

# PRAFULLKUMAR TALE

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## Fields of Interests

Parameterized Complexity, Exact Exponential Algorithms, Graph Algorithms, Graph Theory and Algorithmic Engineering.

## Work Experiences

**CISPA Helmholtz Center for Information Security, Saarbrücken, Germany** July 2020 – present  
*Position:* Post-Doctoral Fellow

**Max-Planck Institute for Informatics ( MPII ), Saarbrücken, Germany** March 2020 – June 2020  
*Position:* Post-Doctoral Fellow

**University Of Bergen, Bergen, Norway** Jan 2019 – June 2019  
*Position:* Researcher (An internship during my Ph.D.)

**Ebay/PayPal Pvt Ltd** June 2012 – July 2013  
*Position:* Software Engineer

## 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** July 2007 – May 2012  
Master of Science in Applied Mathematics (Five year Integrated Degree Program)

## Academic Achievements and Scholarships

**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 in 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 the year 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.

**IIT Joint Entrance Examination – 2007**

Secured All India Rank 3289 in IIT-JEE and 3524 in AIEEE. (Among top 1 % students in the nation.)

**National Talent Search Examination ( NTSE )** 2005 to 2007

Awarded with National Talent Search Examination in the year 2005. This scholarship is given to top 750 students in India.

**Physics Olympiad – 2006**

In the top 1 % (out of 42000 students) at the National level in the Physics Olympiad conducted by Indian Association of Physics Teachers (IAPT).

**Journal Publications** (along with their conference versions)**( J-10 ) On the Parameterized Complexity of Maximum Degree Contraction.**

*Co-author* : Saket Saurabh  
*Journal* : Algorithmica (To appear)  
*Conference* : A preliminary version in International Symposium on Parameterized And Exact Computation IPEC 2020

**( J-9 ) Sparsification Lower Bound for Linear Spanners in Directed Graphs.**

*Co-author* : – none –  
*Journal* : Theoretical Computer Science (To appear)  
*Conference* : – none –

**( J-8 ) On the Parameterized Approximability of Contraction to Classes of Chordal Graphs**

*Co-authors* : Spoorthy Gunda, Pallavi Jain, Daniel Lokshtanov, Saket Saurabh  
*Journal* : ACM Transactions on Computation Theory 13(4) : 27 : 1 – 27 : 40 (2021)  
*Conference* : A preliminary version in Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques, APPROX/RANDOM 2020

**( J-7 ) Paths to Trees and Cacti**

*Co-authors* : Akanksha Agrawal, Lawqueen Kanesh, Saket Saurabh  
*Journal* : Theoretical Computer Science 860 : 98 – 116, (2021)  
*Conference* : A preliminary version in 10<sup>th</sup> International Conference on Algorithms and Complexity, CIAC 2017.

**( J-6 ) Parameterized and Exact Algorithms for Class Domination Coloring**

*Co-authors* : R. Krithika, Ashutosh Rai, Saket Saurabh  
*Journal* : Discrete Applied Mathematics (DAM) Volume 291 : 286 – 299, (2021)  
*Conference* : A preliminary version in SOFSEM 2017: Theory and Practice of Computer Science.

**( J-5 ) Path Contraction Faster than  $2^n$** 

*Co-authors* : Akanksha Agrawal, Fedor Fomin, Daniel Lokshtanov, Saket Saurabh  
*Journal* : SIAM Journal on Discrete Mathematics (SIDMA) 34(2) : 1302 – 1325 (2020)  
*Conference* : A preliminary version in 46<sup>th</sup> International Colloquium on Automata, Languages and Programming, ICALP 2019.

**( J-4 ) Subset Feedback Vertex Set in Chordal and Split Graphs.**

*Co-authors* : Geevarghese Philip, Varun Rajan, Saket Saurabh  
*Journal* : Algorithmica Volume 81 (9) : 3586 – 3629 (2019)  
*Conference* : A preliminary version in 11<sup>th</sup> International Conference on Algorithms and Complexity, CIAC 2019.

**( J-3 ) On the Parameterized Complexity of Contraction to Generalization of Trees.**

*Co-authors* : Akanksha Agarwal, Saket Saurabh  
*Journal* : Theory of Computing Systems, Volume 63 (3) : 587 – 614 (2019)  
*Conference* : A preliminary version in International Symposium on Parameterized and Exact Computation, IPEC 2017.

**( J-2 ) Harmonious Coloring : Parameterized Algorithms and Upper Bounds.**

*Co-authors* : Sudeshna Kolay, Ragukumar Pandurangan, Fahad Panolan, Venkatesh Raman  
*Journal* : Theoretical Computer Science, Volume 772, 132 – 142 (2019)  
*Conference* : A preliminary version in Graph-Theoretic Concepts in Computer Science, WG 2016.

**( J-1 ) Dynamic Parameterized Problems.**

*Co-authors* : R. Krithika, Abhishek Sahu  
*Journal* : Algorithmica Volume 80(9) : 2637 – 2655 (2018)  
*Conference* : A preliminary version in International Symposium on Parameterized and Exact Computation, IPEC 2016.

