

# PRAFULLKUMAR TALE

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Assistant Professor  
Department of Mathematics  
Indian Institute of Science Education  
and Research Pune, India

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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**

Ph.D. in Theoretical Computer Sciences

Aug 2015 – Feb 2020

**The Institute of Mathematical Sciences ( IMSc ), HBNI, Chennai**

Master of Science in Theoretical Computer Sciences

Aug 2013 – Aug 2015

**Indian Institute of Technology ( IIT ), Roorkee**

Master of Science in Applied Mathematics

Jul 2007 – May 2012  
(Five-year Integrated Degree Program)

## Published Articles and Manuscripts<sup>1</sup>

38. **Algorithms and Hardness for Geodetic Set on Tree-like Digraphs**  
*with Florent Foucaud, Narges Ghareghani, Lucas Lorieau, Morteza Mohammad-Noori, and Rasa Parvini Oskuei*  
[C-32] *International Conference on Algorithms and Discrete Applied Mathematics (CALDAM)*, 2026.
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
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-21] *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

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<sup>1</sup>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.

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](#)  
[\[J-20\] Journal of Computer and System Sciences \(JCSS\) 2026, Volume: 156:103724](#)
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](#)  
[\[J-19\] 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](#)  
[\[J-18\] 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](#)  
[\[J-17\] 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](#)  
[\[J-16\] Journal of Computer and System Sciences \(JCSS\), Volume 129: 22-38 \(2022\).](#)
19. **Parameterized Complexity of Weighted Multicut in Trees**  
*with* Esther Galby, Daniel Marx, Philipp Schepper, Roohani Sharma  
[\[C-16\] Graph-Theoretic Concepts in Computer Science \(WG\), 2022](#)  
[\[J-15\] Theoretical Computer Science \(TCS\), Volume 978: 114174 \(2023\)](#)
18. **The Complexity of Contracting Bipartite Graphs into Small Cycles**  
*with* R. Krithika, Roohani Sharma  
[\[C-17\] Graph-Theoretic Concepts in Computer Science \(WG\), 2022](#)  
[\[J-14\] Discrete Mathematics and Theoretical Computer Science \(DMTCS\) 2025, \(To appear\)](#)
17. **A Framework for Parameterized Subexponential Algorithms for Generalized Cycle Hitting Problems on Planar Graphs**  
*with* Daniel 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.  **$\alpha$ -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) May 2025 – Present  
(Jointly supervised with Dr. Shashank Singh (IISER-Bhopal))
- Ms. Fathima Henna (BS-MS, IISER-Bhopal) May 2025 – Present  
(Jointly supervised by Prof. Sujit P.S. (IISER-Bhopal))
- Mr. Rohith K (BS-MS, IISER-Bhopal) May 2025 – Present  
(Jointly supervised by Dr. Ankur Raina (IISER-Bhopal))
- Ms. Astha (BS-MS, IISER-Bhopal) Jan 2025 – Sept 2025
- Mr. Rijul B (BS-MS, IISER-Pune) Jun 2025 – Present
- Mr. Rahul Jana (BS-MS, IISER-Bhopal) Jun 2025 – Present
- Ms. Yashaswini Mathur (BS-MS, IISER-Bhopal) Jun 2025 – Present  
(Our joint work appeared in FSTTCS 2025)
- Mr. Adheesh Trivedi (BS-MS, IISER-Bhopal) Jun 2025 – Present
- Mr Balasubramanian (MSc, IISER-Pune) Jun – Jul 2025
- Mr. Pritam Acharya, (BS-MS, IISER-Pune) Aug – Dec 2023.
- Mr. Jetharam Bhambhu (BS-MS, IISER-Pune) Aug – Dec 2023.
- Mr. Rajat Adak (MSc, IIT Hyderabad) | Manuscript May – July 2023
- Ms. Saraswati Nanoti, (PhD, IIT Gandhinagar) | Manuscript May – Jul 2023
- Mr. T I Darsan (BS-MS, IISER-Pune) 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

### (T3) **Parameterized Approximation Algorithms Workshop (PAAW) 2022:**

*Title* : Parameterized Approximability of Contraction to Classes of Chordal Graphs  
*Date* : 4<sup>th</sup> July 2022

### (T2) **Parameterized Complexity 301:**

*Title* : Graph Contraction: Old and New Developments  
*Date* : 31<sup>st</sup> December 2020

### (T1) **Parameterized Complexity Seminar:**

*Title* : Parameterized Approximability of Contraction to Classes of Chordal Graphs  
*Date* : 24<sup>th</sup> November 2020

## Teaching Experience

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

- **IPEC 2025**

Attended International Symposium on Parameterized and Exact Computation (IPEC) at University of Warsaw in Warsaw, Poland.

Sept 17 – 19, 2025
- **Third Meru Combinatorics Conference 2025**

The conference was organized by Department of Mathematics BITS Pilani, K K Birla, Goa Campus.

May 28 – 30, 2025
- **Frontiers of Geometric Algorithms**

Attended the workshop focused on computational geometry and approximation algorithms organized at the Indian Institute of Science, Bangalore, India.

Dec 11 – 15, 2024
- **ISAAC 2024**

Attended the 35<sup>th</sup> International Symposium on Algorithms and Computation held in Sydney, Australia and presented our work.

Dec 8 – 11, 2024
- **ICGT 2022**

Attended 11<sup>th</sup> workshop on International Colloquium on Graph Theory and Combinatorics at Montpellier, France.

Jul 4 – 8, 2022
- **WG 2022**

Attended 48<sup>th</sup> edition of the International Workshop on Graph-Theoretic Concepts in Computer Science at Tubingen, Germany, and presented our work.

Jun 22 – 24, 2022
- **IPEC 2020**

(Virtually) Attended 15<sup>th</sup> International Symposium on Parameterized and Exact Computation, and presented our work.

Dec 14 – 18, 2020
- **SWAT 2020**

(Virtually) Attended 17<sup>th</sup> Scandinavian Symposium and Workshops on Algorithm Theory and presented our work.

Jun 22 – 24, 2020
- **Algorithmic Tractability via Sparsifiers**

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.

Aug 9 – 12, 2019
- **WorKer 2019**

Attended a workshop on Kernelization organized by the University of Bergen (UiB) at UiB, Norway.

Jun 3 – 7, 2019
- **CIAC 2017**

Attended Algorithms and Complexity - 10<sup>th</sup> International Conference, CIAC 2017 in Athens, Greece and presented our work.

May 24 – 26, 2017
- **Rangoli Of Algorithms ( RoA ) and FSTTCS 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.

Dec 11 – 12, 2016
- **CTD 2016**

Attended Chennai Theory Day organized by Chennai Mathematical Institute and presented research work on various graph coloring.

Apr 28 – 29, 2016
- **WorKer 2015**

Attended workshop on Kernelization organized by the University of Bergen at Sophus Lie Conference Center, Norway.

Jun 1 – 4, 2015
- **FSTTCS 2014**

Attended IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science organized at India International Centre, New Delhi.

Dec 15 – 17, 2014

- **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

- Nominated as **Young Science and Techonlogy Leader** 2025  
Nominated as Young Science and Techonlogy Leader by the Department of Science and Technology, Govt of India, to attend 'Emerging Science, Technology and Innovation Conclave 2025.
- **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.