Devansh **Shringi**

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Education

Indian Institute of Technology, Kanpur _Kanpur, India_
Dual BT-MT in Computer Science and Engineering _Jul 2017 - May 2022 (exptected)_
- M. Tech CPI - 10.0/10.0   Supervisor- **Prof. Nitin Saxena**
- B. Tech CPI - 9.8/10.0

Research Interests

Algebraic Complexity, Pseudorandomness, Computational Algebra and Number Theory, Graph Theory, Computational Complexity Theory

Publications

Explicit Construction of Local Ramanujan Graphs of q+1 degree for almost all prime power q _[paper]_

Rishabh Batra, Nitin Saxena, **Devansh Shringi** _Mar. 2022_
Under review at [STACS 2022]

Honors & Awards

2021	**Research Fellow**, Max Planck Institute for Informatics	
2020	**DAAD-WISE scholarship**, for research in Summer 2020(Redacted due to COVID)	
2018-21	**4 consecutive Academic Excellence Awards**, Indian Institute of Technology, Kanpur	
2017-21	**Exceptional Performances in 8 courses**, Indian Institute of Technology, Kanpur	
2017	**AIR 179 JEE Advance**, out of 200,000 candidates	
2017	**AIR 52 JEE Main**, out of 1.2 million candidates	
2017	**Qualified INChO, INPhO, INAO**, Top 35 in each field(Chemistry,Physics,Astronomy) in all of India	
2016	**Bronze Medal at IOAA 2016**, representing India in Bhubaneswar	
2016	**AIR 88 KVPY Scholarship**, out of 100,000 candidates	
2016	**Qualified INMO, INAO**, Top 35 in all of India	

Research Experience

Construction of Local Ramanujan Graphs (Master Thesis) _Kanpur, India_
Advisor:Prof. Nitin Saxena, IIT K _Jan. 2021 - PRESENT_
- Worked on localizing the known constructions of Ramanujan Graphs of degree prime power+1
- Learnt about the constructions of Ramanujan graphs, Cayley graphs, local expanders and local Ramanujan graphs of degree 3
- Gave construction of infinite families of $O(\log q)$ locality $q+1$ regular bipartite Ramanujan graphs for all $q = p^k, p \geq 5, q = 9^k$
- Working on giving construction for degrees which were left open, i.e. $3^{2k+1} + 1$ and $2^k + 1(k > 1)$
- Led to submission: **Explicit Construction of Local Ramanujan Graphs of q+1 degree for almost all prime power q**

Sparse Polynomial Identity Testing using less Random bits _Saarbrücken, Germany_
Advisor:Prof. Markus Bläser, Max-Planck-Institut für Informatik _Jan. 2021 - July 2021_
- Worked on decreasing the number of random bits required to do Blackbox Polynomial Identity Testing(PIT) for Sparse polynomial
- Learnt about concepts like testers, Sidon sets, Isolation lemma and their application in blackbox PIT
- Created a Hitting set for sparse polynomial with upper bound dependent on only number of monomials
- Also, created a randomized algorithm that can solve PIT for sparse polynomials using only $O(\log(number\ of\ monomials))$ random bits, if variables are given in decreasing order of number of distinct degrees

Polynomial Identity Testing for Depth 4 Circuits Constant Top and Bottom Fan-in (UG project) _Kanpur, India_
Advisor: Prof. Nitin Saxena, IIT K _Jan. 2020 - Nov. 2020_
- Studied about the work done on the problem of PIT for the case of constant top fan-in depth3 and depth 4(constant bottom fan-in) circuits using Sylvester Gallai approach. Also, studied various results on constant top fan-in problem for depth3 circuits.
- Explored an approach to extend the ideal membership approach for depth3 circuits to depth4 using Gröbner's basis and F5 algorithm.
- Worked on extending the work of Shpilka and Peleg of Top fan-in 2 Bottom fan-in 2 from to Top fan-in 2 Bottom fan-in 3
- Created structure theorem for cubics lying in radical generated by 2 cubics that is equivalent to structure theorem by Shpilka for quadratics.

Lower bounds for Graph Streaming Algorithms with constant passes   *Kanpur, India*

Advisor: Prof. Raghunath Tewari, IIT K   *Jan. 2021 - Apr. 2021*

- Read the literature on lower bounds of streaming algorithm
- Learnt about reduction of problem to set Intersection lower bounds, and various tools for it like Unique reach problem and Ruzsa-Szemeredi Graphs
- Worked on extending the near quadratic lower bound of 2 pass streaming algorithm to for 3 pass and beyond
- Created a 3 player communication game that worked for 3 pass algorithm. Also, attempted various designs to create worst case distribution for the problem.

Teaching Experience

Teaching Assistant, CS345: Algorithms II   *Kanpur, India*

Instructor: Prof. Surender Baswana   *Jul. 2021 - Nov. 2021*

- Graded Assignments and Quizzes of 150+ students.

Tutor, ESC101: Fundamentals of Computing   *Kanpur, India*

Instructor: Prof. Debadatta Mishra and Prof. Swarnendu Biswas   *Feb. 2021 - Jun. 2021*

- taught weekly tutorial lectures through zoom and graded students. Also had the responsibility of designing questions for lab assignments and written exams. Also took online doubt discussion sessions.

Tutor, ESC101: Fundamentals of Computing   *Kanpur, India*

Instructor: Prof. Biswabandan Panda   *Oct. 2020 - Feb. 2021*

- taught weekly tutorial lectures through zoom and graded students. Also had the responsibility of designing questions for lab assignments and written exams. Also took online doubt discussion sessions.

Talks

Derandomizing PIT Means Proving Circuit Lower Bounds   *Nov. 2020*

Course: Computational Complexity Theory   *[Slides]*

Polynomial Identity Testing of Depth 4 Constant Top and Bottom Fanin   *Nov. 2019*

Special Interest Group on Theoretical Aspects of Computer Science, SIGTACS, IITK   *[Abstract]*

Introduction to Theoretical Computer Science   *Sep. 2019*

Computer Science Freshers(ACA), IITK   *[Slides]*

Other Professional Activities

Coordinator, Association of Computing Activities (ACA)

Indian Institute of Technology, Kanpur   *Aug. 2019 - Dec. 2020*

- Conducted various events like Happy hours, Freshers and Farewell of CS Department promoting interaction among Department members
- Also organized introductory projects in Computer Science for First year Undergraduate students

Project Mentor

ACA, CSE IITK   *Jan. 2019 - May 2020*

Mentored a group of First Year Students introducing them to various aspects of Theoretical Computer Science

Student Guide

Counselling Service, IITK   *Jul. 2018 - Apr. 2019*

Helped a group of 6 First year Students get familiar in campus and conducted their orientation as their guide.

Graduate Courses

Arithmetic Circuit Complexity,
Randomized Methods in Computational Complexity,
Computational Number Theory and Algebra,
Special Topics in Computer Science Engineering

Quantum Computing*,
Modern Cryptology,
Randomized Algorithms*,

Computational Complexity Theory*,
Algorithmic Information Theory,
Intro to ML*,

*-Exceptional Performance