PRAFULLKUMAR TALE

Assistant Professor
Department of Mathematics
Indian Institute of Science Education
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Fields of Interests

• Parameterized Complexity • Conditional Lower Bounds • Graph Algorithms

Work Experiences

Indian Institute of Science Education and Research Pune, India
Position: Assistant Professor — Apr 2025 – Present

Indian Institute of Science Education and Research Bhopal, India
Position: Assistant Professor — Jan 2024 – Apr 2025

Indian Institute of Science Education and Research Pune, India
Position: INSPIRE Faculty Fellow — Sep 2022 – Dec 2023

CISPA Helmholtz Center for Information Security, Saarbrücken, Germany
Position: Post-Doctoral Researcher — Jul 2020 – Aug 2022

Max-Planck Institute for Informatics (MPII), Saarbrücken, Germany
Position: Post-Doctoral Researcher — Mar 2020 – Jun 2020

University Of Bergen, Bergen, Norway
Position: Researcher (An internship during Ph.D.) — Jan 2019 – Jun 2019

Ebay/PayPal Pvt Ltd
Position: Software Engineer — Jun 2012 – Jul 2013

Education

The Institute of Mathematical Sciences (IMSc), HBNI, Chennai — Aug 2015 – Feb 2020
Ph.D. in Theoretical Computer Sciences

The Institute of Mathematical Sciences (IMSc), HBNI, Chennai — Aug 2013 – Aug 2015
Master of Science in Theoretical Computer Sciences

Indian Institute of Technology (IIT), Roorkee — Jul 2007 – May 2012
Master of Science in Applied Mathematics — (Five-year Integrated Degree Program)

Manuscripts and Publications[1]

37. **Parameterized Complexity of Shortest Path Partition: Treewidth and Diameter**
with Dibyayan Chakraborty, Oscar Defrain, Florent Foucaud, Mathieu Mari

36. **The Parameterized Complexity of Computing the VC-Dimension**
with Florent Foucaud, Harmender Gahlawat, Fionn Mc Inerney
[C-31] Annual Conference on Neural Information Processing Systems (**NeurIPS**), 2025.

35. **A Finer View of the Parameterized Landscape of Labeled Graph Contractions**
with Yashaswini Mathur
[C-30] Foundations of Software Technology and Theoretical Computer Science (**FSTTCS**), 2025

[1]The norm in the theoretical computer science community is to publish a preliminary version of results in conferences (which have page limits) and a full version in journals. Also, the authors' name appear in alphabetical order of their last names, and hence there is no notion of the first author. I attest that I have made significant contributions to all the articles.

34. **Geodetic Set on Graphs of Constant Pathwidth and Feedback Vertex Set Number**
(This is a single author paper.)
[C-29] International Symposium on Parameterized and Exact Computation (**IPEC**), 2025

33. **Revisiting Token-Sliding on Chordal Graphs**
with Rajat Adak, Saraswati Girish Nanoti

32. **Robust Contraction Decomposition for H-Minor-Free Graphs and its Applications**
with Sayan Bandyapadhyay, William Lochet, Daniel Lokshtanov, Dániel Marx, Pranabendu Misra, Daniel Neuen, Saket Saurabh, Jie Xue
[C-28] International Colloquium on Automata, Languages and Programming (**ICALP**), 2025

31. **Structural Parameterization of Locating Dominating Set and Test Cover**
with Dipayan Chakraborty, Florent Foucaud, Diptapriyo Majumdar
[C-27] International Conference on Algorithms and Complexity (**CIAC**), 2025

30. **Metric Dimension and Geodetic Set Parameterized by Vertex Cover**
with Florent Foucaud, Esther Galby, Liana Khazaliya, Shaohua Li, Fionn Mc Inerney, Roohani Sharma
[C-26] International Symposium on Theoretical Aspects of Computer Science (**STACS**), 2025

29. **Telephone Broadcast on Graphs of Treewidth Two**
This is a single author paper.
(The first version is with title 'Double Exponential Lower Bound for Telephone Broadcast'.)
[J-20] Theoretical Computer Science (**TCS**), Volumn:1045: 115282 (2025)

28. **Tight (Double) Exponential Bounds for Identification Problems: Locating-Dominating Set and Test Cover**
with Dipayan Chakraborty, Florent Foucaud, Diptapriyo Majumdar
[C-25] International Symposium on Algorithms and Computation (**ISAAC**), 2024

27. **Problems in NP can Admit Double-Exponential Lower Bounds when Parameterized by Treewidth and Vertex Cover**
with Florent Foucaud, Esther Galby, Liana Khazaliya, Shaohua Li, Fionn Mc Inerney, Roohani Sharma
[C-24] International Colloquium on Automata, Languages and Programming (**ICALP**), 2024

26. **Revisiting Path Contraction and Cycle Contraction**
with R. Krithika, Kutty Malu V K
[C-23] Graph-Theoretic Concepts in Computer Science (**WG**), 2024
[J-19] (To Appear) Journal of Computer and System Sciences (**JCSS**).

