

# M. Rajesh Kannan

## Present address

Assistant Professor (from July 2022)  
Department of Mathematics,  
Indian Institute of Technology Hyderabad,  
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## ACADEMIC QUALIFICATIONS

B.Sc. Mathematics, Anja College, Sivakasi, Tamil Nadu, 2005.

M.Sc. Mathematics, Anja College, Sivakasi, Tamil Nadu, 2008.

Ph.D Mathematics, Indian Institute of Technology Madras, Chennai, Tamil Nadu, 2013. ( Supervisors : Prof KC Sivakumar and Prof P Veeramani)

## RESEARCH AREA

Algebraic and Spectral Graph Theory, Matrix Theory, Combinatorics.

## RESEARCH EXPERIENCE

July 2016- July 2022 - Assistant Professor, Department of Mathematics, IIT Kharagpur, India.

November 2015 - June 2016 - Postdoctoral Fellow, Department of Mathematics, University of Manitoba, Winnipeg, Canada. (Supervisor : Prof. Stephen J. Kirkland)

March 2014 - August 2015, Postdoctoral Fellow, Department of Mathematics, Technion, Israel Institute of Technology, Haifa, Israel. (Supervisors : Prof. Abraham Berman and Prof. Naomi Shaked-Monderer)(German-Israeli Foundation for Scientific and Research development grant number: 1135-18.6/2011)

September 2013 - February 2014, Postdoctoral Fellow, Stat-Math division, Indian Statistical Institute Delhi, New Delhi. (Supervisor : Prof. Ravindra B. Bapat)

August 2013, Summer Student, Department of Mathematics, Technion, Israel Institute of Technology, Haifa, Israel.

July 2010- July 2013, Senior research fellow, Department of Mathematics, IIT Madras.

July 2008- July 2010, Junior research fellow, Department of Mathematics, IIT Madras.

## ACADEMIC ACHIEVEMENTS

"Excellent Young Teacher Award - 2020", IIT Kharagpur (Rs 2,00,000 cash award).

Postdoctoral fellowship 2015, University of Manitoba, Winnipeg, Canada.

Postdoctoral fellowship under German-Israeli Foundation for Scientific and Research development 2014, The Technion Israel Institute of Technology, Haifa, Israel.

Indian Statistical Institute Visiting Scientist fellowship 2013 (Postdoctoral fellowship).

Awarded full Scholarship for attending the summer school in Nonnegative matrices and its application by The Technion, Israel Institute of Technology, August 2013.

National Board for Higher Mathematics, Post doctoral fellowship 2013.

Qualified National Board for Higher Mathematics, Scholarship for Ph.D in Mathematics- 2009.

Qualified CSIR-UGC Junior Research fellowship December 2007.

## **COURSES TAUGHT**

At IIT Kharagpur

MA20103 - Partial differential equation (Autumn 2016, Autumn 2017, Autumn 2018)

MA10002 - Mathematics- II (Spring 2017, Spring 2018)

MA30003/MA41003 - Linear Algebra (Autumn 2017)

MA10001 - Mathematics- I (Autumn 2018, Autumn 2019)

MA60053 - Computational Linear Algebra (Spring 2019, Spring 2020)

MA20013 - Discrete Mathematics (Spring 2019, Spring 2020)

TS70007 - Advanced Mathematical Techniques (Autumn 2019, Autumn 2020)

MA11003 - Advanced Calculus (Autumn 2020)

MA11004 - Linear Algebra, Numerical and Complex Analysis (Spring 2021, Spring 2022)

MA21201/MA31005 - Real Analysis (Autumn 2021)

MA51121/MA60041/MA61003 - Graph Theory and Algorithms (Autumn 2021)

At IIT Hyderabad

MA5010 - Combinatorics and Graph Theory (Autumn 2022, Autumn 2023).

MA5510 - Spectral Graph Theory (Spring 2023).

MA1130 - Vector Calculus (Spring 2023).

MA1240 - Combinatorics (Autumn 2023).

MA 50300 - Algebraic Graph Theory (Autumn 2023).

MA5510 - Spectral Graph Theory (Spring 2024).

## SPONSORED PROJECTS

DST- SERB Core Research Grant.

DST- SERB International Travel Support (ITS) grant (Rs. 1,40,000).

