

Margarita Akhmejanova

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Short Biography

I received my Ph.D. in Mathematics from the Moscow Institute of Physics and Technology (MIPT) in 2022, under the supervision of [Dmitrii Shabanov](#). Earlier, I graduated with honors from Lomonosov Moscow State University with a 6-year Specialist degree in Mathematics and Mechanics (equivalent to a combined B.Sc. and M.Sc.), with specialization in Probability Theory and Mathematical Statistics. In 2021, I was awarded the Young Mathematicians of Russia [award](#) and held a research position in the Laboratory of Combinatorial Mathematics and Geometry [compgeo](#) led by János Pach and Andrey Kupavskii. I subsequently worked as a Postdoctoral Fellow at the KAUST AI Initiative (hosted by [Francesco Orabona](#)), and I am currently a postdoctoral researcher at the Department of Mathematics, Uppsala University, working with [Annika Heckel](#).

Education and Current Academic Appointment

- **Ph.D. in Mathematics**, [Moscow Institute of Physics and Technology](#), 2022.
Supervisor: Dmitry Shabanov.
- **Specialist degree with honors in Mathematics and Mechanics, qualification: Lecturer** (equivalent to a combined B.Sc. and M.Sc.), [Lomonosov Moscow State University](#), 2018.
- **Current academic appointment:** Postdoctoral Researcher, Department of Mathematics, Uppsala University, Sweden, July 2025–present.

Research Interests

- Probabilistic Methods: random graphs, concentration inequalities, threshold phenomena, martingales, etc.
- Extremal Combinatorics: Turán problems, weak saturation, Ramsey theory, hypergraph coloring
- Selected topics in theoretical computer science

List of Publications

Journal Articles

1. M. Akhmejanova, M. Šileikis, “On the upper tail of star counts in random graphs”, *Electronic Journal of Probability* 30, 2025, 1–20. DOI: [10.1214/25-EJP1345](https://doi.org/10.1214/25-EJP1345).

2. M. Akhmejanova, V. Kozhevnikov, M. Zhukovskii, “Maximum induced trees and forests of bounded degree in $G(n, p)$ ”, *Random Structures & Algorithms*. DOI: [10.1002/rsa.70084](https://doi.org/10.1002/rsa.70084)
3. M. Akhmejanova, M. Zhukovskii, “EMSO (FO^2) 0-1 law fails for all dense random graphs”, 68, 4, 2026, e70084, *SIAM Journal on Discrete Mathematics*, 2022. DOI: [10.1137/21M1429655](https://doi.org/10.1137/21M1429655)
4. M. Akhmejanova, S. Longbrake, “Fractional hypergraph coloring”, *Discrete Applied Mathematics*, 397, 2027, 16–24. DOI: [10.1016/j.dam.2026.09.008](https://doi.org/10.1016/j.dam.2026.09.008)
5. M. Akhmejanova, J. Balogh, D. Shabanov, “Chain method for panchromatic colorings of hypergraphs”, *Discrete Applied Mathematics*, 321, 2022, 72–81. DOI: [10.1016/j.dam.2022.06.005](https://doi.org/10.1016/j.dam.2022.06.005)
6. M. Akhmejanova, V. Kozhevnikov, “The maximum size of an induced forest in the binomial random graph”, *Discrete Mathematics* 347 (7), 2025, 114030. DOI: [10.1016/j.disc.2024.114030](https://doi.org/10.1016/j.disc.2024.114030)
7. M. Akhmejanova, A. Kuchukova, A. Valyuzhenich, I. Vorobyev, “Bicrucial k -power-free permutations”, *Discrete Applied Mathematics*, 371, 2025, DOI: [10.1016/j.dam.2025.04.030](https://doi.org/10.1016/j.dam.2025.04.030)
8. Akhmejanova, M.B., Kozhevnikov, V.S. “Induced Forests and Trees in Erdős–Rényi Random Graph”, *Doklady Mathematics*, 2024. DOI: [10.1134/S1064562424701886](https://doi.org/10.1134/S1064562424701886)
9. M. Akhmejanova, K. Olmezov, A. Volostnov, I. Vorobyev, “Wiener index and graphs, almost half of whose vertices satisfy Soltes property”, *Discrete Applied Mathematics*, 2023. DOI: [10.1016/j.dam.2022.09.021](https://doi.org/10.1016/j.dam.2022.09.021)
10. M. Akhmejanova, D. Shabanov, “Equitable colorings of hypergraphs with r colors”, *Journal of Mathematical Sciences*, 2022. DOI: [10.1007/s10958-022-05823-x](https://doi.org/10.1007/s10958-022-05823-x)
11. M. Akhmejanova, “Bi-uniform hypergraph”, *Trudy MIPT*, 13:51, 2021. DOI: [10.53815/20726759-2021-13-3-23](https://doi.org/10.53815/20726759-2021-13-3-23)
12. M. Akhmejanova, D. Shabanov, “Coloring hypergraphs with bounded cardinalities of edge intersections”, *Discrete Mathematics*, 343, 2020, 111692. DOI: [10.1016/j.disc.2019.111692](https://doi.org/10.1016/j.disc.2019.111692)
13. M. Akhmejanova, D. Shabanov, “Equitable colorings of hypergraphs with few edges”, *Discrete Applied Mathematics*, 276, 2020, 212–222. DOI: [10.1016/j.dam.2019.03.024](https://doi.org/10.1016/j.dam.2019.03.024)
14. M. Akhmejanova, “On Equitable Colorings of Hypergraphs”, *Mathematical Notes*, 106, 2019, 319–326. DOI: [10.1134/S0001434619090013](https://doi.org/10.1134/S0001434619090013)
15. M. Akhmejanova, D. Shabanov, “Colorings of b -simple hypergraphs”, *Electron. Notes Discrete Math*, 61, 2017, 29–35. DOI: [10.1016/j.endm.2017.06.017](https://doi.org/10.1016/j.endm.2017.06.017)

