Nitin Saurabh

Curriculum Vitae

Contact Information

Department of Computer Science & Engineering
Indian Institute of Technology Hyderabad
Kandi-502285, Sangareddy
Telangana, India

Phone No.:
E-mail: nitin@cse.iith.ac.in
3295.nitin@gmail.com
Homepage: `https://nitinsau.github.io`

Research Interests

Computational Complexity theory and its connections to **Algebra**, **Algorithms** and **Combinatorics**. More specifically, circuit complexity, analysis of Boolean functions, lower bounds, algebraic complexity, query complexity, communication complexity, and quantum complexity.

Employment

IIT Hyderabad, India.

Assistant Professor
Department of Computer Science and Engineering.

Period: January 2022 - till present.

International Institute of Information Technology, Hyderabad, India.

Assistant Professor

Period: July 2021 - December 2021.

Technion - IIT, Haifa, Israel.

Postdoctoral Fellow
Faculty of Computer Science.

Period: November 2019 - June 2021.
Host: Prof. Yuval Filmus.

Max Planck Institut für Informatik, Saarbrücken, Germany.

Postdoctoral Fellow
Department 1: Algorithms and Complexity.

Period: January 2018 - August 2019.
Host: Dr. Christian Ikenmeyer.

Charles University, Prague, Czechia.

Postdoctoral Fellow
Computer Science Institute of Charles University.
Faculty of Mathematics and Physics.

Period: September 2016 - November 2017.
Host: Prof. Michal Koucký.

Education

The Institute of Mathematical Sciences, Chennai, India.

Integrated Ph.D. in Theoretical Computer Science
Thesis: Analysis of Algebraic Complexity Classes and Boolean Functions.

Period: August 2010 - July 2016 (Thesis defended: December 2016.)
Advisor: Prof. Meena Mahajan.

Chennai Mathematical Institute, Chennai, India.

Bachelor of Science (Honours) in Mathematics and Computer Science
Period: August 2007 - April 2010.

Academic Visits

- **University of Warwick**, UK.
  Host: Prof. Christian Ikenmeyer – March 2023.
- **The Institute of Mathematical Sciences**, India.
  Host: Prof. Meena Mahajan – June-July 2022.
- **Indian Statistical Institute**, India.
  Host: Prof. Sourav Chakraborty – November 2019.
- **Microsoft Research**, India.
  Host: Dr. Satya Lokam – April 2019.
- **Centrum Wiskunde & Informatica**, the Netherlands.
  Host: Prof. Ronald de Wolf – July/August 2017.
- **St. Petersburg State University**, Russia.
  Period: May to June 2016.
- **Charles University**, Czechia.
  Host: Prof. Michal Koucký – March 2016.
- **Tel Aviv University**, Israel.
  Period: February 2016.
- **Saarland University**, Germany.
  Period: March 2014.
- **Simon Fraser University**, Canada.
  Host: Prof. Valentine Kabanets – January to July 2013.
- **Royal Melbourne Institute of Technology**, Australia.
  Period: February 2012.
- **Aarhus University**, Denmark.
  Host: Prof. Kristoffer Arnsfelt Hansen – August 2011.
- **Microsoft Research**, India.
  Host: Dr. Satya Lokam – May to July 2011.

Profile

Google Scholar: `https://scholar.google.com/citations?user=JfhbH68AAAAJ`

Preprints & Publications

▷ Authors are listed in *alphabetical order* in Theoretical Computer Science.

- **On the Communication Complexity of Finding a King in a Tournament**
  Nikhil Mande, Manaswi Paraashar, Swagato Sanyal and Nitin Saurabh.
  Preliminary version in International Conference on Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques (**APPROX/RANDOM**) 2024.
  (CORE Ranking: A)
  DOI: https://doi.org/10.4230/LIPIcs.APPROX/RANDOM.2024.64

- **Approximate Degree Composition for Recursive Functions**
  Sourav Chakraborty, Chandrima Kayal, Rajat Mittal, Manaswi Paraashar and Nitin Saurabh.
  Preliminary version in International Conference on Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques (**APPROX/RANDOM**) 2024.
  (CORE Ranking: A)
  DOI: https://doi.org/10.4230/LIPIcs.APPROX/RANDOM.2024.71

- **Randomized and Quantum Query Complexities of Finding a King in a Tournament**
  Nikhil Mande, Manaswi Paraashar and Nitin Saurabh.
  Preliminary version in 43rd Foundations of Software Technology and Theoretical Computer Science Conference (**FSTTCS**) 2023.
  DOI: https://doi.org/10.4230/LIPIcs.FSTTCS.2023.30