Seed Grant (Principal Investigator), sponsored by SRC, IIT Hyderabad. (Rs 23,10,000)

DST-SERB Matrics project (Mathematical Research Impact-Centric Support). (Rs 6,60,000)

SERB Early carrier research award (Principal Investigator ) sponsored by Department of Science and Technology, India. (Rs 15,87,244)

SERB National Post doctoral fellowship (Mentor) sponsored by Department of Science and Technology, India. (Rs 19,20,000)

ISIRD project (Principal Investigator), sponsored by SRIC, IIT Kharagpur. (Rs 3,95,000)

## SUPERVISION

Ph.d students:

1. Dr. Aniruddha Samantha (2017-2022)
2. Dr. Amrita Mondal (2016 - 2022)(Jointly with Dr Bibhas Adhikari)
3. Dr. Iswar Mahato (2018-2023)
4. Mr. Mainak Basunia (2018-)
5. Mr. Abhay Jayarajan (2023-)
6. Mr. Rahul Roy (2023-)

Post-doctoral fellows:

1. Dr. Ranjit Mehatari (2017 - 2018)(National Postdoctoral Fellowship(DST-SERB))

## JOURNAL PUBLICATIONS

### Published/Accepted

(Underlined name indicates B.Tech/M.Sc., students)

1. Iswar Mahato and M. Rajesh Kannan, *Minimizers for the energy of eccentricity matrices of trees*, Accepted for publication in Linear Multilinear Algebra (2024).
2. Iswar Mahato and M. Rajesh Kannan, *A note on the distance and distance signless Laplacian spectral radius of complements of trees*, Linear Algebra and its Applications, 675(2023), 344-350.
3. Iswar Mahato and M. Rajesh Kannan, *Extremal problems for the eccentricity matrices of complements of trees*, Electronic journal of Linear Algebra Volume 39, pp. 339-354, June 2023.
4. Aniruddha Samanta and M. Rajesh Kannan, *On the spectrum of complex unit gain graph*, Accepted for publication in Journal of the Ramanujan Mathematical Society(2023).
5. Iswar Mahato and M. Rajesh Kannan, *Squared distance matrices of trees with matrix weights*, AKCE International Journal of Graphs and Combinatorics, , no. 2, vol. 20(2023), 177-184.

6. M. Rajesh Kannan and Shivaramakrishna Pragada, *Signed spectral Turañ type theorems*, Linear Algebra and its Applications, 663(2023), 62-79.
7. Iswar Mahato and M. Rajesh Kannan, *On the eccentricity matrices of trees: Inertia and spectral symmetry*, Discrete Mathematics, Volume 345, Issue 11, November 2022, 113067.
8. M. Rajesh Kannan, Shivaramakrishna Pragada and Hitesh Wankhede , *On the construction of cospectral nonisomorphic bipartite graphs*, Discrete Mathematics, Volume 345, Issue 8, August 2022, 112916.
9. M. Rajesh Kannan, Navish Kumar and Shivaramakrishna Pragada, *Normalized Laplacians for Gain Graphs*, American Journal of Combinatorics, Volume 1 (2022), Pages 20-39.
10. Iswar Mahato and M. Rajesh Kannan, *Eccentricity energy change of complete multipartite graphs due to edge deletion*, Special Matrices, (10) 2022, 193-202. (Special Issue: Contemporary Spectral Graph Theory)
11. Iswar Mahato, R. Gurusamy, M. Rajesh Kannan and S. Arockiaraj, *On the spectral radius and the energy of eccentricity matrix of a graph*, Linear and Multilinear Algebra, (71)2023, 5-15.
12. Aniruddha Samanta and M. Rajesh Kannan, *Distance matrices for complex unit gain graphs*, Discrete Mathematics, 345 (2022), no. 1, Paper No. 112634, 12pp.
13. Mainak Basunia, Iswar Mahato and M. Rajesh Kannan, *On the  $A_\alpha$ -spectra of some join graphs*, Bulletin of the Malaysian Mathematical Sciences Society, 44 (2021), 4269-4297.
14. M. Rajesh Kannan, Navish Kumar and Shivaramakrishna Pragada, *On the extremal eigenvalues of gain Laplacian matrices*, Linear Algebra and its Applications, 625 (2021), 212-240.
15. Projesh Nath Choudhury, M. Rajesh Kannan and Apoorva Khare, *Sign non-reversal property for totally positive matrices and testing total positivity on their interval hull*, Bulletin of the London Mathematical Society, 53 (2021), no. 4, 981-990.
16. Projesh Nath Choudhury and M. Rajesh Kannan, *Interval hulls of  $N$ -matrices and almost  $P$ -matrices*, Linear Algebra and its Applications, 617 (2021), 27-38.
17. Aniruddha Samanta and M. Rajesh Kannan, *Bounds for the energy of a complex unit gain graph*, Linear Algebra and its Applications, 612 (2021), 1-29.
18. Himadri Lal Das and M. Rajesh Kannan, *On dense subsets of matrices with distinct eigenvalues and distinct singular values*, Electronic Journal of Linear Algebra, Vol. 36(2020), pp. 834-846.
19. M. Rajesh Kannan and Shivaramakrishna Pragada, *On the construction of cospectral graphs for the adjacency and the normalized Laplacian matrices*, Linear and Multilinear Algebra, 70(2022), no.15, 3009-3030.
20. Iswar Mahato, R. Gurusamy, M. Rajesh Kannan and S. Arockiaraj, *Spectra of eccentricity matrices*, Discrete Applied Mathematics, 285 (2020), 252-260.
21. Ranjit Mehatari, M. Rajesh Kannan and Aniruddha Samanta, *On the Adjacency matrix of Complex Unit Gain Graphs*, Linear and Multilinear Algebra, 70 (2022), no.9, 1798-1813.
22. Ranjit Mehatari and M. Rajesh Kannan, *Eigenvalue bounds for some classes of matrices associated with graphs*, Czechoslovak Mathematical Journal, vol. 71, no. 1 (2021), pp. 231-251.
23. Fouzul Atik, M. Rajesh Kannan and R.B. Bapat, *On distance and Laplacian matrices of trees with matrix weights*, Linear and Multilinear Algebra, 69 (2021), no. 14, 2607-2619.