Peer-Reviewed Conference Proceedings

16. G. Sokolov, M. Thiessen, M. Akhmejanova, F. Vitale, F. Orabona, “Self-Directed Node Classification on Graphs”, in *Proceedings of the 36th International Conference on Algorithmic Learning Theory (ALT), Proceedings of Machine Learning Research* 272 (2025), 1138–1168. PMLR.

Preprints

17. M. Akhmejanova, I. Vorobyev, M. Zhukovskii, “Weak saturation numbers of large complete bipartite graphs”. [arXiv:2508.19435](https://arxiv.org/abs/2508.19435)
18. M. Akhmejanova, I. Bogdanov, G. Chelnokov, “The continualization approach to on-line hypergraph coloring”. [arXiv:2211.09486](https://arxiv.org/abs/2211.09486)

Teaching Experience

- **Uppsala University** — *Seminar Instructor, Multivariable Calculus (Flervariabelanalys, allmän kurs, 5hp, 1MA017)* (January 2026 –present). Teach seminar/tutorial sessions; collect and assess homework; administer and grade exams and re-exams; maintain course materials and communicate deadlines.
- **Lomonosov Moscow State University** — *Teacher / Course Responsible, Combinatorics* (September 2019 – January 2020). Led tutorials (45 students); Defined learning outcomes and syllabus; designed tiered problem sets with rubrics; coordinated TAs; ran active-learning seminars; administered written/oral exams and re-exams; maintained course materials, deadlines, and gradebook.
- **Moscow Institute of Physics and Technology** — *Teacher. Probability & Measure Theory* (September 2019 – January 2020). Led tutorials (20 students); Authored assignments and solution keys; ensured consistent rubric-based grading; held office hours; supported exam design and proctoring;
- **Moscow Institute of Physics and Technology** — *Grader. Random Graphs* (September 2019 – January 2020). Graded homework assignments; ensured consistent rubric-based grading in coordination with the course instructor;

Work Experience

- **Uppsala University**, Sweden, Postdoctoral fellow, July 2025 - present
- **King Abdullah University of Science and Technology**, Saudi Arabia, Postdoctoral fellow, August 2022 - August 2024
- **Laboratory of Combinatorial and Geometric Structures**, Russia-Hungary, Junior Researcher, January 2020 - August 2021, combgeo.org
- **Laboratory for Advanced Combinatorics and Network Applications, MIPT**, Russia, Engineer, January 2020 - December 2021
- **Department of Discrete Mathematics, MIPT**, Russia, Teacher, Probability and Theory of Measure, September 2019 - January 2020
- **Lomonosov Moscow State University**, Russia, Assistant, Combinatorics, September 2019 - January 2020

Parental leave

- 12 months of parental leave, August 2023 - August 2024.

