

ALEXANDER POLYANSKII

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RESEARCH INTERESTS

Discrete and Convex Geometry; Algebraic Combinatorics; Number Theory: Diophantine Approximation

EMPLOYMENT HISTORY

- *Associate Professor* *since Sep 2017*
Moscow Institute of Physics and Technology (MIPT)
Department of Discrete Mathematics
- *Assistant Head of Laboratory & Senior Researcher* *since Dec 2020*
Moscow Institute of Physics and Technology (MIPT)
Laboratory of Combinatorial and Geometric Structures, www.combgeo.org

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- *Senior Researcher* *May 2016 — Nov 2020*
Moscow Institute of Physics and Technology
[Laboratory of Advanced Combinatorics and Networks Applications](#)
 - *Visiting Researcher* *Sep 2018 — Feb 2019*
École Polytechnique Fédérale de Lausanne
Chair of Combinatorial Geometry (head: [János Pach](#))
 - *Postdoctoral Fellow* *Oct 2015 — Sep 2017*
Technion – Israel Institute of Technology
Department of Mathematics (host: [Rom Pinchasi](#))
 - *Assistant Professor* *Sep 2013 — Aug 2017*
Moscow Institute of Physics and Technology
Department of Discrete Mathematics

DEGREES

- *Ph.D. in Mathematics* *Nov 2013*
Moscow State University, Department of Number Theory
Thesis “On the measure of irrationality of certain numbers”
Advisor: [Yury V. Nesterenko](#) (Ostrowski Prize 1997)
- *M.Sc. in Mathematics cum laude* *Jun 2010*
Moscow State University, Department of Number Theory
Thesis “On the non-quadraticity measure of $\ln 2$ ”
Advisor: [Yury V. Nesterenko](#) (Ostrowski Prize 1997)

HONOURS

Awards

- Young Russian Mathematics 2020
- Moscow State University Excellence Scholarship for students 2009 — 2010

FUNDING

Principal Investigator

- Young Russian Mathematics Stipend 2021 — 2023
“*Linear-algebraic and combinatorial methods in discrete and convex geometry*” ≈19 500 US\$
- Grant № 18-31-00149 of the Russian Foundation for Basic Research 2018 — 2020
“*Combinatorial properties of vector families*” ≈26 000 US\$

Co-principal Investigator

- Grant № 22-11-00131 of the Russian Science Foundation 2022 — 2025
“*Algebraic and random combinatorial structures*” ≈249 000 US\$
- Grant № NSh-775.2022.1.1 to Leading scientific schools of Russia 2022 — 2023
“*Theoretical and applied problems in discrete mathematics*” ≈34 000 US\$
- Grant № 21-71-10092 of the Russian Science Foundation 2021 — 2024
“*Extremal problems at the interface between discrete probability and combinatorial geometry*” ≈247 000 US\$
- Grant № NSh-2540.2020.1 to Leading scientific schools of Russia 2020 — 2021
“*Modern problems of discrete mathematics at the interface between combinatorics, geometry, and number theory*” ≈42 000 US\$
- Grant № 075-15-2019-192 of the Russian Federation Government 2019 — 2021
“*Combinatorics, discrete and computational geometry, and analysis of complex data structures*” ≈1 000 000 US\$
- Grant № NSh-6760.2018.1 to Leading scientific schools of Russia 2018 — 2019
“*Combinatorial and geometric problems of discrete mathematics and their applications to analysis of complex networks, theory of algorithms, and coding theory*” ≈39 000 US\$

PUBLICATIONS

Preprints

1. Z. Jiang, A. Polyanskii, “Forbidden induced subgraphs for graphs and signed graphs with eigenvalues bounded from below”. [preprint](#)