25. **Conflict and Fairness in Resource Allocation**
with Susobhan Bandopadhyay, Aritra Banik, Sushmita Gupta, Pallavi Jain, Abhishek Sahu, Saket Saurabh

24. **Parameterized Complexity of Biclique Contraction and Balanced Biclique Contraction**
with R. Krithika, Kutty Malu V K, Roohani Sharma
[C-22] Foundations of Software Technology and Theoretical Computer Science (**FSTTCS**), 2023

23. **Romeo and Juliet Meeting in Forest Like Regions**
with Neeldhara Misra, Manas Mulpuri, Gaurav Viramgami
[C-21] Foundations of Software Technology and Theoretical Computer Science (**FSTTCS**), 2022
[J-18] **Algorithmica**, Volume 86(11): 3465-3495(2024)

22. **Domination and Cut Problems on Chordal Graphs with Bounded Leafage**
with Esther Galby, Daniel Marx, Philipp Schepper, Roohani Sharma
[C-20] International Symposium on Parameterized and Exact Computation (**IPEC**), 2022
[J-17] **Algorithmica**, Volume 86 (5): 1428-1474 (2024)

21. **Metric Dimension Parameterized by Feedback Vertex Set and Other Structural Parameters**
with Esther Galby, Liana Khazaliya, Fionn Mc Inerney, Roohani Sharma
[C-19] Mathematical Foundations of Computer Science (**MFCS**), 2022
[J-16] SIAM Journal on Discrete Mathematics (**SIDMA**), Volume 37 (4): 2241-2264 (2023)

20. **Reducing the Vertex Cover Number via Edge Contractions**
with Paloma T. Lima, Vinicius F. dos Santos, Ignasi Sau, Uéverton S. Souza
[C-18] Mathematical Foundations of Computer Science (**MFCS**), 2022
[J-15] Journal of Computer and System Sciences (**JCSS**), Volume 129: 22-38 (2022).

19. **The Complexity of Contracting Bipartite Graphs into Small Cycles**
with R. Krithika, Roohani Sharma
[C-17] Graph-Theoretic Concepts in Computer Science (**WG**), 2022

18. **Parameterized Complexity of Weighted Multicut in Trees**
with Esther Galby, Dániel Marx, Philipp Schepper, Roohani Sharma
[C-16] Graph-Theoretic Concepts in Computer Science (**WG**), 2022
[J-14] Theoretical Computer Science (**TCS**), Volume 978: 114174 (2023)

17. **A Framework for Parameterized Subexponential Algorithms for Generalized Cycle Hitting Problems on Planar Graphs**
with Dániel Marx, Pranabendu Misra, Daniel Neuen
[C-15] ACM-SIAM Symposium on Discrete Algorithms (**SODA**), 2022

16. **Sparsification Lower Bound for Linear Spanners in Directed Graphs**
(This is a single author paper.)
[J-13] Theoretical Computer Science (**TCS**), Volume 898: 69-74 (2022)

15. **α-approximate Reductions: a Novel Source of Heuristics for Better Approximation Algorithms**
with Fredrik Manne, Geevarghese Philip, Saket Saurabh

14. **On the Parameterized Approximability of Contraction to Classes of Chordal Graphs**
with Spoorthy Gunda, Pallavi Jain, Daniel Lokshtanov, Saket Saurabh
[C-14] Approximation, Randomization, and Combinatorial Optimization **APPROX/RANDOM**, 2020
[J-12] ACM Transactions on Computation Theory (**ToCT**), Volume 13(4): 27:1-27:40 (2021)

13. **Parameterized Complexity of Maximum Edge-Colorable Subgraph**
with Akanksha Agrawal, Madhumita Kundu, Abhishek Sahu, Saket Saurabh
[C-13] Annual International Computing and Combinatorics Conference (**COCOON**), 2020
[J-11] **Algorithmica**, Volume 84 (10): 3075 – 3100 (2022)

12. **On the Parameterized Complexity of Maximum Degree Contraction**
with Saket Saurabh
[C-12] International Symposium on Parameterized And Exact Computation (**IPEC**), 2020
[J-10] **Algorithmica**, Volume 84: 405 – 435 (2022)

