Amritanshu Prasad

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The Institute of Mathematical Sciences
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Personal

Born on 5th July 1975.

Citizen of India.

Areas of specialization

Representation theory, combinatorics, harmonic analysis, number theory, group theory.

Education

B. Stat.(hons.), Indian Statistical Insitute, Kolkatta, 1995.

M.S. Mathematics, The University of Chicago, 1996.

Ph.D. Mathematics, The University of Chicago 2001 (supervised by Prof. Robert E. Kottwitz).

Employment

Professor H, The Institute of Mathematical Sciences (since 2016).

Professor G, The Institute of Mathematical Sciences (since 2011-2016).

Reader F, The Institute of Mathematical Sciences (2007-2011).

Fellow E, The Institute of Mathematical Sciences (2003-2007).

CRM-CICMA fellow, University of Montréal (2001-2003).

Visiting positions

University of Stuttgart, May 2017.

Australian National University, Canberra. October 2006 and September 2015.

Institut des Hautes Études Scientifiques, Bures-sur-Yvette. Summer 2003 and December 2008.

Tata Institute of Fundamental Research, Mumbai. Summer 2004.

Max-Planck Institut für Mathematik, Bonn. Summer 2002.

Honours and distinctions

Fellow, Indian Academy of Sciences (2019).

Srinivasa Ramanujan Memorial Award Lecture, Indian Mathematical Society (2017).

Swarnajayanti Fellowship, Department of Science & Technology (2014-15).

Young Scientist Medal, Indian National Science Academy (2010).

Associate, The Indian Academy of Sciences (2005-2010).

Publications

Books

Representation Theory: A Combinatorial Viewpoint, Cambridge Studies in Advanced Mathematics, vol. 147, Cambridge University Press, 2015.

Papers

1. Cyclic characters of Alternating goups, with Amrutha P and Velmurugan S, (preprint), 2024.
2. Representation zeta functions of arithmetic groups of type A_2 in positive characteristic, with Uri Onn and Pooja Singla, *Int. Math. Res. Not.*, 2025:2, January 2025
3. Set partitions, tableaux, and subspace profiles under regular diagonal matrices, with Samrith Ram, *European J. Combin.*, 124:104060, 2025.
4. Existence of elementwise invariant vectors in representations of symmetric groups, with P. Amrutha and S. Velmurugam, *Algebr. Combin.*, 7(4):915-929, 2024.
5. Some restriction coefficients for the trivial and sign representations, with Sridhar P Narayanan, Digjoy Paul and Shraddha Srivastava, *Algebr. Combin.*, 7(4):1183-1195, 2024.
6. Locally invariant vectors in representations of symmetric groups, with Amrutha P and Velmurugan S, *Sém. Lothar. Combin.*, 91B:66 (Proceedings of the 36th Conference on Formal Power Series and Algebraic Combinatorics), 2024.
7. Enumeration of anti-invariant subspaces and the q-Hermite Catalan matrix, with Samrith Ram, *Adv. Appl. Math.*, 154:102654, 2024.
8. Splitting subspaces and a finite field interpretation of the Touchard-Riordan Formula, with Samrith Ram, *European J. Combin.*, 110:103705, 2023.
9. Simultaneous Conjugacy Classes of Finite p-groups of rank ≤ 5, with Dilpreet Kaur and Sunil Prajapati, *J. Ramanujan Math. Soc.*, 38(3):275–293, 2023.
10. The Frobenius characteristic of character polynomials, *J. Indian Institute of Science*, 102:947–959, 2022.
11. Set Partitions, Tableaux, and Subspace Profiles of Regular Diagonal Operators, with Samrith Ram, *Sém. Lothar. Combin.* (Proceedings of the 34th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC)), 86B.35, 2022.
12. Simultaneous conjugacy classes as combinatorial invariants of finite groups, with Dilpreet Kaur and Sunil Prajapati, *Comm. Algebra*, 50:4549-4559, 2022.