Contributed Talks in Conferences

- British combinatorial conference, 2026, (Cardiff, UK, 2026)
- Random Structures and Algorithms Conference 2023, (Pittsburgh, USA, 2023)
- CanaDam-2023, (2023)
- International Conference on Graphs, Networks and Combinatorics, (New Delhi, India, 2023)
- The 23rd Thailand-Japan Conference on Discrete and Computational Geometry, Graphs, and Games, online, August, 2021.
- Sirius conference of mathematical centers, 1-5 July, (Sochi, Russia, 2021)
- Random Structures and Algorithms Conference, 15-19 July, (Zurich, Switzerland, 2019)
- Extreme Combinatorics and Discrete Geometry, (Russia, Maikop, 2018)

- 61st All-Russian Scientific Conference of MIPT, (Russia, Dolgoprudny, 2018)
- Lomonosov-2018, (Russia, Moscow, 2018)
- 2nd Russian-Hungarian Workshop, June 27-29, (Budapest, Hungary, 2018)
- Building Bridges II. Conference to celebrate the 70th birthday of László Lovász (Budapest, Hungary, July 2–6, 2018)
- 1st Russian-Hungarian Workshop on Discrete Mathematics, (Russia, Moscow, 2017)
- Lomonosov-2017, (Russia, Moscow, 2017)
- EUROCOMB, 28 August - 1 September, (Vienna, Austria, 2017)
- Random Structures and Algorithms Conference, 7-11 August, (Gniezno, Poland, 2017)

Invited Seminar Talks

- Probability seminar, Vilnius university, 2026, Vilnius, Lithuania.
- Discrete mathematics seminar, 2025, Umeå University, Sweden.
- Discrete mathematical seminar, University of Cape Town, 2023, Cape Town, South Africa.
- Combinatorial theory seminar, Ramanujan college, 2023, New Delhi, India.
- Seminar talk, IMPA, 2021, Rio-de-Janeiro, Brazil.
- Geometry and combinatorics seminar, Alfréd Rényi Institute of Mathematics, 2021, Budapest, Hungary.
- Chair seminar, Sobolev Institute of Mathematics, 2019, Novosibirsk, Russia.

Research Visits

- **Sheffield university**, July 2026, Sheffield, UK.
- **Vilnius university**, June 2026, Vilnius, Lithuania.
- **CMU University**, June 2023, Pittsburgh, USA.
- **University of Cape Town**, April 2023, Cape Town, South Africa.
- **IMPA Institute**, December 2021, Rio-de-Janeiro, Brazil
Visiting Prof. Robert Morris and Taísa Martins
- **Alfréd Rényi Institute of Mathematics**, August 2021, Budapest, Hungary
Visiting Prof. András Gyárfás and János Pach
- **Sobolev Institute of Mathematics**, February 2019, Novosibirsk, Russia
Visiting Prof. V. Potapov and Ann Taranenko

Miscellaneous

- **Diploma:** [Diploma](#)
- **Dissertation:** [Dissertation](#)
- **Harvard Teaching Certificate:** [Harvard Teaching Certificate](#)

List of acquired external funding (funding agency, name of project, year, received sum, level of responsibility (main applicant or co-applicant))

- **Funding agency:** Magnusons Foundation
Name of project: Travel Grant
Year: 2025
Awarded amount: 31,600 SEK
Level of responsibility: main applicant
- **Funding agency:** Wenner-Gren Foundations
Name of project: Wenner-Gren Scholarship
Year: 2024
Awarded amount: 360,000 SEK
Level of responsibility: sole grant holder; responsible for submitting project reports
- **Funding agency:** Young Mathematicians of Russia Competition
Name of project: Winner of the “Young Mathematicians of Russia” Competition
Year: 2021
Awarded amount: approximately 8,660 USD
Level of responsibility: main applicant
- **Funding agency:** President of Russia
Name of project: Grant No. MK-1451.2022.1.1 for Young Scientists
Project period: 2022–2024
Total awarded amount: approximately 18,000 USD
Level of responsibility: co-applicant
Project status: awarded to the project team, but not activated because the principal applicant left before the project start
Personal funding status: no personal funding received
- **Funding agency:** Russian Science Foundation
Name of project: Grant No. 22-21-00202 for Small Scientific Groups
Project period: 2022–2024
Total awarded amount: approximately 39,000 USD
Level of responsibility: co-applicant (one of two participants)
Project reporting: I continued to submit the required project reports after the end of my funded participation
Personal funding status: my funded participation ended when my employment at the host institution ended; no personal funding was received thereafter
- **Funding agency:** Leading Scientific Schools of Russia
Name of project: Grant No. NSh-6760.2018.1
Year: 2018–2020
Awarded amount: approximately 39,000 USD
Level of responsibility: co-applicant
- **Funding agency:** Russian Science Foundation
Name of project: Grant No. 22-21-00411
Year: 2020–2022
Awarded amount: approximately 78,000 USD
Level of responsibility: co-applicant
- **Funding agency:** Russian Science Foundation
Name of project: Grant No. MD-1562.2020.1
Year: 2020–2022
Awarded amount: approximately 25,000 USD
Level of responsibility: co-applicant
- **Funding agency:** Moscow Government
Name of project: Moscow Government Scholarship
Year: 2021