- **On the Composition of Randomized Query Complexity and Approximate Degree**
  Sourav Chakraborty, Chandrima Kayal, Rajat Mittal, Manaswi Paraashar, Swagato Sanyal and Nitin Saurabh.
  Preliminary version in International Conference on Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques (**APPROX/RANDOM**) 2023.
  (CORE Ranking: A)
  DOI: https://doi.org/10.4230/LIPIcs.APPROX/RANDOM.2023.63

- **Karchmer-Wigderson Games for Hazard-free Computation**
  Christian Ikenmeyer, Balagopal Komarath and Nitin Saurabh.
  Preliminary version in 14th Innovations in Theoretical Computer Science (**ITCS**) 2023.
  (CORE Ranking: A)
  DOI: https://doi.org/10.4230/LIPIcs.ITCS.2023.74

- **Rabbits Approximate, Cows Compute Exactly!**
  Balagopal Komarath, Anurag Pandey and Nitin Saurabh.
  Preliminary version in 47th International Symposium on Mathematical Foundations of Computer Science (**MFCS**) 2022. (CORE Ranking: A)
  DOI: https://doi.org/10.4230/LIPIcs.MFCS.2022.65

- **Tight lower bounds for approximate & exact k-center in $\mathbb{R}^d$.**
  Rajesh Chitnis and Nitin Saurabh.
  Preliminary version in 38th International Symposium on Computational Geometry (**SoCG**) 2022.
  (CORE Ranking: A)
  DOI: https://doi.org/10.4230/LIPIcs.SoCG.2022.28

- **Approximate Polymorphisms.**
  Gilad Chase, Yuval Filmus, Dor Minzer, Elchanan Mossel and Nitin Saurabh.
  Preliminary version in 54th Symposium on Theory of Computing (**STOC**) 2022.
  (CORE Ranking: A*)
  DOI: https://doi.org/10.1145/3519935.3519966

- **On the Complexity of Detecting Hazards.**
  Balagopal Komarath and Nitin Saurabh.

Information Processing Letters (**IPL**), 162, 2020.
DOI: https://doi.org/10.1016/j.ipl.2020.105980

- **Algebraic Branching Programs, Border Complexity, and Tangent Spaces.**
  Markus Bläser, Christian Ikenmeyer, Meena Mahajan, Anurag Pandey and Nitin Saurabh.
  Preliminary version in 35th Computational Complexity Conference (**CCC**) 2020.
  (CORE Ranking: A)
  DOI: https://doi.org/10.4230/LIPIcs.CCC.2020.21

- **Lower Bounds for Linear Decision Lists.**
  Arkadev Chattopadhyay, Meena Mahajan, Nikhil Mande and Nitin Saurabh.
  Chicago Journal of Theoretical Computer Science (**CJTCS**) 2020(1), 2020.
  DOI: http://doi.org/10.4086/cjtcs.2020.001

- **Improved Bounds on Fourier Entropy and Min-entropy.**
  Srinivasan Arunachalam, Sourav Chakraborty, Michal Koucký, Nitin Saurabh and Ronald de Wolf.
  ACM Transactions on Computation Theory (**TOCT**), 13(4), 2021.
  Preliminary version in 37th International Symposium on Theoretical Aspects of Computer Science (**STACS**) 2020. (CORE Ranking: A)
  DOI: https://doi.org/10.1145/3470860

- **Space-optimal quasi-Gray Codes with Logarithmic Read Complexity.**
  Diptarka Chakraborty, Debarati Das, Michal Koucký and Nitin Saurabh.
  Preliminary version in 26th European Symposium on Algorithms (**ESA**) 2018.
  (CORE Ranking: A)
  DOI: https://doi.org/10.4230/LIPIcs.ESA.2018.12

- **Fourier Entropy-Influence Conjecture for Random Linear Threshold Functions.**
  Sourav Chakraborty, Sushrut Karmalkar, Srijita Kundu, Satya Lokam and Nitin Saurabh.
  Preliminary version in 13th Latin American Theoretical Informatics Symposium (**LATIN**) 2018.
  (CORE Ranking: B)
  DOI: https://doi.org/10.1007/978-3-319-77404-6_21

- **Some Complete and Intermediate Polynomials in Algebraic Complexity Theory.**
  Meena Mahajan and Nitin Saurabh.
  Theory of Computing Systems (**TOCS**) , 62(3), 2018. *Special issue of CSR* 2016.
  Preliminary version in 11th International Computer Science Symposium in Russia (**CSR**), 2016.
  Winner of the **Best Paper Award** at CSR 2016.
  DOI: https://doi.org/10.1007/s00224-016-9740-y