Journal publications

2. O. Pirahmad, A. Polyanskii, A. Vasilevskii, “Intersecting diametral balls induced by a geometric graph”; to appear in *Discrete & Computational Geometry*. preprint
3. A. Glazyrin, R. Karasev, A. Polyanskii, “Covering by planks and avoiding zeros of polynomials”, *International Mathematics Research Notes*, rnac259. preprint
4. N. Chernega, A. Polyanskii, R. Sadykov, “Disjoint edges in geometric graphs”, *Graphs and Combinatorics*, 38, Article number: 162 (2022). preprint
5. M. Naszódi, A. Polyanskii, “Perron and Frobenius meet Carathéodory”, *Electronic Journal of Combinatorics*, 28(3) (2021), P3.26. preprint
6. A. Kupavskii, A. Polyanskii, I. Tomon, D. Zakharov, “The extremal number of surfaces”, *International Mathematics Research Notices*, 2022(17) (2022), 13246–13271. preprint [Gil Kalai’s blog](#)
7. A. Polyanskii, “A cap covering theorem”, *Combinatorica*, 41(5) (2021), 695-702. preprint
8. G. Ivanov, M. Naszódi, A. Polyanskii, “Approximation of the average of some random matrices”, *Journal of Functional Analysis* 279(7) (2020), 108684. preprint
9. F. Nilov, A. Polyanskii, “A Sylvester-Gallai-type Theorem for Abelian Groups”, *Mathematical Notes*, 110 (2021), 110-117.
10. Z. Jiang, A. Polyanskii, “Forbidden subgraphs for graphs of bounded spectral radius, with applications to equiangular lines”, *Israel Journal of Mathematics*, 236 (2020), 393-421. preprint
11. R. Pinchasi, A. Polyanskii, “A one-page solution of a problem of Erdős and Purdy”, *Discrete & Computational Geometry*, 64 (2020), 382–385. [Gil Kalai’s blog](#)
12. A. Polyanskii, “On almost-equidistant sets - II”, *The Electronic Journal of Combinatorics*, 26(2) (2019), #P2.14. preprint
13. A. A. Polyanskii, “On simultaneous approximations of $\ln 3$ and $\pi/\sqrt{3}$ by rational numbers”, *Sbornik: Mathematics*, 210(4) (2019), 589-605.
14. A. Polyanskii, “On almost-equidistant sets”, *Linear Algebra and its Applications*, 563 (2019), 220-230. preprint
15. A. A. Polyanskii, “On the irrationality measures of certain numbers - II”, *Mathematical Notes*, 103(3-4) (2018), 626-634.
16. B. G. Merino, T. Jahn, A. Polyanskii, G. Wachsmuth, “Hunting for reduced polytopes”, *Discrete & Computational Geometry*, 60(3) (2018), 801-808. preprint
17. M. Naszódi, A. Polyanskii, “Approximating set multi-covers”, *European Journal of Combinatorics*, 67 (2018), 174-180. preprint
18. A. Kupavskii, A. Polyanskii, “Proof of Schur’s conjecture in \mathbb{R}^d ”, *Combinatorica*, 37(6) (2017), 1181-1205. preprint
19. A. Polyanskii, “Pairwise intersecting homothets of a convex body”, *Discrete Mathematics*, 340(8) (2017), 1950-1956. preprint
20. Z. Jiang, A. Polyanskii, “Proof of László Fejes Tóth’s zone conjecture”, *Geometric and Functional Analysis*, 27(6), (2017), 1367–1377. preprint [Popular science magazines: EurekAlert! N+1](#)
21. A. B. Kupavskii, A. A. Polyanskii, “On simplices in diameter graphs in \mathbb{R}^4 ”, *Mathematical Notes*, 101(2) (2017), 265-276.

