Nihar Prakash Gargava   nihargargava@gmail.com   http://nihargargava.com

Education	**École Polytechnique Fédérale de Lausanne, Switzerland** Masters of Science in Mathematics	Sept 2017 - Present
	Indian Institute of Technology, Kanpur, India Bachelor of Science in Mathematics and Scientific Computing	July 2013 - May 2017

Scholastic Achievement

- Qualified and secured an All India Rank of 871 out of over 123 thousand candidates in the second round, in Joint Engineering Exam (Advanced), a two-phase exam where over 1.26 million candidates appeared.
- Secured a rank of All India Rank 5 in National Entrance Screening Test 2013, an entrance exam where over 70 thousand candidates appeared.
- Selected for the prestigious Charpak Research Internship Program 2016, organized by 'Campus France', a French-national agency.
- Recipient of INSPIRE scholarship, granted by the Department of Science and Technology, India.
- Recipient of the J.N.Tata Scholarship for Higher Education.

Background

Programming
I have experience in Python, C, C++, openCV, openGL, sage. I have worked on programming project independently and like to develop openGL-based mathematical visualizations. I have a working knowledge of HTML, php and webGL. Here is my github.

Mathematics
I have a thorough background in all major areas of theoretical mathematics. Currently, I am building up to learn about hyperbolic geometry. I am also interested in Probality theory and applications. I maintain this blog.

- **Current courses (EPFL)**: Probablity Theory, Combinatorial Geometry, Set theory, Riemann Surfaces
- **Past courses (IITK)**: Programming, Real Analysis, ODE & Linear Algebra, Abstract Algebra, Probability and Statistics, Mathematical Logic, Data Structures & Algorithms, Complex Analysis, Galois theory, Differential Geometry, Numerical methods, Topology, Lie groups, Alg. Number Th., Alg. Topology, Topics in Arithmetic, Functional Analysis, Intro. to Algebraic Groups, Fluid Mechanics, Theory of Computation, Hyperbolic Geometry, Geometry of differential forms, Measure theory, Partial differential equations.

Workshops attended

Differential Geometry July, 2017
Organised by Prof. Mahan Maharaj, Prof. Indranil Biswas, Prof. Tejas Kalelkar
at Indian Institute of Science Education and Research, Pune

J-holomorphic curves and Gromov Witten invariants July, 2017
Organised by Prof. Ritwik Mukherjee, Prof. Somnath Basu
at National Institute of Science Education and Research, Bhubhaneswar

Representation Theory of Finite Groups June, 2017
Organised by Prof. K V Subramanian, Prof. Amritanshu Prasad and Prof. K. Raghavan
at Chennai Mathematical Institute, Chennai

Probability and Representation Theory March, 2016
Organised by Prof. Arvind Ayyer, Prof. Amritanshu Prasad and Prof. K. Raghavan
at Institute of Mathematical Sciences, Chennai

Projects

Polylogarithms and Combinatorial Hopf Algebra Summer, 2016
Supervised by Prof. Gérard H E Duchamp, Prof. H N Minh
Laboratoire d'Informatique de Paris-Nord, Université Paris-Nord

- This project continued the existing line of work of Prof. Duchamp and Prof. Minh that concerned with understanding polylogarithms with the aid of tools from combinatorics of words. This is an ongoing project and more details can be given on request.

Classical Invariant Theory Sixth Semester, 2016
Supervised by Prof. Preena Samuel, IITK

- Documented and read *Classical Invariant Theory (Kraft, Processi)*, building towards algebraic groups.
- Wedderburn Theory and the Double Centralizer Theorem was covered.
- Understood the Schur-Weyl Duality and in the context of the Representation Theory of $GL(n, \mathbb{C})$.

Algebraic Geometry   Winter, 2015
Supervised by Prof. Sudarshan Gurjar, IIT Bombay

- Covered the book *Algebraic Curves (William Fulton)*.
- Recieved fundamental knowledge of algebraic geometry including Riemann-Roch theorem, sheaves and Noether-normalization theorem.

Representation theory and Combinatorics   Fifth Semester, 2015
Supervised by Prof. A K Lal, IITK

- Read *Enumerative Combinatorics, Vol 2 (Richard Stanley)*, *Young Tableaux (William Fulton)*.
- Understood the Representation Theory of S_n and the connection with Schur polynomials and Young Tableaux. Details are documented.

Algebraic and Enumerative Combinatorics   Summer, 2015
Supervised by Prof. B. Sury, Indian Statistical Institute, Bangalore

- Studied Polya Theory of orbit counting and representation theory of symmetric groups, along with an introduction to matching theory.
- Applied Polya Theory to count the number of hexaflexagons structures, and derive the series A000207 from A000108. Details are in this report.
- Read the popular text *Combinatorics: Theory and Applications (V. Krishnamurthy)*, found an erroneous proof and a way to circumvent the error. Built a notation guide.

KNOT (a 3D visualization tool for Mathematical Knots)   Summer, 2014
Guided by Prof. Aparna Dar, IITK

- Read the books *The Knot Book (Collin Adams)* and *Knot Theory and Its Applications (Kunio Murasugi)*
- Implemented Knot Theory on openGL to compute invariants like Dowker-Thistlethwaite codes, crossing numbers, writhe, Fox-N-Colorability of any knot using concepts in Computational Geometry like the Bentley-Ottmann sweep line algorithm.

ISAAC (a 2D openGL-based physics simulation engine)   First semester, 2013
Course project under Prof. Subhajit Roy, IITK

- Worked upon an interface where user-drawn 2D solids could collide and interact. The entire physics algorithm was designed from scratch. My project helped me achieved a distinction in the course.

ABU Robocon 2014 (International robotics competition)   Winter, 2013
Supervised by Mechatronics Lab, IITK

- Worked to program a pole-to-pole, laterally traversing robot for the institute team.
- Won awards: **Best Innovative Design** at **National ROBOCON 2014**, **Most Innovative Implementation** at **Student Research Convention 2014, IITK**.

Some talks given

Some properties of the image of the star of the plane   12th July, 2016
Journée-séminaire de combinatoire, LIPN, Université Paris-Nord. Here is the abstract.

Cyclic Sieving Phenomenon   15th January, 2016
CoNTRA, Department of Mathematics and Statistics, IITK. Here is the presentation.

Positions of Responsibility

Senior Executive, Research Cell   2016-Present
Research Cell is a student wing that strives to promote and improve the atmosphere and image of research at IIT Kanpur.

Organizer, CoNTRA   2016-Present
CoNTRA is an interest group, of students that hosts student seminars. CoNTRA stands for Combinatorics, Number Theory, Representations and Algebra.

Hobby Group Leader, Science Coffeehouse   2015-2016
Science Coffeehouse is a student-based science discussion group

Coordinator, Card and Board Games Club   2015-2016
CBG is a club which has a vast collection of board games (mostly Euro-style)

Coordinator, English Literature Society   2015-2016
Organizer of activities like Word Puzzles, Just A Minute, Poetry slams, etc.

Academic Mentor for Mathematics, Counseling Service   2014-2015
Gave informal academic lectures to aid incoming freshmen with academic courses

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Extra-curricular Activities

Active participant in many student activities, skilled in dancing (I have won a state-level competition at the age of 11), skilled in playing music instruments such as Flute and Saxophone, ardent science enthusiast (organise and give talks at Science Coffeehouse), board games lover.

I once took a week-long workshop aimed at high school students. Here is some material that I had made.

I sometimes make animated pedagogical visuals. They can be found here.