**Conference Publications** (that do not have a journal version yet)**( C-6 ) A Framework for Parameterized Subexponential Algorithms for Generalized Cycle Hitting Problems on Planar Graphs**

*Co-authors* : Dániel Marx, Pranabendu Misra, Daniel Neuen  
*Conference* : (To appear) ACM-SIAM Symposium on Discrete Algorithms (SODA 2022)

**( C-5 ) Parameterized Complexity of Maximum Edge-Colorable Subgraph**

*Co-authors* : Akanksha Agrawal, Madhumita Kundu, Abhishek Sahu, Saket Saurabh  
*Conference* : Annual International Computing and Combinatorics Conference, COCOON 2020

**( C-4 ) On the Parameterized Complexity of Grid Contraction**

*Co-authors* : Saket Saurabh, Ueverton Dos Santos Souza  
*Conference* : 17<sup>th</sup> Scandinavian Symposium and Workshops on Algorithm Theory, SWAT 2020

**( C-3 ) An FPT Algorithm for Contraction to Cactus**

*Co-authors* : R. Krithika, Pranabendu Misra  
*Conference* : Annual International Computing and Combinatorics Conference, COCOON 2018

**( C-2 ) Exact and Parameterized Algorithms for  $(k, i)$ -Coloring***Co-authors* : Diptapriyo Majumdar, Rian Neogi, Venkatesh Raman*Conference* : Algorithms and Discrete Applied Mathematics, 3<sup>rd</sup> International Conference, CALDAM 2017**( C-1 ) Lossy Kernels for Graph Contraction Problems***Co-authors* : R. Krithika, Pranabendu Misra, Ashutosh Rai*Conference* : Foundations of Software Technology and Theoretical Computer Science, FSTTCS 2016

## Manuscripts

**( M-2 ) Reducing the Vertex Cover Number via Edge Contractions***Co-authors* : Paloma T. Lima, Vinicius F. dos Santos, Ignasi Sau, Uéverton S. Souza**( M-1 )  $\alpha$ -approximate Reductions: a Novel Source of Heuristics for Better Approximation Algorithms.***Co-authors* : Fredrik Manne, Geevarghese Philip, Saket Saurabh

## Reviewer for

Journals: TCS (2021), JCSS (2021) $\times 2$ , DAM (2021), DMTCS (2021), JCSS (2020) $\times 2$ , TCS (2019) $\times 2$ , and Algorithmica (2018).

Conferences: ISAAC (2021), WG (2021), ISAAC (2020), COCOON (2020), ESA (2020), ICALP (2020), STACS (2020), ESA (2019), IPEC (2018), COCOON (2018), IPEC (2017), and IPEC (2016).

## Research Visits

University of Bergen, Bergen, Norway

May 2017 – July 2017

University of Bergen, Bergen, Norway

Sep 2016 – Nov 2016

Max-Planck Institute for Informatics ( MPII ), Saarbrücken, Germany

June 2015 – July 2015

## Invited Talks

**(T2) Parameterized Complexity 301:***Title* : Graph Contraction: Old and New Developments*Date* : 31<sup>st</sup> December 2020**(T1) Parameterized Complexity Seminar:***Title* : On the Parameterized Approximability of Contraction to Classes of Chordal Graphs*Date* : 24<sup>th</sup> November 2020

## Teaching Experience

Teaching Assistant to the course *Parameterized Algorithm* by Prof. Saket Saurabh during Jan-May 2016 at The Institute Of Mathematical Sciences, Chennai.

Instructor for five workshops on *Introduction to MATLAB*. Each workshop was held at Institute Computer Centre, IIT Roorkee for two hours daily spread over three days and has participation of more than 60 students.

## Programming Experience

### **Lossy Kernelization in Practice**

Jan 2019 – June 2019

We posit that 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**

March 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 request, fixing patches.

## Conferences and Workshops Attended

### **IPEC 2020**

December 14 – 18, 2020

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

### **SWAT 2020**

June 22 – 24, 2020

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

### **Algorithmic Tractability via Sparsifiers**

August 9 – 12, 2019

Attended workshop on tools used to sparsify the instances of hard problems that arise algorithmically. This workshop was organized at Leh, India and supported by the ERC Grant LOPRE and the Institute of Mathematical Sciences.

### **WorKer 2019**

June 3 – 7, 2019

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

### **CIAC 2017**

May 24 – 26, 2017

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

### **Rangoli Of Algorithms ( RoA ) and FSTTCS 2016**

December 11 – 12, 2016

Attended RoA as a part of IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science organized at Chennai Mathematical Institute, India.

### **CTD 2016**

April 28 – 29, 2016

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

**WorKer 2015**

June 1 – 4, 2015

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

**FSTTCS 2014**

December 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.

**Workshop on Social Networks**

Feb 20 – 24, 2012

Attended the workshop jointly organized by IIT-Madras, IMSc and IMI Chennai. Many prominent speakers from diversified areas such as Computer Science, Mathematics, Physics, History and Social Studies delivered lectures regarding growth and effect of social networks.

**National Workshop on Computer Algebra System ( CAS )**

Jan 27 – 31, 2011

Attended the workshop hosted by Bhaskaracharya Pratishthana, Pune as a crash course for following mathematical software - GAP, Pari-GP, SAGE & Maxima.

**SciPy.in 2010**

Dec 13 – 18, 2010

Participated in an International Conference on Python for education and scientific computing hosted by FOSSEE at IIT-Hyderabad, ISB and Mahindra Satyam. Contributed to the function “Parametric\_plot” to matplotlib during sprint sessions.

**Sage Days 25, India**

Aug 9 – 13, 2010

Participated in an international conference on the open source mathematical software SAGE hosted by FOSSEE at IIT Bombay. Contributed to the ‘Textbook Completion’ project during sprint sessions.

## References

**Prof. Saket Saurabh**

The Institute Of Mathematical Sciences, HBNI, Chennai, India

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