24. Fouzul Atik, R.B. Bapat and M. Rajesh Kannan, *Resistance matrices of graphs with matrix weights*, Linear Algebra and its applications, 571(2019), 41-57.
25. Projesh Nath Choudhury, M. Rajesh Kannan and K.C. Sivakumar, *A note on linear preservers on semi-positive and minimal semipositive matrices*, Electronic Journal of Linear Algebra, 34(2018), pp. 687-694.
26. Projesh Nath Choudhury, M. Rajesh Kannan and K.C. Sivakumar, *New contributions to semipositive and minimally semipositive matrices*, Electronic Journal of Linear Algebra, 34(2018), pp. 35-53.
27. M. Rajesh Kannan, *P-proper splittings*, Aequationes Mathematicae, 91(2017), no. 4, 619-633.
28. Hongwei Jin, M. Rajesh Kannan and Minru Bai, *Lower and upper bounds for H-eigenvalues of even order real symmetric tensors*, Linear and Multilinear Algebra, 65 (2017), no. 7, 1402-1416.
29. Naomi Shaked-Monderer, Abraham Berman, Mirjam Dür, M. Rajesh Kannan, *SPN completable graphs*, Linear algebra and its applications, 498 (2016), 58-73.
30. M. Rajesh Kannan and K. C. Sivakumar, *On Certain Positivity Classes of Operators*, Numerical Functional Analysis and Optimization, 37 (2016), no. 2, 206-224.
31. M. Rajesh Kannan, Naomi Shaked-Monderer, Abraham Berman, *On weakly irreducible nonnegative tensors and interval hulls of some classes of tensors*, Linear and Multilinear Algebra, 64 (2016), no. 4, 667-679.
32. M. Rajesh Kannan, Naomi Shaked-Monderer, Abraham Berman, *Some properties of strong  $\mathcal{H}$ -tensors and general  $\mathcal{H}$ -tensors*, Linear Algebra and its Applications, 476 (2015), 42-55.
33. M. Rajesh Kannan and R. B. Bapat, *Generalized Principal Pivot transforms*, Linear Algebra and its Applications, 454 (2014), 49-56.
34. M. Rajesh Kannan and K. C. Sivakumar, *Intervals of Certain Classes of Z-matrices*, Discussiones Mathematicae - General Algebra and Applications, 34 (2014), 85-93.
35. M. Rajesh Kannan and K. C. Sivakumar,  *$P_+$ -matrices: A generalization of P-matrices*, Linear and Multilinear algebra, 62 (2014), 1-12.
36. M. Rajesh Kannan and K. C. Sivakumar, *Moore-Penrose inverse positivity of interval matrices*, Linear Algebra and its Applications, 436 (2012), 571-578.

#### Preprints/Submitted

( Underlined name indicates B.Tech/M.Sc., students)

1. M. Rajesh Kannan, Shivaramakrishna Pragada and Hitesh Wankhede, *Constructing cospectral graphs by unfolding non-bipartite graphs*, preprint, submitted.
2. Aniruddha Samanta and M. Rajesh Kannan, *Bounds and extremal graphs for the energy of complex unit gain graphs*, preprint, submitted.
3. Amrita Mandal, Bibhas Adhikari and M. Rajesh Kannan, *On the eigenvalue region of permutative doubly stochastic matrices of order up to 4*, preprint, submitted.
4. Projesh Nath Choudhury, M. Rajesh Kannan and K.C. Sivakumar, *Bounds for a solution set of linear complementarity problems over Hilbert spaces*, preprint (2020).
5. Projesh Nath Choudhury, M. Rajesh Kannan and K.C. Sivakumar, *P-operators over ordered Banach spaces*, preprint(2020).
6. M. Rajesh Kannan and Stephen Kirkland, *Minimizing the Kemeny constant of trees with the given degree sequence*, preprint(2016).

