May 1st, 2023

Konstantin Tikhomirov
Associate Professor

Department of Mathematical Sciences, CMU

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http://www.andrew.cmu.edu/user/ktikhomi

Associate Professor	Contact information:
Department of Mathematical Sciences	ktikhomi@andrew.cmu.edu
Carnegie Mellon University	Wean Hall 8121, Pittsburgh, PA 15213

I. Earned degrees

2016   **PhD in Pure Mathematics**
University of Alberta, Canada
Advisor: Dr. Nicole Tomczak-Jaegermann
Co-advisor: Dr. Vlad Yaskin

2011   **Candidate of Sciences in Pure Mathematics**
Samara State University, Russia (dissertation defended in Voronezh, Russia)
Advisor: Dr. Sergey V. Astashkin

2008   **Specialist in Applied Mathematics and Information Technologies**
Samara State University, Russia

II. Employment history

2022/08–present   **Associate Professor**, Department of Mathematics, CMU

2018/08–2023/02   **Assistant Professor**, School of Mathematics, GeorgiaTech

2017/08–2017/12   **Viterbi Postdoctoral fellow**, MSRI, Berkeley
Advisor: Dr. Mark Rudelson

2016/09–2018/07   **Instructor**, Princeton University

2011/09–2016/06   **Teaching assistant**, University of Alberta, Canada

2008/03–2011/08   **Software developer**, CQG Inc. (www.cqg.com)

2007/05–2008/02   **Software developer**, Mercury Development (www.mercdev.com)

III. Honors and Awards

2022	The Rollo Davidson Prize, *http://www.statslab.cam.ac.uk/rollo-davidson-trust*
2022	Invited sectional lecture at the International Congress of Mathematicians 2022
2019	The Sloan Research Fellowship
2017	The Doctoral Prize of the Canadian Mathematical Society, *https://cms.math.ca/MediaReleases/2017/Doctoral*

IV. Research, scholarship and creative activities

Refereed Publications and Submitted Articles

Published and Accepted Journal Articles

1. H. Huang, K. Tikhomirov, On dimension-dependent concentration for convex Lipschitz functions in product spaces, Electronic Journal of Probability, to appear. arXiv:2106.06121

2. C. Mao, M. Rudelson, K. Tikhomirov, Exact Matching of Random Graphs with Constant Correlation, Probab. Theory and Related Fields, to appear. arXiv:2110.05000

3. K. Tikhomirov, P. Youssef, Sharp Poincaré and log-Sobolev inequalities for the switch chain on regular bipartite graphs. Probab. Theory and Related Fields, to appear. arXiv:2007.02729

4. A. E. Litvak and K. E. Tikhomirov, Singularity of sparse Bernoulli matrices, Duke Math. J. **171** (2022), no. 5, 1135–1233. MR4402560

5. J. Hao, H. Huang, G. Livshyts, K. Tikhomirov, Distribution of the minimal distance of random linear codes, IEEE Transactions on Information Theory, to appear. arXiv:1912.12833

6. H. Huang, K. Tikhomirov, A remark on the smallest singular value of powers of Gaussian matrices, Electron. Commun. Probab. **25** (2020), Paper No. 10, 8 pp. MR4066303

7. A. E. Litvak, K. Tikhomirov and N. Tomczak-Jaegermann, Small ball probability for the condition number of random matrices, in *Geometric aspects of functional analysis. Vol. II*, 125–137, Lecture Notes in Math., 2266, Springer, Cham [2020]. MR4175760

8. G. V. Livshyts, K. Tikhomirov and R. Vershynin, The smallest singular value of inhomogeneous square random matrices, Ann. Probab. **49** (2021), no. 3, 1286–1309. MR4255145

9. G. Paouris, K. Tikhomirov and P. Valettas, Hypercontractivity and lower deviation estimates in normed spaces, Ann. Probab. **50** (2022), no. 2, 688–734. MR4399161

10. K. Tikhomirov and P. Youssef, Outliers in spectrum of sparse Wigner matrices, Random Structures Algorithms **58** (2021), no. 3, 517–605. MR4234995

11. K. Tikhomirov, Singularity of random Bernoulli matrices, Ann. of Math. (2) **191** (2020), no. 2, 593–634. MR4076632

12. A. Lytova and K. Tikhomirov, On delocalization of eigenvectors of random non-Hermitian matrices, Probab. Theory Related Fields **177** (2020), no. 1-2, 465–524. MR4095020

