Devansh **Shringi**

(+91) 7568481777 | devansh@cse.iitk.ac.in | https://devansh99.github.io/ | devansh99

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

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 in all of India
2016	**Bronze Medal at IOAA**, representing India in Bhubaneswar
2016	**AIR 88 KVPY Scholarship**, out of 100,000 candidates
2015	**Qualified INMO**, 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, and extending the result in VW17 from 3 regular to $q+1$ regular
- Gave construction of infinite families of $O(\log q)$ locality $q+1$ regular bipartite Ramanujan graphs of size $2(q^n-1)$ where $n = 4 \cdot 3^t$, $t \in \mathbb{Z}_{\geq 0}$, for $q = p^k, p \geq 5, q = 9^k$
- This localized construction for almost all degrees for which construction of Ramanujan graphs is known, also allowed creating local unique-neighbour expanders
- 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

Remote(COVID)

Advisor:Prof. Markus Bläser, Max Planck Institute of Informatics *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 $O(\log(\textit{number of monomials}))$ 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 latest work done in the on the problem for the case of constant top and bottom fan-in by Amir Shpilka , Shir Peleg, Ankit Gupta using Sylvester Gallai approach. Also, studied 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 for it's computation.
- 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(UG project)

Remote(COVID)

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

- Read on literature of lower bounds of streaming algorithm, specifically work by Sepehr Assadi and Ran Raz for 2 pass algorithms
- 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

Tutor, ESC101: Fundamentals of Computing

Kanpur, India

Instructor: Biswabandan Panda (Fall 20-21) and Debadatta Mishra (Spring 20-21) — *Oct. 2020 - Jun. 2021*

- For 2 semesters, taught weekly tutorial lectures and graded students. Also had the responsibility of designing questions for lab assignments and written exams.

Teaching Assistant, CS345: Algorithms II

Kanpur, India

Instructor: Surender Baswana — *Jul. 2020 - Nov. 2021*

- Graded Assignments and Quizzes of 150+ students.

Talks

Derandomizing PIT Means Proving Circuit Lower Bounds

Nov. 2020

Course: Computational Complexity Theory

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]*

Extracurricular Activity

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,
Quantum Computing*,
Modern Cryptology,
Randomized Algorithms*,
Computational Complexity Theory*,
Algorithmic Information Theory,
Intro to ML*

**-Exceptional Performance*