Nitin Saurabh

Curriculum Vitae

Contact Information

Technion - Israel Institute of Technology
Faculty of Computer Science
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Personal Information

Date of Birth: April 27, 1990.
Nationality: Indian.

Research Interests

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

Employment

Technion - IIT, Haifa, Israel.

Postdoctoral Fellow
Faculty of Computer Science.

Period: November 2019 - till present.
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

- **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.

- **Approximate Polymorphisms.**
  Gilad Chase, Yuval Filmus, Dor Minzer and Nitin Saurabh.
  arXiv: `https://arxiv.org/abs/2106.00093`

- **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.
  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.
  To appear in *ACM Transactions on Computation Theory* (**TOCT**).
  Preliminary version in 37th International Symposium on Theoretical Aspects of Computer Science (**STACS**) 2020.
  DOI: `https://doi.org/10.4230/LIPIcs.STACS.2020.45`

- **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.
  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.
  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.
  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.
  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

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)

- "*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 (**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.
- **Conferences:** STOC, FOCS, CCC, SODA, ICALP, STACS, FSTTCS, CSR, RANDOM, ISSAC, FAW, ISAAC, CIAC, SWAT.

References

Dr. Meena Mahajan
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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