

Apoorva Khare: Publications

BOOKS AND SURVEY ARTICLES (PEER-REVIEWED)

- (1) **A. Khare**. *Matrix analysis and entrywise positivity preservers* (**Book**), 2022. London Mathematical Society Lecture Note Series, Cambridge University Press, vol. 471, xxii+292 pp.; and Texts and Readings In Mathematics (TRIM Series), Hindustan Book Agency, vol. 82, xxii+339 pp.
- (2) A. Belton, D. Guillot, **A. Khare**, and M. Putinar. A panorama of positivity. I: Dimension free (survey article), *Analysis of Operators on Function Spaces* (The Serguei Shimorin Memorial Volume; A. Aleman, H. Hedenmalm, D. Khavinson, M. Putinar, Eds.), pp. 117–165, Trends in Mathematics, Birkhauser, 2019.
- (3) A. Belton, D. Guillot, **A. Khare**, and M. Putinar. A panorama of positivity. II: Fixed dimension (survey article), *Complex Analysis and Spectral Theory*, Proceedings of the CRM Workshop held at Laval University, QC, May 21–25, 2018 (G. Dales, D. Khavinson, J. Mashreghi, Eds.). CRM Proceedings – AMS Contemporary Mathematics 743, pp. 109–150, American Mathematical Society, 2020. (The *unified survey* containing both parts can be found at arXiv:math.CA/1812.05482.)
- (4) **A. Khare** and A. Lachowska. *Beautiful, Simple, Exact, Crazy: Mathematics in the Real World* (**Book**, 480 pp.), Yale University Press, 2015.
- (5) **A. Khare**. Representations of complex semi-simple Lie groups and Lie algebras (invited survey article), *Connected at Infinity II: A Selection of Mathematics by Indians* (R. Bhatia, C.S. Rajan, and A.I. Singh, Eds.), TRIM, Hindustan Book Agency, pp. 85–129, 2013.

PAPERS (PEER-REVIEWED)

- (6) A. Belton, D. Guillot, **A. Khare**, and M. Putinar. *Totally positive kernels, Pólya frequency functions, and their transforms*, Journal d'Analyse Mathématique (63 pp.), in press; arXiv:math.FA/2006.16213.
- (7) L. Bouthat, **A. Khare**, J. Mashreghi, and F. Morneau-Guérin. *The p -norm of circulant matrices*, Linear and Multilinear Algebra (14 pp.), in press; arXiv:math.FA/2109.09728.
- (8) A. Belton, D. Guillot, **A. Khare**, and M. Putinar. *Moment-sequence transforms*, Journal of the European Mathematical Society, 24(9):3109–3160, 2022.
- (9) A. Belton, D. Guillot, **A. Khare**, and M. Putinar. *Matrix compression along isogenic blocks*, Acta Scientiarum Mathematicarum (Szeged), 88(1–2) – 100th anniversary special volume, 417–448, 2022.
- (10) **A. Khare**. *Smooth entrywise positivity preservers, a Horn–Loewner master theorem, and symmetric function identities*, Transactions of the American Mathematical Society, 375(3):2217–2236, 2022.
- (11) G. Dhillon and **A. Khare**. *The weights of simple modules in Category \mathcal{O} for Kac–Moody algebras*, Journal of Algebra, 603:164–200, 2022.
- (12) A. Belton, D. Guillot, **A. Khare**, and M. Putinar. *Hirschman–Widder densities*, Applied and Computational Harmonic Analysis, 60:396–425, 2022.
- (13) **A. Khare** and A. Tikaradze. *Covering modules by proper submodules*, Communications in Algebra, 50(2):498–507, 2022.

PAPERS (PEER-REVIEWED) (CONT.)

