

Yaroslav Shitov (Шитов Ярослав Николаевич)

Born: June 3, 1989, Tolyatti, USSR

Citizenship: Russian

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Education

- 2015 D.Sc. in Mathematics (*доктор физико-математических наук*), Moscow Lomonosov State University. Thesis: “Linear algebra over semirings”
- 2012 Ph.D. in Mathematics (*кандидат физико-математических наук*), Moscow Lomonosov State University. My advisor was Alexander Guterman. Thesis: “Rank functions of matrices over semirings”
- 2010 M.Sc. in Mathematics, Moscow Lomonosov State University

Research interests

- to have fun
- tropical mathematics (algebraic geometry and linear algebra, matrix factorization, rank functions, related computational problems)
- matrix theory (nonnegative matrix factorization, its applications and computational complexity, linear algebra over semirings)
- abstract algebra (structure of rings, semirings, and modules over them)
- computational geometry (extended formulations of convex polytopes and their applications in combinatorial optimization)

Professional activities

- National Research University - Higher School of Economics (Moscow), Department of Higher Mathematics, Senior Lecturer (since 2012)
- Moscow Lomonosov State University, Department of Mechanics and Mathematics, Research Associate (2012-2013)
- Served as a referee for *Chicago Journal on Theoretical Computer Science*, *Communications in Algebra*, *Discrete & Computational Geometry*, *Discrete Mathematics*, *Discrete Optimization*, *Discussiones Mathematicae Graph Theory*, *Doklady Mathematics*, *Electronic Journal of Combinatorics*, *IEEE Access*, *Information Processing Letters*, *Journal of Algebra*, *Journal of Combinatorial Theory Series A*, *Journal of Global Optimization*, *Linear Algebra and its Applications*, *Linear & Multilinear Algebra*, *SIAM Journal on Applied Algebraic Geometry*, *Transactions of the American Mathematical Society*, *Vestnik St. Petersburg University Mathematics*.

Publications

46. A semigroup identity for tropical 3x3 matrices, *Ars Mathematica Contemporanea* 14 (2018) 15-23.
45. The nonnegative rank of a matrix: Hard problems, easy solutions, *SIAM Review* 59 (2017) 794-800.
44. Which semifields are exact? *Journal of Algebra* 492 (2017) 393-401.
43. The Complexity of Positive Semidefinite Matrix Factorization, *SIAM Journal on Optimization* 27 (2017) 1898-1909.
42. Three remarks on spectra of zero-nonzero patterns, *Linear Algebra and its Applications* 534 (2017) 73-77.
41. A tractable NP-completeness proof for the two-coloring without monochromatic cycles of fixed length, *Theoretical Computer Science*, 671 (2017) 1-3.
40. Coloring the power graph of a semigroup, *Graphs and Combinatorics* 33 (2017) 485-487.
39. On the complexity of failed zero forcing, *Theoretical Computer Science*, 660 (2017) 102-104.
38. A counterexample on outer inverses in semigroups, *Linear Algebra and its Applications* 513 (2017) 120-121.
37. A counterexample on tropical linear spaces, *Linear Algebra and its Applications* 511 (2016) 19-21.
36. Extending orthogonal subsets of semimodules, *Linear Algebra and its Applications* 508 (2016) 225-233.
35. Sums of square-zero endomorphisms of a free module, *Linear Algebra and its Applications* 507 (2016) 191-197.
34. A matrix ring with commuting graph of maximal diameter, *Journal of Combinatorial Theory, Series A* 141 (2016) 127-135.
33. On the characteristic polynomial of a supertropical adjoint matrix, *Linear Algebra and its Applications* 499 (2016) 26-30.
32. Rank functions of tropical matrices, *Linear Algebra and its Applications* 498 (2016) 326-348. (Joint with Alexander Guterman.)
31. A note on square roots of nonnegative matrices, *Linear Algebra and its Applications* 497 (2016) 62-65.
30. The diameter of Chess grows exponentially, *The American Mathematical Monthly* 123 (2016) 71-77.
29. On the max-min and tropical CP-rank conjectures, *Linear & Multilinear Algebra* 64 (2016) 219-220.
28. Tropical lower bounds for extended formulations, *Mathematical Programming* 153 (2016) 67-74.
27. The arctic rank of a Boolean matrix, *Journal of Algebra* 433 (2015) 168-182. (Joint with Alexander Guterman and LeRoy Beasley.)
26. Mixtures of star trees and deficiency graphs, *European Journal of Combinatorics* 44A (2015) 140-143.

