093–2127, 2018.
6. Plabic graphs and zonotopal tilings.
Proc. Lond. Math. Soc., 117(4): 661–681, 2018.
5. A Littlewood-Richardson rule for dual stable Grothendieck polynomials.
J. Combin. Theory Ser. A, 151: 23–35, 2017.
4. (with D. Grinberg and G. Liu) Refined dual stable Grothendieck polynomials and generalized Bender-Knuth involutions.
Electron. J. Combin., 23(3): Paper 3.14, 28, 2016.
3. (with V. Zolotov) Extensions of isometric embeddings of pseudo-Euclidean metric polyhedra.
Electron. Res. Announc. Math. Sci., 23: 1–7, 2016.
2. (with G. Panina) Manifolds associated to simple games.
J. Knot Theory Ramifications, 25(12): 1642003, 14, 2016.
1. Existence of a persistent hub in the convex preferential attachment model.
Probab. Math. Statist., 36(1):59–74, 2016.

TALKS

- Amplituhedra and Origami

Michigan Interdisciplinary Meeting on Amplitudes

Solvable Lattice Models & Interacting Particle Systems. Simons symposium in Krün, Germany

The Amplituhedron: Structure, Combinatorics, and Positive Geometry. Les Diablerets, Switzerland

Perfectly matched perspectives on statistical mechanics, combinatorics and geometry. A conference in honor of Richard Kenyon. Marseille, France

Cornell Discrete Geometry and Combinatorics Seminar

IAS Combinatorics of Fundamental Physics Workshop

Fall 2024-2025
- Move-reduced graphs on a torus vs positroid Catalan numbers

IPAM Workshop II: Integrability and Algebraic Combinatorics

Spring 2024
- Geometric objects associated to planar bipartite graphs

IPAM Workshop I: Statistical Mechanics and Discrete Geometry

Spring 2024
- Introduction to cluster algebras

IPAM: Geometry, Statistical Mechanics, and Integrability Tutorials

Spring 2024
- Monotone links in DAHA and EHA

AIM Workshop “Algebra, geometry, and combinatorics of link homology”

UC Davis Combinatorics Seminar

Spring–Summer 2023
- Parity duality for the amplituhedron

Simons Center for Geometry and Physics Workshop “Combinatorics and Geometry of Convex Polyhedra”

Spring 2023
- Braid variety cluster structures and 3D plabic graphs

USC Combinatorics Seminar

AIM workshop “Cluster algebras and braid varieties”

Winter 2023
- Positroids, knots, and q, t -Catalan numbers

MIT Applied Mathematics Seminar

Cornell Oliver Club

Duke Mathematics Department Colloquium

Canada-Mexico-USA Conference in Representation Theory, Noncommutative Algebra, and Categorification

Open Problems in Algebraic Combinatorics 2022

Stanford Mathematics Department Colloquium

AIM link homology group, cluster structures seminar (Zoom)

AlCoVE conference (Zoom)

Torus Knots Seminar (Zoom)

ICERM workshop, Brown University (Zoom)

2021–2023
- Ising model, total positivity, and criticality

FPSAC 2021 (Zoom)

Oberwolfach Mini-Workshop: Scattering Amplitudes, Cluster Algebras, and Positive Geometries (Zoom)

Harvard CMSA, Combinatorics, Physics and Probability Seminar (Zoom)

CCNY Math Colloquium (Zoom)

Séminaire Dimers (Zoom)

Positive Geometries in Scattering Amplitudes and Beyond Workshop (Zoom)

Yale University Clusters and Geometry Seminar (Zoom)

University of Michigan Combinatorics seminar (Zoom)

2021–2022
- Symmetries of stochastic colored vertex models

Dimers in Combinatorics and Cluster Algebras conference (Zoom)

Russian Integrable Probability Seminar (Zoom)

Summer 2020
- Totally positive spaces: topology and applications

St. Petersburg Geometry and Combinatorics Seminar (Zoom)