- **VNP=VP in the Multilinear World.**
  Meena Mahajan, Nitin Saurabh and Sébastien Tavenas.
  Information Processing Letters (**IPL**), 116(2), 2016.
  DOI: http://dx.doi.org/10.1016/j.ipl.2015.08.004

- **Upper Bounds on Fourier Entropy.**
  Sourav Chakraborty, Raghav Kulkarni, Satya Lokam and Nitin Saurabh.
  Theoretical Computer Science (**TCS**), vol. 654, 2016. *Special issue of COCOON* 2015.
  Preliminary version in 21st International Computing and Combinatorics Conference (**COCOON**), 2015. (CORE Ranking: A)
  DOI: http://dx.doi.org/10.1016/j.tcs.2016.05.006

- **Homomorphism Polynomials Complete for VP.**
  Arnaud Durand, Meena Mahajan, Guillaume Malod, Nicolas de Rugy-Altherre and Nitin Saurabh.

Chicago Journal of Theoretical Computer Science (**CJTCS**) 2016(3), 2016.
Preliminary version in 34th Foundations of Software Technology and Theoretical Computer Science Conference (**FSTTCS**), 2014.
DOI: http://dx.doi.org/10.4086/cjtcs.2016.003

- **An Improved Deterministic #SAT Algorithm for Small de Morgan Formulas.**
  Ruiwen Chen, Valentine Kabanets and Nitin Saurabh.
  Algorithmica 76(1), 2016.
  Preliminary version in 39th International Symposium on Mathematical Foundations of Computer Science (**MFCS**) , 2014. (CORE Ranking: A)
  DOI: http://dx.doi.org/10.1007/s00453-015-0020-z

- **Counting Paths in Planar Width 2 Branching Programs.**
  Meena Mahajan, Nitin Saurabh and Karteek Sreenivasaiah.
  Preliminary version in 18th Computing: the Australasian Theory Symposium (**CATS**), 2012.
  URL: https://crpit.scem.westernsydney.edu.au/abstracts/CRPITV128Mahajan.html

Awards and Honours

Winner of the **Best Paper Award** at **CSR 2016**.
https://nitinsau.github.io/CSR.pdf

Recipient of the **Canadian Commonwealth Scholarship Program** 2012-13 by the Canadian Bureau for International Education.
This enabled me to visit Simon Fraser University, Canada, where I worked under the guidance of Prof. Valentine Kabanets. https://nitinsau.github.io/CCSP-award-letter.pdf

One of the two recipients of the **student travel award** by **ACM India** to attend ACM Turing centenary celebrations, San Francisco, June 2012.
https://nitinsau.github.io/ACMPressRelease.pdf

Recipient (2007-2010) of **Scholarship for Higher Education** (SHE), an INSPIRE Scholarship given by the Department of Science and Technology, Government of India, for undergraduate studies.

Secured the **First** place in the **Regional Mathematics Olympiad** (RMO), **2006**, in the State of Jharkhand, India.

Teaching Experience

Theory of Computation
Course Lecturer.
IIT Hyderabad, India.
Semester: January to May 2025.
https://nitinsau.github.io/toc-s25-iith.html

Quantum Computing
Course Lecturer.
IIT Hyderabad, India.
Semester: August to December 2024.
https://nitinsau.github.io/quantum-m24-iith.html

Algorithms
Course Lecturer.

IIT Hyderabad, India.
Semester: January to May 2024.
https://nitinsau.github.io/algo-s24-iith.html

Topics in Computing
Course Lecturer.
IIT Hyderabad, India.
Semester: August to December 2023.
https://nitinsau.github.io/BF-m23-iith.html

Algorithms
Course Lecturer.
IIT Hyderabad, India.
Semester: January to May 2023.
https://nitinsau.github.io/algo-s23-iith.html

Computational Complexity
Course Lecturer.
IIT Hyderabad, India.
Semester: August to December 2022.
https://nitinsau.github.io/CT-m22-iith.html

Algorithms
Course Lecturer (co-taught with Fahad Panolan).
IIT Hyderabad, India.
Semester: January to May 2022.

Complexity Theory I
Course Lecturer (co-taught with Girish Varma).
International Institute of Information Technology Hyderabad, India.
Semester: August to December 2021.
https://nitinsau.github.io/CT-m21-iiith.html

Guest Lecture.
Course: Random Graphs (2019-2020), Course Lecturer: Yuval Filmus.
Technion - IIT, Haifa, Israel.

Introduction to Boolean Function Complexity (Advanced Course).
Course Lecturer.
Max Planck Institut für Informatik, Saarbrücken, Germany.
Semester: April to July 2019.
https://www.mpi-inf.mpg.de/departments/algorithms-complexity/teaching/summer19/bool-complexity/
https://nitinsau.github.io/BFC19-notes.html

Discrete Mathematics (Graduate Course).
Teaching Assistant.
The Institute of Mathematical Sciences, Chennai, India.
Semester: August to December 2014.