25. Bases of a free semimodule are small, *Linear Algebra and its Applications* 466 (2015) 38-40.
24. Nonnegative rank of a matrix with one negative eigenvalue, *Linear & Multilinear Algebra* 63 (2015) 221.
23. Two concepts of singularity for matrices over semirings, *Linear & Multilinear Algebra* 63 (2015) 201-220.
22. Tropical semimodules of dimension two, *St. Petersburg Mathematical Journal* 26 (2015) 341-350.
21. Studying nonnegative factorizations with tools from linear algebra over a semiring, *Communications in Algebra* 43 (2015) 4359-4366.
20. Extended formulations for convex heptagons, *Doklady Mathematics*, 92 (2015) 707-708.
19. Detecting matrices of combinatorial rank three, *Journal of Combinatorial Theory, Series A* 126 (2014) 166-176.
18. Sign patterns of rational matrices with large rank, *European Journal of Combinatorics* 42 (2014) 107-111.
17. Group rings that are exact, *Journal of Algebra* 403 (2014) 179-184.
16. The complexity of tropical matrix factorization, *Advances in Mathematics* 254 (2014) 138-156.
15. An upper bound for nonnegative rank, *Journal of Combinatorial Theory, Series A* 122 (2014) 126-132.
14. Mixed subdivisions and ranks of tropical matrices, *Proceedings of the American Mathematical Society* 142 (2014) 15-19.
13. How many Boolean polynomials are irreducible? *International Journal of Algebra and Computation* 24 (2014) 1183-1189.
12. On the complexity of Boolean matrix ranks, *Linear Algebra and Its Applications* 439 (2013) 2500-2502.
11. When do the r -by- r minors of a matrix form a tropical basis? *Journal of Combinatorial Theory, Series A* 120 (2013) 1166-1201.
10. On Boolean matrices with full factor rank, *Sbornik Mathematics* 204 (2013) 1691-1699.
9. On the coincidence of the factor and Gondran-Minoux rank functions of matrices over a semiring, *Journal of Mathematical Sciences* 193 (2013) 802-808.
8. Tropical matrices and group representations, *Journal of Algebra* 370 (2012) 1-4.
7. On tropical matrices of small factor rank, *Linear Algebra and its Applications* 437 (2012) 2727-2732.
6. Tropical patterns of matrices and the Gondran-Minoux rank function, *Linear Algebra and its Applications* 437 (2012) 1793-1811. (Joint with Alexander Guterman.)
5. On matrices with different tropical and Kapranov ranks, *Mathematical*

Notes 92 (2012) 286-291.

4. On the Kapranov ranks of tropical matrices, *Linear Algebra and its Applications* 436 (2012) 3247-3253.

3. Inequalities for Gondran-Minoux rank and idempotent semirings, *Linear Algebra and its Applications* 435 (2011) 1769-1777.

2. Example of the matrix of size 6x6 with different tropical rank and Kapranov rank, *Moscow University Mathematics Bulletin* 66 (2011) 227-229.

1. Matrices with different Gondran-Minoux and determinantal ranks over max-algebras, *Journal of Mathematical Sciences* 163 (2009) 598-624.

Unpublished papers and preprints

47. Sublinear extensions of polygons, preprint (2014) arXiv:1412.0728.

48. Nonnegative rank depends on the field, preprint (2015) arXiv:1505.01893.

49. A universality theorem for nonnegative matrix factorizations, preprint (2016) arXiv:1606.09068.

50. Euclidean distance matrices and separations in communication complexity theory, preprint (2016) arXiv:1607.08097.

Miscellaneous

- My «Erdős index» is 2.