13. M. Rudelson and K. Tikhomirov, The sparse circular law under minimal assumptions, Geom. Funct. Anal. **29** (2019), no. 2, 561–637. MR3945840

14. K. Tikhomirov, On the Banach-Mazur distance to cross-polytope, Adv. Math. **345** (2019), 598–617. MR3900705

15. A. Litvak, A. Lytova, K. Tikhomirov, N. Tomczak-Jaegermann and P. Youssef, The rank of random regular digraphs of constant degree, J. Complexity **48** (2018), 103–110. MR3828839

16. A. Litvak, A. Lytova, K. Tikhomirov, N. Tomczak-Jaegermann and P. Youssef, Circular law for sparse random regular digraphs, J. Eur. Math. Soc. (JEMS) **23** (2021), no. 2, 467–501. MR4195739

17. A. Litvak, A. Lytova, K. Tikhomirov, N. Tomczak-Jaegermann and P. Youssef, Structure of eigenvectors of random regular digraphs, Trans. Amer. Math. Soc. **371** (2019), no. 11, 8097–8172. MR3955544

18. G. Livshyts and K. Tikhomirov, Cube is a Strict Local Maximizer for the Illumination Number, Discrete Comput. Geom. **63** (2020), no. 1, 209–228. MR4045746

19. K. Tikhomirov, Invertibility via distance for noncentered random matrices with continuous distributions, Random Structures Algorithms **57** (2020), no. 2, 526–562. MR4129729

20. A. Litvak, A. Lytova, K. Tikhomirov, N. Tomczak-Jaegermann and P. Youssef, The smallest singular value of a shifted d-regular random square matrix, Probab. Theory Related Fields **173** (2019), no. 3-4, 1301–1347. MR3936157

21. A. Lytova and K. Tikhomirov, The variance of the ℓ_p^n-norm of the Gaussian vector, and Dvoretzky's theorem, Algebra i Analiz **30** (2018), no. 4, 107–139. MR3851373

22. K. Tikhomirov, Superconcentration, and randomized Dvoretzky's theorem for spaces with 1-unconditional bases, J. Funct. Anal. 274 (2018), no. 1, 121–151. arXiv:1702.00859

23. Tikhomirov, K. and Youssef, P., On the norm of a random jointly exchangeable matrix, J Theor Probab (2018). https://doi.org/10.1007/s10959-018-0844-y

24. K. Tikhomirov and P. Youssef, The spectral gap of dense random regular graphs, Ann. Probab. **47** (2019), no. 1, 362–419. MR3909972

25. A. E. Litvak and K. Tikhomirov, Order statistics of vectors with dependent coordinates, and the Karhunen-Loève basis, Ann. Appl. Probab. **28** (2018), no. 4, 2083–2104. MR3843824

26. Ch. Bordenave, P. Caputo, D. Chafaï and K. Tikhomirov, On the spectral radius of a random matrix: an upper bound without fourth moment, Ann. Probab. 46 (2018), no. 4, 2268–2286. arXiv:1607.05484

27. K. Tikhomirov, Illumination of convex bodies with many symmetries, Mathematika, **63** (2017), no. 2, 372–382. arXiv:1606.08976

28. G. Livshyts and K. Tikhomirov, Randomized coverings of a convex body with its homothetic copies, and illumination. Proc. Amer. Math. Soc., to appear.
arXiv:1606.08876

29. K. Tikhomirov, Sample covariance matrices of heavy-tailed distributions, Int. Math. Res. Not. IMRN **2018**, no. 20, 6254–6289. MR3872323

30. A. Litvak, A. Lytova, K. Tikhomirov, N. Tomczak-Jaegermann and P. Youssef, Adjacency matrices of random digraphs: singularity and anti-concentration, J. Math. Anal. Appl. **445** (2017), no. 2, 1447–1491. MR3545253. arXiv:1511.00113

31. A. E. Litvak, A. Lytova, K. Tikhomirov, N. Tomczak-Jaegermann, P. Youssef, Anti-concentration property for random digraphs and invertibility of their adjacency matrices, C. R. Math. Acad. Sci. Paris **354** (2016), no. 2, 121–124. MR3456885

32. D. Chafaï and K. Tikhomirov, On the convergence of the extremal eigenvalues of empirical covariance matrices with dependence. Probab. Theory Relat. Fields 170 (2018), no. 3-4, 847–889. arXiv:1509.02231