13. Polynomial induction and the restriction problem, with Sridhar P Narayanan, Digjoy Paul and Shraddha Srivastava, *Indian J. Pure Applied Math.* volume 52:6431–651, 2021.
14. Character polynomials and the restriction problem, with Sridhar P Narayanan, Digjoy Paul and Shraddha Srivastava, *Algebr. Combin.*, 4:703–722, 2021.
15. On the divisibility of character values of the symmetric group, with Jyotirmoy Ganguly and Steven Spallone, *Electronic J. Combinatorics*, 27(2):P2.1, 2020.
16. Representations, characters, and counting colourings under symmetry, *Math. Newslett. Ramanujan Math. Soc.*, 30:33–37, 2020.
17. Schur algebras for the alternating group and Koszul duality, with T. Geetha and Shraddha Srivastava, *Pacific J. Math.*, 2020.
18. An introduction to Schur polynomials, *Graduate J. Math.*, 4:62–85, 2019.
19. Macdonald trees and determinants of representations for finite Coxeter groups, with Arvind Ayyer and Steven Spallone, *Indian J. Discrete Math.*, 5(1):1–22, 2019.
20. Tableau Correspondences and Representation Theory, with Digjoy Paul and Arghya Sadhukhan, *Contemp. Math.*, 738 (Contributions in Algebra and Algebraic Geometry), 2019.
21. Knuth's moves on timed words, *The Mathematics Student*, 87,(3-4):1-11, 2018.
22. Comparison of Gelfand-Tsetlin bases for alternating and symmetric groups, with T. Geetha, *Algebr. Represent. Theory*, 21:131–143, 2018.
23. Representations of symmetric groups with non-trivial determinant, with Arvind Ayyer and Steven Spallone, *J. Combin. Th. Ser. A*, 150:208–232, 2017.
24. Odd partitions in Young's lattice, with Arvind Ayyer and Steven Spallone, *Sém. Lothar. Combin.*, 75:B75g, 2016.
25. The centre of the Schur algebra, with T. Geetha, *Asian-Eur. J. Math.*, 9, 1650006, 2016.
26. Similarity of matrices over local rings of length two, with Pooja Singla and Steven Spallone, *Indiana Univ. Math. J.*, 64:471–514, 2015.
27. Combinatorics of finite abelian groups and Weil representations, with Kunal Dutta, *Pacific J. Math.*, 275:295–324, 2015.
28. Graphic interpretation of the structure constants of the Schur algebra, with T. Geetha, *Proceedings of International Congress of Women Mathematicians*, abstract no. 20140020, 2014.
29. Orbits of pairs in abelian groups, with C. P. Anilkumar, *Sém. Lothar. Combin.*, 70:B70h, 2014.
30. Buildings, extensions, and volume growth entropy, with Jayadev Athreya and Anish Ghosh, *New York J. Math.*, 19:1-11, 2013.
31. Degeneration and orbits of tuples and subgroups in an Abelian group, with Wesley Calvert and Kunal Dutta, *J. Group Theory* 16:221-233, 2013.
32. Ultrametric logarithm laws II, with Jayadev Athreya and Anish Ghosh, *Monatsh. Math.*, 167:333-356, 2012.
33. The Cartan matrix of a centralizer algebra, with Umesh V. Dubey and Pooja Singla, *Proc. Indian Acad. Sci. Math. Sci.*, 122(1):63-73, 2012.