- (14) A. Belton, D. Guillot, **A. Khare**, and M. Putinar. *Preservers of totally positive kernels and Pólya frequency functions*, Mathematics Research Reports, 3:35–56, 2022.
[Joint announcement of 3 papers: arXiv/2006.16213 (*J. d'Analyse Math.*, in press), arXiv/2008.05121 (preprint, 2020), arXiv/2101.02129 (*Appl. Comp. Harm. Anal.*, 2022).]
- (15) **A. Khare** and T. Tao. *On the sign patterns of entrywise positivity preservers in fixed dimension*, American Journal of Mathematics, 143(6):1863–1929, 2021.
- (16) **A. Khare**. *Sharp nonzero lower bounds for the Schur product theorem*, Proceedings of the American Mathematical Society, 149(12):5049–5063, 2021.
- (17) P.N. Choudhury, M.R. Kannan, and **A. Khare**. *Sign non-reversal property for totally non-negative and totally positive matrices, and testing total positivity of their interval hull*, Bulletin of the London Mathematical Society, 53(4):981–990, 2021.
- (18) **A. Khare** and V.P. Pingali. *On an asymptotic characterisation of Griffiths semipositivity*, Bulletin des Sciences Mathématiques, 167: art.# 102956, 7 pp., 2021.
- (19) **A. Khare** and B. Rajaratnam. *Differential calculus on the space of countable labelled graphs*, Advances in Operator Theory, 6(1): art.# 12, 28 pp., 2021.
- (20) **A. Khare** and B. Rajaratnam. *Probability inequalities and tail estimates for metric semigroups*, Advances in Operator Theory, 5(3):779–795, 2020
(Special issue in honor of Rajendra Bhatia).
- (21) C. Benedetti, R.S. González D'León, C.R.H. Hanusa, P.E. Harris, **A. Khare**, A.H. Morales, and M. Yip. *A combinatorial model for computing volumes of flow polytopes*, Transactions of the American Mathematical Society, 372(5):3369–3404, 2019.
- (22) A. Belton, D. Guillot, **A. Khare**, and M. Putinar. *Simultaneous kernels of matrix Hadamard powers*, Linear Algebra and its Applications 576:142–157, 2019.
- (23) **A. Khare** and A. Tikaradze. *A Carlitz–von Staudt type theorem for finite rings*, Linear Algebra and its Applications 568:106–126, 2019.
- (24) (As D.H.J. Polymath:) T. Fritz, S. Gadgil, **A. Khare**, P. Nielsen, L. Silberman, and T. Tao. *Polymath14: Homogeneous length functions on groups*, Algebra & Number Theory 12(7):1773–1786, 2018.
- (25) **A. Khare**. *Generalized nil-Coxeter algebras over discrete complex reflection groups*, Transactions of the American Mathematical Society 370(4):2971–2999, 2018.
- (26) G. Dhillon and **A. Khare**. *Faces of highest weight modules and the universal Weyl polyhedron*, Advances in Mathematics 319:111–152, 2017.
- (27) **A. Khare** and B. Rajaratnam. *The Hoffmann–Jørgensen inequality in metric semigroups*, Annals of Probability 45(6A):4101–4111, 2017.
- (28) D. Guillot, **A. Khare**, and B. Rajaratnam. *Preserving positivity for rank-constrained matrices*, Transactions of the American Mathematical Society 369(9):6105–6145, 2017.
- (29) **A. Khare**. *Standard parabolic subsets of highest weight modules*, Transactions of the American Mathematical Society 369(4):2363–2394, 2017; erratum, Trans. AMS 369(4):3015, 2017.
- (30) **A. Khare**. *Generalized nil-Coxeter algebras, cocommutative algebras, and the PBW property*, AMS Contemporary Mathematics 688:139–168, 2017
(Special issue in honor of Donald S. Passman).

PAPERS (PEER-REVIEWED) (CONT.)

