Tushant Mittal

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EDUCATION

Indian Institute of Technology Kanpur, Uttar Pradesh, India — Jul 2014 – Present

- B.Tech. in Computer Science and Engineering, $9.2/10.0$

FIITJEE, Hyderabad, Telangana, India — May 2014

- Board of Intermediate Education, 96.9%

Bharatiya Vidya Bhavan's Public School, Hyderabad, Telangana, India — Apr 2012

- Central Board of Secondary Education (CBSE), $10.0/10.0$

RESEARCH INTERESTS

- Computational Complexity
- Cryptography
- Computational Number Theory and Algebra

PREPRINTS

The Mahler measure for arbitrary tori , with Prof. Matilde Lalin — *arXiv Link*

RESEARCH EXPERIENCE

Algebraic Independence — Aug 2017 – Dec 2017
Under Prof. Nitin Saxena, IIT Kanpur — Report

- Studied the computational problem of testing algebraic independence of a set of multivariate polynomials over fields of small characteristic.
- Proved a new criterion which relates dependence of polynomials with a idea of the shifted ones.
- Also explored a new method of dimension reduction to univariates

Mahler Measure — May 2017 – Jul 2017
Under Prof. Matilde Lalin, Université de Montréal — arXiv

- Studied a particular polynomial and the elliptic curve given by its Weierstrass form.
- Proved Boyd's Conjecture which was a relation between their Mahler measures and L-function values.
- Generalized the relation to a variation of Mahler measure where the defining integral is performed over a more general torus instead of the unit torus.
- Work submitted to Research in Number Theory, Springer and currently under review

Algebraic Geometry — May 2016 – Jul 2016
Under Prof. Kapil Paranjape, IISER Mohali — Report

- Learned commutative algebra and explored different aspects of Algebraic Geometry such as Computational, Classical and Enumerative Algebraic Geometry
- Covered the basics of Algebraic Geometry and also learnt about Gröbner basis, Schläfli's Double Six.
- Found an elementary proof of the Grassmannian as a projective variety using linear algebra and algebraic geometry which is more accessible than the traditional one which uses exterior algebra.

ACADEMIC ACHIEVEMENTS

- **MITACS Globalink Research Internship** — 2017
- **Summer Research Fellowship Programme, Indian Academy of Science** — 2016
- **Joint Entrance Examination (JEE Advanced)** , Rank 186 / 1,20,000 — 2014
- **KVPY National Fellowship, DST, Government of India** — 2014

SELECTED TALKS

Categorical Complexity — Sep 2017 – Dec 2017
Course Project for Category Theory, taken by Prof. Amit Kuber — Report

Algebraic Independence - I,II — Oct 2017
Series of two talks given in SIGTACS, IITK — *Slides*

Gröbner Basis Apr 2017
Course Project for Computational Number Theory and Algebra, taken by Prof. Nitin Saxena *Slides*

Democracy's Impossible - Arrow's Theorem Mar 2016
Talk given in Science Coffeehouse, IITK

Information Theory Nov 2015
Course Project for Discrete Mathematics, taken by Prof. Rajat Mittal *Report*

Cutting a Cake - Monsky's Theorem Oct 2015
Talk given in Science Coffeehouse, IITK

Sperner's Lemma Aug 2015
2^{nd} *prize in the intra-college SciTalk competition*

PROJECTS

Cryptanalysis Jan 2017 – Apr 2017
Course Project for Modern Cryptology, taken by Prof. Manindra Agrawal

- Designed and coded differential cryptanalysis attacks for various encryption schemes such as a 6 round DES, RSA with small public exponent using Coppersmith algorithm , 4 round AES

C++-Compiler Jan 2017 – Apr 2017
Course Project for Compiler Design, taken by Prof. Amey Karkare

- Implemented an end-to-end compiler for C++, written in Python

NachOS Aug 2016 – Nov 2016
Course Project for Operating Systems, taken by Prof. Mainak Chaudhuri

- Implemented various system calls, scheduling algorithms and comparatively evaluated their performance

GRADUATE COURSES

- Approximation Algorithms *
- Algorithmic Game Theory *
- Computational Complexity
- Computational Number Theory and Algebra
- Sheaves and Topos Theory *
- Category Theory
- Modern Cryptology
- Randomized Algorithms
- Elliptic Curves and Applications

* - Courses to be taken next semester

TEACHING EXPERIENCE

Tutor - Fundamentals of Computing

- Selected as one among 12 tutors for the introductory programming course with 450 students.
- Taught weekly tutorial lectures, supervised the lab practice sessions and graded students .
- Also had the responsibility of designing questions for lab assignments, midterm and endterm exams.

Volunteer Teacher, Shiksha Sopan, IITK

- Volunteered with Shiksha Sopan, an NGO aimed at providing education to economically weaker section of the society.
- Taught mathematics at a primary government school in the nearby Bara Sirohi village.

EXTRA CURRICULAR

Quizzing

- An avid quizzer, I have participated and won at many intra-college quizzes and inter-school competitions.
- Managed the Quiz Club, IITK's affairs as the Secretary in 2015-16 and as the Coordinator in 2016-17.

Science Talks

- Chosen as the **Leader**, Science Coffeehouse, IITK a hobby group where discussions and talks are held on a wide number of scientific topics, for the academic year 2016-17

TECHNICAL SKILLS

Sage, Mathematica, C/C++, Python, Octave, Bash, Verilog, HTML/CSS, PHP, SQL, Django, LaTeX, GNUPlot, Git, SQLite