34. Degenerations and orbits in finite abelian groups, with Kunal Dutta, *J. Combin. Th. Ser. A*, 118(6):1685-1694, 2011.
35. An easy proof of the Stone-von Neumann-Mackey theorem, *Exposition. Math.*, 29(1):110-118, 2011.
36. Counting subspaces of a finite vector space - 2, *Resonance*, 15(12):1074-1083, 2010.
37. Counting subspaces of a finite vector space - 1, *Resonance*, 15(11):977-987, 2010.
38. Inductive algebras and homogeneous shifts, with M. K. Vemuri, *Compl. Anal. Oper. Theory*, 4:1015-1027, 2010.
39. Locally compact abelian groups with symplectic self-duality, with Ilya Shapiro and M. K. Vemuri, *Adv. Math.*, 225:2429-2454, 2010.
40. Iwahori-Hecke algebras, with Tom Haines and Robert Kottwitz, *J. Ramanujan Math. Soc.*, 25:113-145, 2010.
41. On Cuspidal representations of general linear groups over discrete valuation rings, with Anne-Marie Aubert, Uri Onn and Alexander Stasinski, *Israel J. Math.*, 175:391-420, 2010.
42. Inductive algebras for finite Heisenberg groups, with M. K. Vemuri, *Comm. Algebra*, 38:509-514, 2010.
43. On character values and decomposition of the Weil representation, *J. Anal.*, 17:73-86, 2009.
44. Ultrametric logarithm laws I, with J. S. Athreya and Anish Ghosh, *Discrete Contin. Dynam. Systems*, 2:337-348, 2009.
45. Similarity classes of 3×3 matrices over a principal local ring, with Nir Avni, Uri Onn and Leonid Vaserstein, *Comm. Algebra*, 37:2601-2615, 2009.
46. Eigenfunctions of the Laplace-Beltrami operator on hyperboloids, with Murali Vemuri, *Tamkang J. Math.*, 39:335-339, 2008.
47. Representations of a finite group in positive characteristic, *Math. Newslet. Ramanujan Math. Soc.*, 16:73-78, 2007.
48. A note on Bruhat decomposition of GL(n) over local principal rings, with Uri Onn and Leonid Vaserstein. *Comm. Algebra*, 34:4119-4130, 2006.
49. On Bernstein's presentation of Iwahori-Hecke algebras and representations of split reductive groups over non-Archimedean local fields. *Bull. Kerala Math. Assoc.*, special issue on harmonic analysis and quantum groups, 31-51, 2005.
50. Reduction theory for a rational function field. *Proc. Indian Acad. Sci. Math. Sci.*, 113:153-163, 2003.
51. Almost unramified automorphic representations for split groups over $\mathbf{F}_q(t)$. *J. Algebra*, 262:253-261, 2003.
52. Almost unramified discrete spectrum for split groups over $\mathbf{F}_q(t)$. *Duke Math. J.*, 113:237-257, 2002.

Current Students and Postdoctoral Fellows

Varun Kaushal Shah (MSc student)

Suhas Rao (PhD student)

S Velmurugan (PhD student)

Soumyadip Sarkar (PhD student)

Tirtharaj Basu (PhD student)

Rijubrata Kundu (postdoctoral fellow)

PhD supervision

Sridhar P Narayanan, Two restriction problems in the representation theory of symmetric groups (2021).

Digjoy Paul, The multiset partition algebra (2020).

Uday Bhaskar Sharma, Counting similarity classes of tuples of commuting matrices over a finite field (2017).

C. P. Anilkumar, Orbits of pairs in finite modules over discrete valuation rings and permutation representations (2014).

Pooja Singla, Representations and conjugacy classes of general linear groups over principal ideal local rings of length two (2010).

MSc supervision

M. Shriya (University of Hyderabad), On Enumeration of Vector Partitions (2023).

K. Seethalakshmi (IISER Pune), A Chinese Remainder Theorem for Partitions (2019). Recipient of the best M.S. thesis award.

Arghya Sadhukhan, General Linear Group and Symmetric Group: Commuting Actions and Combinatorics (2017).

Kamalakshya Mahatab, Geometry of Linear Diophantine equations (2012).

Venkata Raghu Tej Pantangi, Representation Theory of Symmetric Groups (2012).

Selected talks at conferences and meetings

Splitting subspaces and a finite field interpretation of the Touchard-Riordan Formula, Invited talk at the Ramanujan Symposium, IIT Madras, 22 December 2022.

Splitting Subspaces and the Touchard-Riordan Formula, Indian Institute of Sciecne Bangalore, May 6, 2022.

Schur Algebras for the Alternating Group and Koszul Duality, University of Haifa Algebra Seminar, December 24, 2020.

Simultaneous conjugacy classes in finite groups, Groups, Algebras, Representations and Computation, ICTS Bangalore, October 2019.

Experimental Mathematics with Python and Sage, PySangamam, IIT Madras, September 2018.

Securing Information in the Internet Era, Science at the Sabha (Science popularization event held at the Music Academy, Chennai), February 2017.