- (31) A. Belton, D. Guillot, **A. Khare**, and M. Putinar. *Matrix positivity preservers in fixed dimension. I*, Advances in Mathematics 298:325–368, 2016.
- (32) D. Guillot, **A. Khare**, and B. Rajaratnam. *Critical exponents of graphs*, Journal of Combinatorial Theory, Series A 139:30–58, 2016.
- (33) **A. Khare**. *Faces and maximizer subsets of highest weight modules*, Journal of Algebra 455:32–76, 2016.
- (34) **A. Khare** and A. Tikaradze. *On Category \mathcal{O} over triangular generalized Weyl algebras*, Journal of Algebra 449:687–729, 2016.
- (35) D. Guillot, **A. Khare**, and B. Rajaratnam. *Preserving positivity for matrices with sparsity constraints*, Transactions of the American Mathematical Society 368(12):8929–8953, 2016.
- (36) A. Belton, D. Guillot, **A. Khare**, and M. Putinar. *Matrix positivity preservers in fixed dimension*, Comptes Rendus Mathématique de l’Académie des Sciences 354(2):143–148, 2016.
- (37) P. Diao, D. Guillot, **A. Khare**, and B. Rajaratnam. *Differential calculus on graphon space*, Journal of Combinatorial Theory, Series A 133:183–227, 2015.
- (38) D. Guillot, **A. Khare**, and B. Rajaratnam. *Complete characterization of Hadamard powers preserving Loewner positivity, monotonicity, and convexity*, Journal of Mathematical Analysis and Applications 425(1):489–507, 2015.
- (39) D. Guillot, **A. Khare**, and B. Rajaratnam. *The critical exponent conjecture for powers of doubly nonnegative matrices*, Linear Algebra and its Applications 439(8):2422–2427, 2013.
- (40) **A. Khare** and T.B. Ridenour. *Faces of weight polytopes and a generalization of a theorem of Vinberg*, Algebras and Representation Theory 15(3):593–611, 2012.
- (41) V. Chari, **A. Khare**, and T.B. Ridenour. *Faces of polytopes and Koszul algebras*, Journal of Pure and Applied Algebra 216(7):1611–1625, 2012.
- (42) **A. Khare**. *The sum of a finite group of weights of a Hopf algebra*, Axioms 1(3):259–290, 2012 (Special issue on: “Hopf Algebras, Quantum Groups and Yang-Baxter Equations”).
- (43) A. Khare, A. Saxena, and **A. Khare**. *Solutions of several coupled discrete models in terms of Lamé polynomials of arbitrary order*, Pramana 79(3):377–392, 2012.
- (44) **A. Khare** and A. Tikaradze. *Center and representations of infinitesimal Hecke algebras of \mathfrak{sl}_2* , Communications in Algebra 38(2):405–439, 2010.
- (45) **A. Khare**. *Functoriality of the BGG Category \mathcal{O}* , Communications in Algebra 37(12):4431–4475, 2009.
- (46) **A. Khare**. *Vector spaces as unions of proper subspaces*, Linear Algebra and its Applications 431(9):1681–1686, 2009.
- (47) W.L. Gan and **A. Khare**. *Quantized symplectic oscillator algebras of rank one*, Journal of Algebra 310(2):671–707, 2007.
- (48) **A. Khare**. *Divisibility tests and recurring decimals in Euclidean domains* (final section with P. Moree), JP Journal of Algebra, Number Theory, and Appl. (JPANTA) 7(1):1–32, 2007.
- (49) **A. Khare**. *Category \mathcal{O} over the symplectic oscillator algebra*, Ph.D. Thesis, University of Chicago, 2006.
- (50) **A. Khare**. *Category \mathcal{O} over a deformation of the symplectic oscillator algebra*, Journal of Pure and Applied Algebra 195(2):131–166, 2005; erratum, JPAA 199:319–320, 2005.

PAPERS (PEER-REVIEWED) (CONT.)

- (51) **A. Khare**. *Divisibility tests*, Furman University Electronic Journal of Undergraduate Mathematics (FUEJUM) 3:1–5, 1997.

CONFERENCE PROCEEDINGS – FPSAC

(INTERNATIONAL CONFERENCE ON “FORMAL POWER SERIES AND ALGEBRAIC COMBINATORICS”)

- (52) P.N. Choudhury and **A. Khare**. *Blowup polynomials and delta-matroids of graphs* (extended abstract of the paper “*The blowup-polynomial of a metric space: connections to stable polynomials, graphs and their distance spectra*”), 34th FPSAC, 2022; Séminaire Lotharingien de Combinatoire 86B, Article #42 (12 pages), 2022.
- (53) **A. Khare** and T. Tao. *Schur polynomials, entrywise positivity preservers, and weak majorization* (extended abstract of the paper “*On the sign patterns of entrywise positivity preservers in fixed dimension*”), 30th FPSAC, 2018; Séminaire Lotharingien de Combinatoire 80B, Article #14 (12 pages), 2018.
- (54) **A. Khare**. *Generalized nil-Coxeter algebras* (extended abstract of the paper “*Generalized nil-Coxeter algebras over discrete complex reflection groups*”), 30th FPSAC, 2018; Séminaire Lotharingien de Combinatoire 80B, Article #29 (12 pages), 2018.
- (55) C. Benedetti, R.S. González D’León, C.R.H. Hanusa, P.E. Harris, **A. Khare**, A.H. Morales, and M. Yip. *The volume of the caracol polytope* (extended abstract of the paper “*A combinatorial model for computing volumes of flow polytopes*”), 30th FPSAC, 2018; Séminaire Lotharingien de Combinatoire 80B, Article #87 (12 pages), 2018.
- (56) G. Dhillon and **A. Khare**. *The Weyl–Kac weight formula* (extended abstract of the paper “*Characters of highest weight modules and integrability*”), Talk at the 29th FPSAC, 2017; Séminaire Lotharingien de Combinatoire 78B, Article #77 (12 pages), 2017.
- (57) D. Guillot, **A. Khare**, and B. Rajaratnam. *The critical exponent: a novel graph invariant* (extended abstract of the paper “*Critical exponents of graphs*”), 29th FPSAC, 2017; Séminaire Lotharingien de Combinatoire 78B, Article #62 (12 pages), 2017.
- (58) A. Belton, D. Guillot, **A. Khare**, and M. Putinar. *Schur polynomials and matrix positivity preservers* (extended abstract of the paper “*Matrix positivity preservers in fixed dimension. I*”), 28th FPSAC, 2016; DMTCS Proceedings BC, pages 155–166, 2016.