MIT Thesis Defense

2019–2020
- Higher secondary polytopes and regular plabic graphs

Southern California Discrete Mathematics Symposium 2020

10h Discrete Geometry and Algebraic Combinatorics Conference, South Padre Island, TX

2019–2020
- Regularity theorem for totally nonnegative flag varieties

MIT Infinite Dimensional Algebra Seminar

Spring 2019
- Ising model and total positivity

University of Toronto Special Colloquium

University of Illinois Integrability and Representation Theory seminar

MIT Integrable Probability seminar

University of California, Los Angeles Math Department Colloquium

University of Michigan combinatorics seminar

Fall 2018
- Plabic graphs and zonotopal tilings

30th International Conference on Formal Power Series and Algebraic Combinatorics

University of California, Berkeley, Math 270 “Hot topics in algebra” (guest lecture)

2017–2018
- The totally nonnegative Grassmannian is a ball

MIT, 18.218 “Topics in combinatorics” (guest lecture)

Spring 2018

- *R*-systems Fall 2017
AMS Joint Meeting, Special Session on Dynamical Algebraic Combinatorics, San Diego, CA
Université du Québec à Montréal, LaCIM seminar
- Zamolodchikov periodicity and integrability 2017–2018
University of California, Los Angeles algebra seminar
Infinite Analysis 17, Osaka, Japan (two lectures)
University of California, Berkeley combinatorics seminar
University of Michigan combinatorics seminar
AMS Sectional Meeting at Hunter College
Brandeis University combinatorics seminar
University of Minnesota combinatorics seminar
AMS Sectional Meeting at Bowdoin College
MIT combinatorics seminar
- The symmetry and Schur expansion of dual stable Grothendieck polynomials Fall 2015
MIT combinatorics seminar
- Existence of a persistent hub in the convex preferential attachment model Summer 2014
11th International Vilnius Conference on Probability and Mathematical Statistics
- Manifolds associated to simple games Spring 2014
Algebraic topology and its applications seminar at Moscow State University
St. Petersburg A. D. Aleksandrov geometry seminar

TEACHING EXPERIENCE

- UCLA Math 61: Introduction to Discrete Structures Spring 2025
Undergraduate class
Lecturer. Evaluation score: 8.0 (max = 9.0)
- UCLA Math 206A: Combinatorial Theory Fall 2022
Graduate class on Symmetric Functions
Lecturer. Evaluation score: 8.8 (max = 9.0)
- UCLA Math 180: Graph Theory Spring 2022
Undergraduate class
Lecturer. Evaluation score: 8.23 (max = 9.0)
- UCLA Math 206A: Combinatorial Theory Fall 2021
Graduate class on Geometric Combinatorics
Lecturer. Evaluation score: 9.0 (max = 9.0)
- UCLA Math 184: Enumerative Combinatorics Spring 2021
Undergraduate class
Lecturer. Evaluation score: 8.14 (max = 9.0)
- UCLA Math 206B: Combinatorial Theory Winter 2021
Graduate topics class on cluster algebras
Lecturer. Evaluation score: 8.57 (max = 9.0)
- UCLA Math 180: Graph Theory Spring 2020
Undergraduate class
Lecturer. Evaluation score: 8.21 (max = 9.0)
- UCLA Math 206B: Combinatorial Theory Winter 2020
Graduate topics class on total positivity
Lecturer. Evaluation score: 9.0 (max = 9.0)
- MIT IAP 18.01 Calculus make-up class January 2018
Lecturer and recitation leader
- MIT 18.02 Multivariable calculus Fall 2016
Recitation leader. Evaluation score: 6.2 (max = 7.0)
- PRIMES, SPUR, RSI, and DRP programs at MIT 2015–2016
Undergraduate and high school student mentor
- Differential and convex geometry Fall 2013
Recitation leader (St. Petersburg State University)
- Differential geometry Spring 2012
Recitation leader (St. Petersburg State University)