Colloquium talk at IIT Madras, October 2016.

31st Annual Conference of the Ramanujan Mathematical Society, Trichy, June 2016.

National Conference on Algebra and its Applications, Pondicherry University, February 2016.

India Taiwan Conference on Discrete Mathematics, IIT Madras, July 2015.

Discussion meeting on Group Theory, IISER Mohali, May 2014.

Current trends in Algebra, IISER Bhopal, August 2014.

One day colloquium sponsored by the Dr. R. Vaidyanathaswamy Mathematics Trust, University of Madras, Chennai, March 2011.

Non-commutatuve Rings and Combinatorial Representation Theory, Pondicherry University, September 2010.

Algebraic and Combinatorial Aspects of Representation Theory, National Institute of Advanced Studies (ICM satellite), Bangalore, August 2010.

11th Discussion Meeting in Harmonic Analysis, NISER Bhubaneswar, January 2010.

Teaching Experience

Graduate courses at IMSc

Algebraic Combinatorics (online course on NPTEL, with S. Viswanath), first run 2022.

Functional Analysis, Jan-Apr 2008, Jan-Apr 2022.

Algebra I and Algebra II (online courses on NPTEL, with S. Viswanath), first run 2020.

Complex Analysis, Jan-Apr 2004, Aug-Dec 2018.

Programming for Mathematicians, Aug-Dec 2016.

Measure Theory, Aug-Dec 2015.

Classic Representation Theory, Jan-Apr 2013.

Topology I, Aug-Dec 2012.

Combinatorics in Representation Theory, Jan-Apr 2011.

Topology II, Jan-Apr 2010.

Locally Compact Abelian Groups, Aug-Dec 2009.

Topics in Representation Theory, Aug-Dec 2006.

Undergraduate teaching

Mathematical Thiking, (jointly with S. Viswanath in the online BS in data science and applications program of IIT Madras), Sep-Dec 2023.

Representation Theory (Chennai Mathematical Institute), Aug-Dec 2011.

Spirit of Enquiry Lectures on Calculus (weekend course for college students), Aug-Dec 2009.

Lie-Theoretic Methods in Analysis (Chennai Mathematical Institute), Jan-Apr 2007.

Analysis (Chennai Mathematical Institute), Aug-Dec 2004 and 2005.

Number theory (McGill University), Winter 2003.

Linear algebra and multivariate calculus (Concordia University and McGill University), 2002-2003.

Freshman calculus (University of Chicago), 1997-2001.

Workshop courses

Linear Algebra through Data Science, The Insitute of Mathematical Sciences, Chennai, May 2024.

Groebner bases, NCM teacher enrichment program: A Panorama of Geometry, IMSc, November 2023.

Counting subspaces and matrices, NCM ATM school: Advanced Topics in Finite Fields, IMSc, July 2023.

A glimse of modular representation theory, AIS representation theory, Chennai Mathematical Institute, June-July 2022.

The plactic monoid, NCM workshop: Combinatorial models in representation theory, IMSc, November 2019.

Introduction to Schur polynomials, NCM workshop: Schubert varieties, IMSc, November 2017.

Representation theory of symmetric groups, AIS representation Theory of Finite Groups, Chennai Mathematical Institute, June 2017.

The Fourier transform on locally compact Abelian groups, Discussion Meeting on Harmonic Analysis, Chennai Mathematical Institute, December 2013.

Green's work on $GL(n)$, Advanced Training in Mathematics Workshop held at TIFR on Deligne-Lusztig Theory, December 2011.

Selberg's trace formula for a cocompact discrete subgroup in a locally compact topological group, workshop on Analytic Number Theory, Feb 2010.

Representations of $\mathrm{GL}_2(\mathbf{F}_q)$, $\mathrm{SL}_2(\mathbf{F}_q)$, *and some remarks about* $\mathrm{GL}_n(\mathbf{F}_q)$, AIS in Pune on Representation Theory and its Applications, July 2007.

Basics of algebraic groups, ISI workshop on Lie Groups, Dec 2006.

Software Development and Programming

Contributor to Sage mathematical software (www.sagemath.org).