11. **On the Parameterized Complexity of Grid Contraction**
with Saket Saurabh, Ueverton Dos Santos Souza

[C-11] Scandinavian Symposium and Workshops on Algorithm Theory (**SWAT**), 2020
[J-09] Journal of Computer and System Sciences (**JCSS**), Volume 129: 22-38 (2022)

10. **Subset Feedback Vertex Set in Chordal and Split Graphs**
with Geevarghese Philip, Varun Rajan, Saket Saurabh
[C-10] International Conference on Algorithms and Complexity (**CIAC**), 2019
[J-08] **Algorithmica**, Volume 81 (9): 3586-3629 (2019)

9. **Path Contraction Faster than 2^n**
with Akanksha Agrawal, Fedor Fomin, Daniel Lokshtanov, Saket Saurabh
[C-09] International Colloquium on Automata, Languages and Programming (**ICALP**), 2019
[J-07] SIAM Journal on Discrete Mathematics (**SIDMA**), 34(2): 1302-1325 (2020)

8. **An FPT Algorithm for Contraction to Cactus**
with R. Krithika, Pranabendu Misra
[C-08] Annual International Computing and Combinatorics Conference (**COCOON**), 2018
[J-06] Theoretical Computer Science (**TCS**), Volume 954: 113803 (2023).

7. **Exact and Parameterized Algorithms for (k, i)-Coloring**
with Diptapriyo Majumdar, Rian Neogi, Venkatesh Raman
[C-07] Algorithms and Discrete Applied Mathematics, (**CALDAM**), 2017

6. **Paths to Trees and Cacti**
with Akanksha Agrawal, Lawqueen Kanesh, Saket Saurabh
[C-06] International Conference on Algorithms and Complexity (**CIAC**), 2017
[J-05] Theoretical Computer Science (**TCS**), Volume 860: 98-116 (2021)

5. **On the Parameterized Complexity of Contraction to Generalization of Trees**
with Akanksha Agarwal, Saket Saurabh
[C-05] International Symposium on Parameterized and Exact Computation (**IPEC**), 2017
[J-04] Theory of Computing Systems (**ToCS**) Volume 63 (3): 587-614 (2019)

4. **Parameterized and Exact Algorithms for Class Domination Coloring**
with R. Krithika, Ashutosh Rai, Saket Saurabh
[C-04] **SOFSEM** 2017: Theory and Practice of Computer Science
[J-03] Discrete Applied Mathematics (**DAM**), Volume 291: 286-299 (2021)

3. **Lossy Kernels for Graph Contraction Problems**
with R. Krithika, Pranabendu Misra, Ashutosh Rai
[C-03] Foundations of Software Technology and Theoretical Computer Science (**FSTTCS**), 2016

2. **Dynamic Parameterized Problems**
with R. Krithika, Abhishek Sahu
[C-02] International Symposium on Parameterized and Exact Computation **IPEC**, 2016
[J-02] **Algorithmica**, Volume 80(9): 2637-2655 (2018)

1. **Harmonious Coloring: Parameterized Algorithms and Upper Bounds**
with Sudeshna Kolay, Ragukumar Pandurangan, Fahad Panolan, Venkatesh Raman
[C-01] Graph-Theoretic Concepts in Computer Science (**WG**), 2016
[J-01] Theoretical Computer Science (**TCS**), Volume 772: 132-142 (2019)