## CONFERENCES, WORKSHOPS ORGANIZING/ORGANIZED

1. Annual Foundational School - I, December 4-31, 2022. Funded by National Centre for Mathematics.
2. Faculty Student Development Program on "Spectral Graph Theory and applications", IIT Hyderabad(Under PALS) November 24-25, 2022.
3. Annual Instructional School on "Algebraic Combinatorics and Spectral Graph Theory", 30 May 2022 to 18 Jun 2022. Funded by National Centre for Mathematics.
4. Weekly e-seminar on "Graphs, matrices and applications", from July 2020 to December 2021.
5. Weekly seminar on "Graphs, matrices and applications", in the Department of Mathematics, IIT Kharagpur, from January 2018 - March 2020.
6. AICTE QIP short term course on "Advanced Matrix Algebra and Applications" 18 - 22 September 2019 in the Department of Mathematics, IIT Kharagpur.
7. AICTE QIP short term course on "Linear Algebra and Differential Equations" 24 - 28 August 2018 in the Department of Mathematics, IIT Kharagpur.
8. Lecture series "Combinatorics commutative algebra: Introduction to edge ideals", from 02 - 06 July 2018 in the Department of Mathematics and Center for Theoretical Studies, IIT Kharagpur.

## INVITED TALKS IN CONFERENCES/WORKSHOPS

1. Invited talk in the symposium on "Algebraic Graph Theory" in 38<sup>th</sup> annual Ramanujan Mathematical Society (RMS) conference, December 22-24, 2023, IIT Guwahati.
2. Invited talk in "International Conference on Linear Algebra and its Applications", December 18-21, 2023, Centre for Advanced Research in Applied Mathematics and Statistics, MAHE, Manipal, India.
3. Invited talk in "International Conference on Graph Theory and its Applications", December 18-20, 2023, Amrita Vishwa Vidyapeetham, Coimbatore.
4. Invited talk in "International Conference on Spectral and Approximation Theory (ICSAT-2023)", November 27-30, 2023 Cochin University of Science And Technology.
5. Invited talk : Series of six lectures in the Advanced Instructional School on Algorithmic Graph Theory, 10-07-2023 to 12-07-2023, IIT Indore. (Supported by National Center for Mathematics( NCM), IIT Bombay and TIFR Mumbai)
6. Invited talk in a Minisymposium in the 25<sup>th</sup> International Linear Algebra Society Conference 12-06-2023 to 16-06-2023, Madrid, Spain.
7. Invited talk in pre-conference instructional workshop on Spectral Graph Theory 04-06-2023 to 07-06-2023 ( Part of annual conference of Academy of Discrete Mathematics and its applications(ADMA) and Graph theory day.)
8. "GANITHA GARIMA", A workshop on core areas of Mathematics (Algebraic Graph Theory), 29-11-2021 to 03-12-2021, Department of Mathematics, University of Kerala, Thiruvananthapuram, Kerala. (Webinar)
9. "Online Refresher Course in Mathematics (Algebraic Graph Theory)", October 16-29, 2021, UGC-Human Resource Development Centre, Savitribai Phule Pune University, Pune, Maharashtra. (Webinar)