33. E. Rebrova and K. Tikhomirov, Coverings of random ellipsoids, and invertibility of matrices with i.i.d. heavy-tailed entries, Israel J. Math. **227** (2018), no. 2, 507–544. MR3846333

34. K. Tikhomirov and P. Youssef, When does a discrete-time random walk in $\mathbb{R}^n$ absorb the origin into its convex hull?, Ann. Probab. **45** (2017), no. 2, 965–1002. MR3630291. arXiv:1410.0458

35. S. V. Astashkin, G. P. Curbera and K. E. Tikhomirov, On the existence of RUC systems in rearrangement invariant spaces, Math. Nachr. **289** (2016), no. 2-3, 175–186. MR3458300

36. K. Tikhomirov, The limit of the smallest singular value of random matrices with i.i.d. entries, Adv. Math. **284** (2015), 1–20. MR3391069

37. K. E. Tikhomirov, The smallest singular value of random rectangular matrices with no moment assumptions on entries, Israel J. Math. **212** (2016), no. 1, 289–314. MR3504328

38. K. E. Tikhomirov, On the distance of polytopes with few vertices to the Euclidean ball, Discrete Comput. Geom. **53** (2015), no. 1, 173–181. MR3293493

39. K. E. Tikhomirov, The Randomized Dvoretzky's theorem in ℓ_∞^n and the χ-distribution, Geometric Aspects of Functional Analysis, Lecture Notes in Mathematics, **2116** (2014), 455–463.

40. S. V. Astashkin, L. Maligranda and K. E. Tikhomirov, New examples of K-monotone weighted Banach couples, Studia Math. **218** (2013), no. 1, 55–88. MR3125124

41. K. E. Tikhomirov, Almost Euclidean sections in symmetric spaces and concentration of order statistics, J. Funct. Anal. **265** (2013), no. 9, 2074–2088. MR3084497

42. S. V. Astashkin and K. E. Tikhomirov, A probabilistic version of Rosenthal's inequality, Proc. Amer. Math. Soc. **141** (2013), no. 10, 3539–3547. MR3080175

43. S. V. Astashkin and K. E. Tikhomirov, On some probabilistic analogues of the Rosenthal inequality. (Russian) Mat. Zametki **90** (2011), no. 5, 665–671; translation in Math. Notes **90** (2011), no. 5-6, 644–650. MR2962557

44. K. E. Tikhomirov, K-monotone weighted couples of Banach lattices. (Russian) Sibirsk. Mat. Zh. **52** (2011), no. 1, 187–200; translation in Sib. Math. J. **52** (2011), no. 1, 147–158. MR2810261

45. S. V. Astashkin and K. E. Tikhomirov, On stably $\mathcal{K}$-monotone Banach couples. (Russian) Funktsional. Anal. i Prilozhen. **44** (2010), no. 3, 65–69; translation in Funct. Anal. Appl. **44** (2010), no. 3, 212–215. MR2760515

46. S. V. Astashkin and K. E. Tikhomirov, On stability of $\mathcal{K}$-monotonicity of Banach couples, Rev. Mat. Complut. **23** (2010), no. 1, 113–137. MR2578575

Conference Presentation with Proceedings (refereed)

1. K.Tikhomirov, Quantitative invertibility of non-Hermitian random matrices, Proceedings of the International Congress of Mathematicians 2022, to appear. arXiv:2206.00601

2. C.Mao, M.Rudelson, K.Tikhomirov, Random Graph Matching with Improved Noise Robustness, COLT 2021, to appear. arXiv:2101.11783

3. K. E. Tikhomirov, A strengthening of a theorem of Marcinkiewicz, in *Marcinkiewicz centenary volume*, 369–383, Banach Center Publ., 95, Polish Acad. Sci. Inst. Math., Warsaw, 2011. MR2918349

Submitted Journal Articles and preprints

1. K. Tikhomirov, On the probability that convex hull of random points contains the origin. arXiv:2304.13133

2. K. Tikhomirov, On bounded degree graphs with large size-Ramsey numbers, submitted. arXiv:2210.05818

3. K. Tikhomirov, A remark on the Ramsey number of the hypercube, submitted. arXiv:2208.14568

4. K. Tikhomirov, P. Youssef, Regularized modified log-Sobolev inequalities, and comparison of Markov chains, submitted. arXiv:2206.12477

5. H. Huang, K. Tikhomirov, Shotgun assembly of unlabeled Erdos–Renyi graphs. Preprint. arXiv:2108.09636

Other Publications and Creative Products

- K. Tikhomirov (2016), High-Dimensional Phenomena in Convex Geometry, and Random Matrix Theory, PhD dissertation, University of Alberta.