Incidence Theorems and their Applications (Reading Group).
jointly organized with Swaroop N P, Syed Meesum and Meena Mahajan.
The Institute of Mathematical Sciences, Chennai, India.
Semester: January to April 2014.

Linear Programming and Combinatorial Optimization (Graduate Course).
Teaching Assistant.
The Institute of Mathematical Sciences, Chennai, India.
Semester: August to December 2012.

Talks (Selected)

- "*Rabbits Approximate, Cows Compute Exactly!*", Workshop on Algebraic Complexity Theory (WACT), University of Warwick, UK, March 2023.
- "*Improved Upper Bounds on Fourier Entropy*", Workshop on Sensitivity, Query Complexity, Communication Complexity and Fourier Analysis of Boolean Function, ISI, Kolkata, February 2020.
- "*On Fourier Entropy-Influence Conjecture*", MPI-INF and MPI-MiS joint workshop on Theoretical Computer Science and Algebraic Geometry, Saarbrücken, January 2019.
- "*Space-optimal quasi-Gray Codes with Logarithmic Read Complexity*", MPII, Saarbrücken, February 2018.
- "*Upper Bounds on Fourier Entropy*", MPII, Saarbrücken, August 2017.
- "*Some Complete and Intermediate Polynomials in Algebraic Complexity Theory*", CSR, St. Petersburg, June 2016.
- "*Upper Bounds on Fourier Entropy*", Charles University, Prague, March 2016.
- "*Homomorphism Polynomials Complete for VP*", FSTTCS, New Delhi, December 2014.
- "*Deterministic #SAT Algorithm for de Morgan Formulas*", MFCS, Budapest, August 2014.
- "*Counting Paths in Planar Width 2 Branching Programs*", CATS, Melbourne, February 2012.

Professional Activities

Participation in Conferences and Workshops (Selected)

- Simons Lecture Series on Advances in Boolean Function Analysis (**July/August 2020**).
- 35th Computational Complexity Conference, Saarbrücken, Germany (**July 2020**).
- Workshop on Sensitivity, Query Complexity, Communication Complexity and Fourier Analysis of Boolean Function, ISI Kolkata, India (**February 2020**).
- Complexity, Algorithms, Automata and Logic Meet, CMI Chennai, India (**January 2019**).
- MPI-INF and MPI-MiS joint workshop on Theoretical Computer Science and Algebraic Geometry, Saarbrücken, Germany (**January 2019**).
- Summer School on Algorithms and Lower Bounds, Prague, Czechia (**July 2018**).
- S3CS: Swedish Summer School in Computer Science, Stockholm, Sweden (**July 2017**).
- Perspectives on Complexity Theory and Cryptography, Bangalore, India (**January 2017**).
- 11th Computer Science Symposium in Russia, St. Petersburg, Russia (**June 2016**).
- Special semester program on Complexity Theory, St. Petersburg, Russia (**May-June 2016**).
- Workshop on Algebraic Complexity Theory (**Warwick 2023, Bangalore 2019, Paris 2018, Tel Aviv 2016, Saarbrücken 2014**).
- Foundations of Software Technology and Theoretical Computer Science Conference (**December**

2014, 2012, 2011 and 2010).

- Workshop on Computational Complexity at Banff International Research Station, Banff, Canada (**July 2013**).
- Mysore Park workshop on *Recent trends in Algorithms and Complexity*, Infosys Mysore, India (**2012, 2011, and 2010**).
- ACM A.M. Turing Centenary Celebration, San Francisco, USA (**June 2012**).
- ICM-2010 satellite conference on Algebraic and Probabilistic Aspects of Combinatorics and Computing, IISc Bangalore, **2010**.

Review Service

- **Journals:** Journal of Computer and System Sciences, ACM-TOCT, SIAM Journal of Computing, IEEE Transactions on Information Theory.
- **Conferences:** STOC, FOCS, CCC, SODA, ICALP, STACS, FSTTCS, CSR, RANDOM, ISSAC, ITCS, FAW, ISAAC, CIAC, SWAT.

References

Dr. Meena Mahajan
Professor
The Institute of Mathematical Sciences, Chennai
E-mail: meena@imsc.res.in

Dr. Satya V. Lokam
Senior Researcher
Microsoft Research India, Bangalore
E-mail: Satya.Lokam@microsoft.com

Dr. Michal Koucký
Professor
Charles University, Prague
E-mail: koucky@iuuk.mff.cuni.cz