Research Group

- Mr. Shubham (PhD, IISER-Bhopal) is working with me on algorithmic aspect of some lattice problems. He is jointly supervised by Dr. Shashank Singh (IISER-Bhopal) May 2025 – Present
- Ms. Fathima Henna (BS-MS, IISER-Bhopal) is working towards her master's thesis. She is jointly supervised by Prof. Sujit P.S. (IISER-Bhopal). May 2025 – Present
- Mr. Rohith K (BS-MS, IISER-Bhopal) is working towards his master's thesis. He is jointly supervised by Dr. Ankur Raina (IISER-Bhopal). May 2025 – Present
- Ms. Astha (BS-MS, IISER-Bhopal) is working on parameterized complexity of edge contraction problems. Jun 2025 – Present
- Mr. Rijul B (BS-MS, IISER-Pune) completed his summer internship and continued his semester project. He is working on structural properties of planar graphs. Jun 2025 – Present
- Mr. Rahul Jana (BS-MS, IISER-Bhopal) is working on exact exponential algorithms for some graph coloring problems. Jun 2025 – Present
- Ms. Yashaswini Mathur (BS-MS, IISER-Bhopal) is working on parameterized complexity of some Labelled Contraction problem. Jun 2025 – Present
- Mr. Adheesh Trivedi (BS-MS, IISER-Bhopal), is working on exact exponential algorithms for some graph coloring problems. Jun 2025 – Present
- Mr Balasubramanian (MSc, IISER-Pune), completed his summer internship working on some parameterized algorithms. Jun – Jul 2025
- Mr. Pritam Acharya, (BS-MS, IISER-Pune) completed his semester project working on *parameterized approximation algorithms for geometric problems*. Aug – Dec 2023.
- Mr. Jetharam Bhambhu (BS-MS, IISER-Pune) completed his semester project reading *Combinatorial Optimization by Papadimitriou and Steiglitz* Aug – Dec 2023.
- Mr. Rajat Adak (MSc, IIT Hydrabad) worked on *Token Sliding on Chordal Graphs*. This manuscript contains our work with Saraswati. May – July 2023
- Ms. Saraswati Nanoti, (PhD, IIT Gandhinagar), worked on *Token Sliding on Chordal Graphs*. This manuscript contains our work with Rajat. May – Jul 2023
- Mr. T I Darsan (BS-MS, IISER-Pune) completed his semester project reading the book *The Game of Cops and Robbers on Graphs by Bonato and Nowakowski* Jan – May 2023.

Reviewer for

- **2026**: STACS×2
- **2025**: ICALP, STACS, MFCS, WADS, CALDAM, IWOCA, TCS×2
- **2024**: STACS, SWAT, MFCS, WG, ISAAC, Algorithmica×3, JCSS, DMTCS, I&C, Acta Informatica
- **2023**: STACS, ICALP, SODA, ESA, WADS, WG, MFCS, IPEC×2, FSTTCS, Algorithmica, TCS×2
- **2022**: SIDMA, ESA×2, WG×2, ISAAC, Algorithmica, TCS,
- **2021**: WG×2, JCSS×2, ISAAC, TCS, DMTCS, DAM
- **2020**: STACS, ICALP, ESA, ISAAC, JCSS×2, COCOON
- **2019**: ESA, TCS×2
- **2018**: Algorithmica, IPEC, COCOON
- **2017**: WG, IPEC
- **2016**: IPEC

Invited Talks

(*T*3) **Parameterized Approximation Algorithms Workshop (PAAW) 2022**:
Title : Parameterized Approximability of Contraction to Classes of Chordal Graphs
Date : 4^{th} July 2022

(*T*2) **Parameterized Complexity 301**:
Title : Graph Contraction: Old and New Developments
Date : 31^{st} December 2020

(*T*1) **Parameterized Complexity Seminar**:
Title : Parameterized Approximability of Contraction to Classes of Chordal Graphs
Date : 24^{th} November 2020

Teaching Experience

6. **Numerical Analysis @ IISER-Pune** Aug 2025 – Nov 2025 (`Course webpage`)
5. **Competitive Programming @ IISER-Bhopal** Jan 2025 – Apr 2025 (`Course webpage`)
4. **Computer Organization @ IISER-Bhopal** Aug 2024 – Nov 2024 (`Course webpage`)
3. **Data Structure and Algorithms @ IISER-Bhopal** Jan 2024 – Apr 2024 (`Course webpage`)
2. **Mathematics of Network Algorithms @ IISER-Pune** Aug 2023 – Dec 2023 (`Course webpage`)
1. **Algorithms @ IISER-Pune** Jan 2023 – May 2023

Programming Experience

∘ **Lossy Kernelization in Practice** Jan – June 2019
We posit that a carefully crafted lossy reduction rule can yield improved approximation solution in practice. I have implemented (in C++ and CPLEX) different algorithms to solve Dominating Set on sparse graphs for various benchmark instances to support our hypothesis.

∘ **The Parameterized Algorithms and Computational Experiments Challenge (PACE)**
Implemented various algorithms to solve the following problems on large graphs: Vertex Cover using C++ (in 2019), Steiner Tree using C++ (in 2018), and Minimum Fill-In using Python (in 2017).

∘ **SymPy – Open Source Project** Mar 2011 – May 2012
One of the authors of SymPy, an open-source Python library for symbolic mathematics. I have contributed to its development by submitting functions, reviewing pull requests, fixing patches.

Conferences and Workshops Attended

∘ **Third Meru Combinatorics Conference 2025** May 28 – 30, 2025
The conference was organized by Department of Mathematics BITS Pilani, K K Birla, Goa Campus.