22. V. V. Bulankina, A. B. Kupavskii, A. A. Polyanskii, “On Schur’s conjecture in \mathbb{R}^4 ”, *Mathematical Notes*, 97(1) (2015), 21-29.
23. A. Polyanskii, “On a question of Makai and Martini on bodies of constant width”, *Contributions to Algebra and Geometry*, 55(2) (2014), 635-636.
24. A. A. Polyanskii, “Quadratic irrationality exponents of certain numbers”, *Moscow University Mathematics Bulletin*, 68(5) (2013), 237-240.
25. A. A. Polyanskii, “Square exponent of irrationality of $\ln 2$ ”, *Moscow University Mathematics Bulletin*, 67(1) (2012), 25-30.
26. A. Polyanskii, “On the irrationality measure of certain numbers”, *Moscow Journal of Combinatorics and Number Theory*, 1(4) (2011), 80-90. [preprint](#)

Refereed publications in conference proceedings

27. A. Polyanskii, “Pairwise intersecting homothets of a convex body”, *Electronic Notes in Discrete Mathematics* 61, 1003-1009. Abstracts of the talks at Eurocomb 2017, Vienna, Austria, Sep 2017.

Expository publications (in Russian)

28. E. Bakaev, G. Chelnokov, A. Polyanskii, “Discharging method”, *Kvant* 12 (2019), 31-33.
29. F. Nilov, A. Polyanskii, N. Polyanskii, “The Szemerédi–Trotter theorem”, *Matematicheskoe Prosveshchenie* (2017), 186-196.
30. A. Polyanskii, P. Tarasov, “Selected examination problems in Discrete Analysis”, *Matematicheskoe Prosveshchenie* (2017), 205-209.
31. A. Polyanskii, “New lattice problems”, *Kvant* 2 (2013), 40-42.
32. A. Polyanskii, “To shoot a cannon with sparrows”, *Kvant* 2 (2012), 49-50, 60-61.

SERVICE TO THE PROFESSION

Conferences, workshops, and minisymposia organised

<i>Oct 3 – 11, 2021</i>	Workshop on Open Problems in Combinatorics and Geometry III (in Russian) Adygea, Russia
<i>Jul 5 – Aug 6, 2021</i>	Research Experience for Undergraduates (in Russian) Moscow, Russia
<i>Jun 28 – Jul 2, 2021</i>	Minisymposium “Combinatorial and Geometric Structures” Moscow Conference on Combinatorics and Applications; online
<i>Dec 2 – 4, 2020</i>	Combinatorics and Geometry Days III online
<i>Sep 28 – Oct 4, 2020</i>	Workshop on Open Problems in Combinatorics and Geometry II Adygea, Russia
<i>Apr 13 – 16, 2020</i>	Combinatorics and Geometry Days II online

<i>Nov 26 – 27, 2019</i>	<u>Combinatorics and Geometry Days I</u> Moscow, Russia
<i>Oct 13 – 19, 2019</i>	<u>Workshop on Open Problems in Combinatorics and Geometry I</u> Adygea, Russia

Research seminars organised

<i>Since Feb 2020</i>	<u>Big Seminar of the Laboratory CombiGeo Structures</u> YouTube (jointly with Andrey Kupavskii, János Pach, Ilya Shkredov, and Maksim Zhukovskii)
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STUDENT SUPERVISION

Ph.D. students

<u>Alexander Golovanov</u>	<i>Sep 2019 – Dec 2022</i>	Distance Problems in Discrete Geometry
<u>Rinat Sadykov</u>	<i>Since Sep 2019</i>	

Bachelor's and Master's students

Wei Rao	<i>Master's 2023</i>	Fedor Gerasimov	<i>Bachelor's 2023</i>
Polina Barabanshchikova	<i>Master's 2024</i> <i>Bachelor's 2022</i>	Saro Harutyunyan	<i>Bachelor's 2023</i>
Alexander Zaykov	<i>Master's 2021</i> <i>Bachelor's 2018</i>	<u>Olimjoni Pirahmad</u>	<i>Master's 2021</i>
<u>Andrey Sergunin</u>	<i>Master's 2021</i> <i>Bachelor's 2019</i>	Krishnendu Bhowmick	<i>Master's 2021</i>
<u>Alexey Vasilevskii</u>	<i>Bachelor's 2021</i>	Egor Bakaev	<i>Bachelor's 2021</i>
Alexander Kora	<i>Bachelor's 2019</i>	<u>Nikita Chernega</u>	<i>Bachelor's 2018</i>