10. Pre-workshop for "International Conference on Discrete Mathematics", October 8-10, 2021, Department of Mathematics, Manonmaniam Sundranar University, Tirunelveli, Tamil Nadu. (Webinar)
11. "VYKHARI - International Lecture Series", 15-09-2021 to 1-10-2021, BCM College, Kottayam, Kerala. (Webinar)
12. Faculty Development Training Programme on Discrete Mathematics, 28 June - 03 July 2021, Department of Mathematics, Ramco Institute of Technology, Rajapalayam, Tamil Nadu. (Webinar)
13. "Online - Six-Day FDTP on Algebra and Number Theory", 24-05-2021 to 29-05-2021, Department of Mathematics, KGiSL Institute of Technology, Coimbatore, Tamil Nadu. (Webinar)
14. "Online workshop on Numerical Linear Algebra", 19-25 September 2020, Department of Mathematics, Assam University, Silchar, Assam. (Webinar)
15. International Faculty Development Programme on "Avant-garde trends in Mathematics," 17-23 June, 2020, Bannari Amman Institute of Technology, Sathyamangalam, Tamil Nadu. (Webinar)
16. Two days Online Faculty Development Programme on "Algebra and Number Theory", 25-26 May, 2020, Department of Mathematics, Ramco Institute of Technology, Rajapalayam, Tamil Nadu. (Webinar)
17. "Conference on Linear Algebra and its Applications" in honour of Prof Ravindra B Bapat, December 26-27, 2019, Indian Statistical Institute, Delhi Centre, New Delhi.
18. "Workshop on Spectral Graph Theory" (Ten lectures), November 16-20, 2019, Indian Institute of Technology Ropar, Punjab.
19. "International Conference on Number Theory and Graph Theory", June 27-29, 2019, Department of Studies in Mathematics, University of Mysore, Mysuru, Karnataka.
20. International conference on "Emerging area of Mathematics for science and technology", 19 February 2019, organized by Rathinam College of Arts and Science, Coimbatore, Tamil Nadu.
21. "Two-day National seminar on emerging trends in Topology and Geometry", February 15-16, 2019, organized by ANJA College, Sivakasi, Tamil Nadu.
22. "CALDAM 2019" 5th Annual International Conference on Algorithms and Discrete Applied Mathematics IIT Kharagpur. February 14-16, 2019
23. Conference on "Analysis and applications", June 18-22, 2018, Department of Mathematics. IIT Madras, Chennai, Tamil Nadu.
24. One week workshop on "Analysis, Algebra and descriptive statistics" June 4 -9, 2018, Department of Mathematics, Mepco Schlenk engineering college, Sivakasi, Tamil Nadu.
25. A two days symposium on "Nonlinear analysis and Fluid dynamics", March 30-31, 2018, Department of Mathematics, IIT Madras, Chennai, Tamil Nadu.
26. A six day workshop on "Algebraic Graph Theory" January 25 - 30, 2018, Department of Mathematics, NITK Surathkal, Karnataka.
27. Conference on "Applications of Mathematics and science in engineering" January 21, 2018, Department of Mathematics, NIT Raipur, Chhattisgarh .
28. Workshop on "Nonnegative matrices and applications" December 16, 2017, Department of Mathematics, NITK Surathkal, Karnataka.

29. National Conference on "Some Contemporary Research Direction in Discrete Mathematics" May 30, 2017, organized by Department of Mathematics, Mepco Schlenk engineering college, Sivakasi, Tamil Nadu.
30. NBHM sponsored two days "National seminar on some recent research directions in graph theory" March 9 -10, 2017, The centre for Graph Theory, Ayya Nadar Janaki Ammal College, Sivakasi, Tamil Nadu.
31. Mini workshop on "Linear complementarily problems and generalizations" September 24- 25, 2016, Indian Statistical Institute Chennai Center, Chennai, Tamil Nadu.

## CONTRIBUTED TALKS

1. First Meru Combinatorics Conference 2023, 29th to 31st May, 2023, Pondicherry University.
2. December, 2017: ICLAA 2017 : International Conference on Linear Algebra and its Applications, Manipal University, Manipal, Karnataka, India.
3. May, 2016: Western Canadian Linear Algebra Meeting, University of Manitoba, Winnipeg, Canada. (Title: Some properties of semipositive matrices)
4. October, 2014: Indian Statistical Institute, Chennai center, India. (Title: Spectral theory of nonnegative tensors)
5. October, 2014: Department of Mathematics, Indian Institute of Technology Madras, Chennai, India. (Title: Spectral theory of nonnegative tensors)
6. October, 2014: Department of Mathematics, Indian Institute of Technology Hyderabad, Hyderabad, India. (Title: Spectral theory of nonnegative tensors)
7. August, 2014 : Summer school in Nonnegative matrices: Theory and Applications, The Technion, Israel Institute of Technology, Haifa, Israel. (Title: Spectral theory of nonnegative tensors)
8. August, 2013 : Summer school in Nonnegative matrices: Theory and Applications, The Technion, Israel Institute of Technology, Haifa, Israel. (Title:  $P_+$ -matrices: A generalization of  $P$ -matrices.)
9. January, 2012 : International Conference on Game Theory, Operations Research and their Applications (GTORA 2012), Indian Statistical Institute, Chennai center, India. (Title:  $P_+$ -matrices: A generalization of  $P$ -matrices.)

## DECLARATION

I confirm that all the above stated particulars in this CV are true to the best of my knowledge and that I can provide documentary evidence to verify all the given information.

M. Rajesh Kannan

Last updated: January 26, 2024