∘ **Frontiers of Geometric Algorithms** Dec 11 – 15, 2024
Attended the workshop focused on computational geometry and approximation algorithms organized at the Indian Institute of Science, Bangalore, India.

∘ **ISAAC 2024** Dec 8 – 11, 2024
Attended the 35^{th} International Symposium on Algorithms and Computation held in Sydney, Australia and presented our work.

∘ **ICGT 2022** Jul 4 – 8, 2022
Attended 11^{th} workshop on International Colloquium on Graph Theory and Combinatorics at Montpellier, France.

◦ **WG 2022** Jun 22 – 24, 2022
Attended 48^{th} edition of the International Workshop on Graph-Theoretic Concepts in Computer Science at Tubingen, Germany, and presented our work.

◦ **IPEC 2020** Dec 14 – 18, 2020
(Virtually) Attended 15^{th} International Symposium on Parameterized and Exact Computation, and presented our work.

◦ **SWAT 2020** Jun 22 – 24, 2020
(Virtually) Attended 17^{th} Scandinavian Symposium and Workshops on Algorithm Theory and presented our work.

◦ **Algorithmic Tractability via Sparsifiers** Aug 9 – 12, 2019
Attended workshop on tools used to sparsify the instances of hard problems that arise algorithmically. This workshop was organized in Leh, India, and supported by the ERC Grant LOPRE and the Institute of Mathematical Sciences.

◦ **WorKer 2019** Jun 3 – 7, 2019
Attended a workshop on Kernelization organized by the University of Bergen (UiB) at UiB, Norway.

◦ **CIAC 2017** May 24 – 26, 2017
Attended Algorithms and Complexity - 10^{th} International Conference, CIAC 2017 in Athens, Greece and presented our work.

◦ **Rangoli Of Algorithms (RoA) and FSTTCS 2016** Dec 11 – 12, 2016
Attended RoA as a part of the IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science organized at Chennai Mathematical Institute, India.

◦ **CTD 2016** Apr 28 – 29, 2016
Attended Chennai Theory Day organized by Chennai Mathematical Institute and presented research work on various graph coloring.

◦ **WorKer 2015** Jun 1 – 4, 2015
Attended workshop on Kernelization organized by the University of Bergen at Sophus Lie Conference Center, Norway.

◦ **FSTTCS 2014** Dec 15 – 17, 2014
Attended IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science organized at India International Centre, New Delhi.

◦ **Advanced School on Parameterized Algorithms & Kernelization (ASPAK)** Mar 3 – 8, 2014
This school was focused on several recent advances in parameterized algorithms and kernelization. It covered many fundamental as well as few advanced techniques.

Academic Achievements and Scholarships

◦ **Scientific High Level Visiting Fellowship (SSHN)** 2024
Awarded Scientific High Level Visiting Fellowship (SSHN) 2024 by the Embassy of France in India. This interdisciplinary fellowship supported research visit to France.

◦ **INSPIRE Faculty Fellowship** 2022
Awarded INSPIRE Faculty Fellowship by the Department of Science and Technology, Govt. of India to carry out independent research.

◦ **CV Raman Post-Doctoral Fellowship** 2022 *(Declined)*
Awarded the CV Raman Post-Doctoral Fellowship by Indian Institute of Sciences, Bangalore.

◦ **Best Student Paper Award at IPEC** 2016
Awarded Best Student Paper Award for our paper titled 'Dynamic Parameterized Problems' at International Symposium on Parameterized and Exact Computation, IPEC 2016.

◦ **National Board for Higher Mathematics (NBHM)** 2010 *(Declined)*
Selected for M.A./M.Sc. Scholarship conducted by NBHM and funded by Department of Atomic Energy, Govt of India. Only twenty-two students throughout the nation were selected in that year.

◦ **Innovation in Science Pursuit for Inspired Research (INSPIRE)** 2008 *(Declined)*
Awarded Innovation in Science Pursuit for Inspired Research (INSPIRE) scholarship by the Department of Science and Technology, Govt of India, for perusing basic science at Indian Institute of Technology.

◦ **Kishore Vaigyanik Protsahan Yojana (KVPY)** 2008 to 2012
Recipient of Kishore Vaigyanik Protsahan Yojana scholarship awarded by Department of Science and Technology, Govt of India in 2007. It is the highest-paid scholarship at the graduate level.

◦ **Merit-cum-means Scholarships (MCM)** 2007 to 2008
Awarded merit-cum-means scholarships by Indian Institute of Technology for being second in the Mathematics department in the academic year 2007.