TEACHING EXPERIENCE

<i>Since Fall 2017</i>	“Introduction to Discrete Geometry” in English Two-semester graduate course at MIPT. Online (×2) <i>Lecturer</i> (×5), <i>Coordinator</i> (×3) ≈ 5-10 students
<i>Fall 2014, Fall 2019</i>	“Modern Discrete Geometry”. Graduate course at MIPT <i>Lecturer</i> (×2) ≈ 7 students
<i>Spring 2020</i>	“Spectral graph theory”. Bachelor course at MIPT <i>Coordinator</i> (×1) ≈ 7 students

<i>Fall 2014 — Fall 2019</i>	Reading group on Combinatorics and Discrete Geometry for Undergraduates at MIPT <i>Organiser</i> (×6), <i>Coordinator</i> (×3) ≈ 10 students
<i>Fall 2013 — Spring 2015</i>	“Discrete Analysis”. Two-semester bachelor course at MIPT <i>Teaching assistant</i> (×2) ≈ 25 students
<i>Spring 2015</i>	“Ring theory”. Bachelor course at MIPT <i>Teaching assistant</i> (×1) ≈ 25 students
<i>Fall 2013, Spring 2014</i>	“Linear Algebra”. Two-semester bachelor course at MIPT. <i>Teaching assistant</i> (×1) ≈ 25 students
<i>Fall 2013, Spring 2014</i>	“Calculus”. Two-semester bachelor course at MIPT <i>Teaching assistant</i> (×1) ≈ 25 students
<i>Fall 2011, Fall 2012</i>	“Elementary Number Theory” Bachelor course at Moscow State University (MSU) <i>Grader</i> (×2) ≈ 30 students
<i>Fall 2012</i>	“Analytic Number Theory” Graduate course at the branch of MSU in Dushabe, Tajikistan <i>Lecturer</i> (×1) ≈ 12 students

Math Olympiads Coaching

<i>Fall 2014, Spring 2015</i>	Three olympiad math courses targeted at schoolchildren of grades 7 through 9 www.foxford.ru, a leading Russian online school <i>Lecturer</i> (×3) ≈ 100 students per a course
<i>Fall 2014, Spring 2015</i>	All math courses at www.foxford.ru <i>Coordinator</i> (×1) 1000+ students
<i>Summer 2012, Summer 2013</i> <i>Summer 2015, Fall 2022</i>	IMO training schools <i>Coach</i> (×4) ≈ 10-20 students
<i>Fall 2012, Spring 2013</i>	Moscow Math Olympiad circle <i>Coach</i> (×1) ≈ 15-20 students
<i>2012, 2014, 2019</i>	Summer Conference of Tournament of Towns www.turgor.ru/en/lktg/ <i>Coordinator</i> (×2), <i>Author</i> (×3) of research projects targeted at talented schoolchildren ≈ 10-20 students per a research project

- *Author* of more than 25 problems for mathematical olympiads including Problem 3 at the IMO 2013 and Problem 3 at the Romanian Masters of Mathematics 2017
- *Coordinator* at the IMO 2021, the All-Russian Mathematical Olympiad 2011, 2012, 2013, 2015
- *Couch* of Elizaveta Streltsova, a winner of the CGMO (2013 bronze and 2014 silver)