Presentations

Invited colloquium talks

Institution	Date	Title

University of California, San Diego (Math department)	2023/02/02	The average-case analysis of the Gaussian Elimination with Partial Pivoting
National University of Singapore (Math department) (via Zoom)	2022/04/08	The average-case analysis of the Gaussian Elimination with Partial Pivoting
University of Alberta (Math department) (via Zoom)	2021/10/21	Exact Matching of Random Graphs with Constant Correlation
UC Berkeley (Math department) (via Zoom)	2021/04/08	Singularity of random Bernoulli matrices
University of Michigan (Math department)	2020/02/04	Singularity of random Bernoulli matrices
Yale University (Math department)	2019/12/04	Singularity of random Bernoulli matrices
NYU Abu Dhabi (Math department)	2019/11/26	Singularity of random Bernoulli matrices
GeorgiaTech (ARC Colloquium)	2019/03/04	Singularity of random Bernoulli matrices

Invited presentations at conferences and workshops

Conference/Workshop	Event dates	Title of the talk
AMS 2023 Spring Central Sectional Meeting	2023/04/15–2023/04/16	On the Ramsey number of the hypercube
AMS 2023 Spring Southeastern Sectional Meeting	2023/03/18–2023/03/19	On bounded degree graphs with large size-Ramsey numbers
Workshop on Probabilistic Methods in Geometry and Analysis, ICERM	2022/10/17–2022/10/21	On the Ramsey number of the hypercube
Workshop in Convexity and High-Dimensional Probability, GeorgiaTech	2022/05/23–2022/05/27	Smoothed and average-case analysis of matrix computations
Algebraic questions in random integral matrices, Ohio State University (via Zoom)	2020/11/14–2020/11/15	Singularity of random discrete matrices
Joint Mathematics Meeting, Denver CO, AMS-SIAM Special Session on Random Matrices and Integrable Systems	2020/01/18	Invertibility of inhomogeneous random matrices
Asymptotic Geometric Analysis IV, Saint–Petersburg, Russia	2019/07/01–2019/07/06	Singularity of random Bernoulli matrices
Mini-course at the Summer Meeting of the Canadian Mathematical Society, Regina, Canada	2019/06/07–2019/06/10	Convex–geometric methods in random matrix theory
AMS Sectional Meeting, University of Hawaii at Manoa, Honolulu	2019/03/22–2019/03/24	No-gaps delocalization of random matrices with independent entries.

AMS Sectional Meeting, University of Michigan, Ann Arbor	2018/10/20–2018/10/21	No-gaps delocalization of eigenvectors of non-Hermitian random matrices.
Quantitative Linear Algebra Culminating Workshop at Lake Arrowhead, CA	2018/06/10–2018/06/15	On the Banach–Mazur distance to the cube.
Simons Algorithms and Geometry Annual Meeting, New York	2018/05/18	Circular law for very sparse non-Hermitian random matrices.
Workshop on Random Matrices and Free Probability Theory, IPAM, UCLA	2018/05/14–2018/05/18	Circular law for very sparse non-Hermitian random matrices.
Columbia University, NY (Princeton–Columbia Probability Day)	2018/04/13	On the normal vector to a random hyperplane.
AMS Special Session on Probability in Convexity and Convexity in Probability, Ohio	2018/03/16–2018/03/18	The condition number of random square matrices.
Workshop on Geometric functional analysis and applications, MSRI, Berkeley	2017/11/13–2017/11/17	Invertibility via distance for random matrices with continuous distributions.
Stochastic Processes and their Applications (SPA2017), Moscow	2017/07/24–2017/07/28	On invertibility of random matrices.
Foundations of Computational Mathematics 2017, Barcelona, Session on Random Matrices	2017/07/10–2017/07/19	The smallest singular value of adjacency matrices of random regular digraphs.
Recent Advances in Discrete and Analytic Aspects of Convexity, BIRS, Canada	2017/05/21–2017/05/26	Superconcentration, and randomized Dvoretzky's theorem for spaces with 1-unconditional bases.
ProbabLY ON Random Matrices, Lyon, France	2017/04/03–2017/04/07	Sample covariance matrices of heavy-tailed distributions.
Workshop in Analysis and Probability, Texas A&M University, Concentration Week on Geometric Functional Analysis	2016/07/25–2016/07/29	On the spectral radius of a random matrix with i.i.d. entries.
2016 CMS Summer Meeting, Edmonton, Canada	2016/06/24–2016/06/27	Randomized coverings by homothetic copies, and illumination.
Conference on Geometric Functional Analysis in Honour of Nicole Tomczak-Jaegermann, Edmonton, Canada	2016/05/16–2016/05/20	Sample covariance matrices of heavy-tailed distributions.
Convexity, probability and discrete structures, a geometric view point, Marne-la-Vallée, France	2015/10/26–2015/10/30	The smallest singular value of random matrices with heavy-tailed entries.
AMS Fall Western Sectional Meeting, San Francisco, CA	2014/10/25–2014/10/26	The limit of the smallest singular value of random matrices with i.i.d. entries.