ADDITIONAL RESEARCH OUTPUT

- (1) **A. Khare** and T. Tao. *Schur polynomials, entrywise positivity preservers, and weak majorization*, Poster presented at the 30th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC ’18), 2018.
- (2) **A. Khare**. *Generalized nil-Coxeter algebras*, Poster presented at the 30th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC ’18), 2018.
- (3) C. Benedetti, R.S. González D’León, C.R.H. Hanusa, P.E. Harris, **A. Khare**, A.H. Morales, and M. Yip. *The volume of the caracol polytope*, Poster at the 30th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC ’18), 2018.
- (4) A. Belton, D. Guillot, **A. Khare**, and M. Putinar. *Schur polynomials and matrix positivity preservers*, Poster presented at the 28th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC ’16), 2016.

ADDITIONAL RESEARCH OUTPUT (CONT.)

- (5) D. Guillot, **A. Khare**, and B. Rajaratnam. Concept note by organizers, Workshop on *Positivity, graphical models, and modeling of complex multivariate dependencies*, American Institute of Mathematics (AIM), 2014.
- (6) **A. Khare** and B. Rajaratnam. *Rigorous mathematical foundations for network analysis*, Poster (Mathematics) presented at the DARPA Young Faculty Award KickOff Meeting, Washington D.C., 2012.
- (7) **A. Khare** and B. Rajaratnam. *Rigorous mathematical foundations for network analysis*, Poster (Mathematics) presented at the DARPA Young Faculty Award KickOff Meeting, Washington D.C., 2011.

PREPRINTS

- (1) **A. Khare** and G. Krishna Teja. *A weight-formula for all highest weight modules, and a higher order parabolic category \mathcal{O}* (2022), arXiv:math.RT/2203.05515.
- (2) **A. Khare** and S. Sahi. *From Cauchy's determinant formula to bosonic and fermionic immanant identities* (2022), arXiv:math.RT/2201.03129.
- (3) S. Bhattacharya and **A. Khare**. *The lattice of nil-Hecke algebras over real and complex reflection groups* (2021), arXiv:math.RA/2111.14800.
- (4) P.N. Choudhury and **A. Khare**. *Multivariate blowup-polynomials of graphs* (2021), arXiv:math.CO/2106.03751.
- (5) P.N. Choudhury and **A. Khare**. *The blowup-polynomial of a metric space: connections to stable polynomials, graphs and their distance spectra* (2021), arXiv:math.MG/2105.12111.
- (6) **A. Khare**. *Multiply positive functions, critical exponent phenomena, and the Jain–Karlin–Schoenberg kernel* (2020), arXiv:math.FA/2008.05121.
- (7) P.N. Choudhury and **A. Khare**. *Distance matrices of a tree: two more invariants, and in a unified framework* (2019), arXiv:math.CO/1903.11566.
- (8) **A. Khare**. *Matrix analysis, Pólya frequency functions, and preservers of (total) positivity*, Lecture notes (320+ pp.), available on author's website and under revision.
- (9) **A. Khare**. *The non-compact normed space of norms on a finite-dimensional Banach space* (2018), arXiv:math.CA/1810.06188.
- (10) **A. Khare** and B. Rajaratnam. *The Khinchin–Kahane inequality and Banach space embeddings for metric groups* (2016), arXiv:math.PR/1610.03037.
- (11) P. Diao, D. Guillot, **A. Khare**, and B. Rajaratnam. *Model-free consistency of graph partitioning* (2016), arXiv:math.CO/1608.03860.
- (12) **A. Khare** and B. Rajaratnam. *Integration and measures on the space of countable labelled graphs*, preprint (under revision), arXiv:math.CA/1506.01439.
- (13) **A. Khare**. *Axiomatic framework for the BGG Category \mathcal{O}* , preprint (under revision), arXiv:math.RT/1502.06706.
- (14) D. Guillot, **A. Khare**, and B. Rajaratnam. *On fractional Hadamard powers of positive block matrices*, preprint (under revision), arXiv:math.FA/1404.6839.