Awarded amount: 300 USD
Level of responsibility: main applicant

Selected Research Contributions

On the upper tail of star counts in random graphs: Let X count the number of r -stars in the random binomial graph $\mathbb{G}(n, p)$. In A1 we determine, for fixed r and $\varepsilon > 0$, the asymptotics of $\log X \geq (1 + \varepsilon)X$ assuming only $X \rightarrow \infty$ and $p \rightarrow 0$ thus giving a first class of irregular graphs for which the *upper tail problem* for subgraph counts (stated by Janson and Ruciński in 2004) is solved in the sparse setting.

Induced subgraphs in random graphs: We show concentration in an interval of size $o(1/p)$ for the maximum size (number of vertices) of an induced forest in $G(n, p)$ for all $C\varepsilon/n < p < 1 - \varepsilon$. It is the first generalization of the celebrated Frieze's result to another class of induced subgraphs for such a range of p . In another paper, we prove 2-point concentration of the size of the maximum induced forest (and tree) of bounded degree in $G(n, p = \text{const})$. We also present seemingly new generalizations of Cayley's formula for counting labeled trees (and forests) of bounded degree. See, A2, A3, A4.

Continuization approach to on-line hypergraph coloring: We introduced a general version of a chip game and its continuous version in A5, providing precise results for continuous versions of various colorings, including proper, panchromatic, and list colorings.

EMSO (FO²) 0-1 law fails for all dense random graphs: We disproved the EMSO(FO²) convergence law for the binomial random graph $G(n, p)$ in A6, showing that there is an existential monadic second-order sentence that fails for every $p \in (0, 1)$.

Self-directed learning of convex labelings on graphs: While previous research has focused on self-directed learning for Euclidean halfspaces, linear functions, and general multi-class hypothesis classes, no prior work has specifically addressed self-directed node classification on graphs. In this paper, we tackle this problem by developing efficient algorithms tailored for it. Specifically, we concentrate on the case of (geodesically) convex clusters, where for any two nodes with the same label, all nodes on any shortest path between them also share the same label. We present a polynomial-time algorithm. Additionally, we demonstrate that our algorithm is robust even when clusters are slightly non-convex, still achieving a logarithmic mistake bound in n . Finally, for the more common case of homophilic clusters we propose an efficient algorithm. A7.

Coloring hypergraphs with bounded cardinalities of edge intersections: In A8, we studied b -simple hypergraphs, where no two edges share more than b vertices, and proved that any such hypergraph with a maximum edge degree $c \cdot n^{r-b}$ is r -colorable for $n \geq n_0(b)$.

Equitable and panchromatic hypergraph colorings: We established a new lower bound for the number of edges in an n -uniform hypergraph that prevents panchromatic coloring with r colors in A9. Additionally, a new bound for equitable colorings was provided in A10 using Pluhar's technique.

Weak saturation numbers of large complete bipartite graphs: We obtain exact values and new bounds for $wsat(n, K_{s,t})$ in the previously unaddressed range. To prove lower bounds, we introduce a new method that takes into account connectivity properties of subgraphs of the complement $\bar{G}$. This yields a lower bound that is tight up to an additive constant; see A11.

Other scientific merits/achievements

In 2021, I received the prestigious Young Mathematicians of Russia award. The result is available on the competition website in English: <https://old.mccme.ru/ium//rym/2020/winners-english.html>.