Geometric tomography and Harmonic Analysis, BIRS, Canada	2014/03/09–2014/03/14	On the distance of polytopes with few vertices to the Euclidean ball.
AMS Fall Central Sectional Meeting, St. Louis, MO	2013/10/18–2013/10/20	The χ-distribution and the randomized Dvoretzky's theorem in ℓ_∞^n.
Asymptotic Geometric Analysis, Saint-Petersburg, Russia	2013/6/20–2013/6/24	Random vectors with i.i.d. coordinates: concentration and Dvoretzky's theorem.
Banach spaces: Geometry and Analysis, Jerusalem, Israel	2013/5/26–2013/5/31	Almost Euclidean sections in symmetric spaces.

Invited seminar presentations

Institution/Seminar	Date	Title of the talk
Upenn/Temple Probability seminar	Feb 28th, 2023	Functional inequalities on the space of d-regular directed graphs, with applications to mixing
Stochastics and Statistics seminar, MIT	Sept 30th, 2022	Regularized modified log-Sobolev inequalities, and comparison of Markov chains
Analysis seminar at University of Waterloo, Canada (via Zoom)	Oct 20th, 2021	Shotgun assembly of Erdos–Renyi graphs
Russian Integrable Probability Seminar (via Zoom)	June 28th, 2021	Singularity of sparse random matrices
Seminar on Random Matrices and Combinatorics, University of Oxford, UK (via Zoom)	June 1st, 2021	Invertibility of random square matrices
Seminar for stochastic processes, ETH Zurich, Switzerland (via Zoom)	May 12th, 2021	Singularity of random Bernoulli matrices
Probability Seminar at UIUC, IL (via Zoom)	April 14th, 2021	Random Graph Matching with Improved Noise Robustness
Analysis seminar at Bilkent University, Ankara, Turkey (via Zoom)	March 10th, 2021	Random Graph Matching with Improved Noise Robustness
Simons Collaboration on Algorithms and Geometry meeting (via Zoom)	Sept 18th, 2020	Singularity of random Bernoulli matrices
Nonlinear analysis seminar at NC State University (via Zoom)	Sept 16th, 2020	Littlewood-Offord inequalities, and random matrices
Informal Analysis Seminar, Kent State University, OH	2019/11/09–2019/11/10	The average-case analysis in the Littlewood–Offord theory
Probability Seminar, University of California in San Diego	Jan 12th, 2017	The spectral gap of dense random regular graphs.
Combinatorics and Probability Seminar, Yale University	Nov 10th, 2016	The spectral gap of dense random regular graphs.

Combinatorics and Probability Seminar, Yale University	Jan 28th, 2016	Adjacency matrices of random digraphs: singularity and anti-concentration.
Probability Seminar, University of Washington, WA	Oct. 5th, 2015	The smallest singular value of random matrices with independent rows.
PIMS Probability Seminar, University of British Columbia, BC	Sept. 30th, 2015	The smallest singular value of random matrices with independent entries.
Analysis/Probability Learning Seminar, University of Michigan, MI	Sept. 24th, 2015	On the convergence of the extremal eigenvalues of empirical covariance matrices with dependence.
Functional Analysis Seminar, Université Pierre et Marie Curie, Paris, France	Dec. 4th, 2014	The smallest singular value of random matrices with no moment assumptions on entries.
Analysis and Probability Seminar, Université Paris-Dauphine, France	Nov. 25th, 2014	The limit of the smallest singular value of random matrices with i.i.d. entries.
Analysis Seminar, University of Missouri, Columbia, MO	Oct. 22nd, 2013	The Gaussian measure of thin shells and the randomized Dvoretzky's theorem.