TALKS

Seminar talks

- Budapest Big Combinatorics + Geometry Seminar, Rényi Institute, Hungary, online *Feb 2022*
- Budapest Big Combinatorics + Geometry Seminar, Rényi Institute, Hungary *Sep 2021*
- Algebraic geometry lab seminar, Higher School of Economics; Moscow, Russia, online *Apr 2021*
- Geometry and combinatorics, Saint-Petersburg University, Russia *Mar 2021*
- Discrete geometry and geometry of numbers, Moscow State University, Russia, online *Feb 2021*
- Measure Theory Seminar, Kent State University, USA, online *Oct 2020*
- Combinatorics Seminar, Technion, Haifa, Israel *Feb 2020*
- Geometry Seminar, University of Fribourg, Switzerland *Feb 2019*
- Dobrushin Mathematics Laboratory Seminar, IITP RAS, Moscow, Russia *Dec 2017*
- Joint DCG–DISOPT seminar, EPFL, Switzerland *Oct 2017*
- Discrete geometry and geometry of numbers, Moscow State University, Russia *Apr 2017*
- Discrete mathematics seminar, Moscow Institute of Physics and Technology, Russia *Mar 2017*
- Seminar on Combinatorics, Game and Optimization, LSE, UK *Jan 2016*
- Joint DCG–DISOPT seminar, EPFL, Switzerland *May 2015*
- Discrete mathematics seminar, Moscow Institute of Physics and Technology, Russia *Sep 2014*
- Discrete geometry and geometry of numbers, Moscow State University, Russia *Mar 2014*
- Discrete mathematics seminar, Moscow Institute of Physics and Technology, Russia *Feb 2014*
- Research seminar of the Number Theory Department, Moscow State University, Russia *Dec 2012*

Talks at international conferences

- 4th Autumn Mathematical Readings in Adygea 2021, Maykop, Russia *Oct 2021*
- Conference of world-class international mathematical centres, Sirius, Russia *Aug 2021*
- 8th European Congress of Mathematics, online, Portorož, Slovenia *Jun 2021*
- CANADam, minisymposium: Discrete Geometry (IM4), Canada, online *May 2021*
- 62th scientific conference in MIPT, Russia *Nov 2019*
- Discrete Geometry Days 2, Budapest University of Technology and Economics, Hungary *Jul 2019*
- 3rd Russian-Hungarian Combinatorial Workshop, Petrozavodsk, Russia *May 2019*
- 2nd Russian-Hungarian Combinatorial Workshop, Budapest, Hungary *Jun 2018*
- XV International conference: Algebra, Number Theory, and Discrete Geometry, Russia *May 2018*
- ERC Workshop: Geometric Transversals and Epsilon-Nets, Ein-Gedi, Israel *Mar 2018*
- 60th scientific conference in MIPT, Russia *Nov 2017*
- Eurocomb 2017, Vienna, Austria *Aug 2017*

- International Conference “Numbers, Forms and Geometry”, Sochi, Russia *Aug 2017*
- Discrete Geometry and Convexity - BÁRÁNY 70, Rényi Institute, Budapest, Hungary *Jun 2017*
- Israel Mathematical Union 2017 Annual Meeting, Akko, Israel, poster talk *May 2017*
- Discrete Geometry Days, Budapest University of Technology and Economics, Hungary *Jun 2016*
- Intuitive Geometry, László Fejes Tóth Centennial, Rényi Institute, Hungary *Jul 2015*
- International Conference Sum(m)it:240, Rényi Institute, Hungary *Jul 2014*
- Moscow Workshop on Combinatorics and Number Theory, MIPT, Russia *Feb 2014*
- International conference “Diophantine Analysis”, Astrakhan, Russia *Jul 2012*
- International conference “Lomonosov 2010”, Moscow State University, Russia *Apr 2010*

REFEREEING WORK

Advances in Geometry, Algebra and Analysis, Discrete & Computational Geometry, Discrete Mathematics, Izvestiya: Mathematics, Russian Mathematical Surveys, European Journal of Combinatorics, Mathematika, Moscow Journal of Combinatorics and Number Theory, Matematicheskoe Prosveshchenie, Kvant

- Editor of Matematicheskoe Prosveshchenie, an expository journal in Russian intended for a wide audience of mathematicians.