Milind Hegde

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Education

2012 – Present — **Bachelor of Science**, *Indian Institute of Science*, Bangalore (4-Year Degree)
Major in Mathematics, expected to graduate in May 2016.
The top student of the mathematics majors group of 21 students.

Latest Term GPA: 7.8/8   Cumulative GPA: 7.6/8

Excelled in advanced mathematics courses including measure theory, probability theory, stochastic processes, functional analysis, algebraic topology, real & complex analysis, commutative algebra, Galois theory, and representation theory.

Exam Scores

GRE (Revised General)	Verbal 170/170 (99 percentile)	Quantitative 170/170 (98 percentile)	Analytic Writing 5/6 (93 percentile)
GRE Subject (Mathematics)	Scaled Score: 910 (99 percentile)		
TOEFL	Reading 30/30	Listening 30/30	Speaking 30/30 · Writing 28/30

Research Experience & Summer Projects

August 2015 – Present — **Final Year Research Project, IISc**
- Studying harmonic analysis, singular integral operators, and the Fock space.
- Working on an open problem on the boundedness of a certain class of integral operators on the Fock space (Integr. Equ. Oper. Theory 81 (2015), pg. 451–454.)
- Gave a short proof of the unitary equivalence of the Hilbert transform to an integral operator on the Fock space.
- Under the guidance of Prof. S. Thangavelu.

June 8 – July 9, 2015 — **Participant in Visiting Students' Research Programme, TIFR, Mumbai**
- Studied algebraic number theory, including Dedekind domains, unique prime factorization of ideals, finiteness of class number, and Dirichlet's unit theorem.
- Wrote a report containing some of the important theorems and their proofs.
- Gave a twenty minute talk titled *The Sign of the Gauss Sum*.
- Under the guidance of Prof. Sandeep Varma.

May 5 – June 19, 2014 — **Research Project, IIT-Bombay**
- Studied graph theory, extremal combinatorics, and the Complete Intersection Theorem. Wrote an article explaining the entire proof of the latter.
- Worked on a conjecture in extremal graph theory regarding the minimum size of the maximum cycle length in a certain class of graphs.
- Made some headway for small cases as well as for sufficiently large ones.
- Under the guidance of Prof. Niranjan Balachandran.

Summer 2013 — **Summer Project at Physics Department, IISc**
- Studied fluid mechanics and the Plateau-Rayleigh Instability. Wrote a report summarizing the properties of the instability.
- Under the guidance of Prof. Arnab Rai Choudhuri.

Course Projects & Presentations

2015   **Presentation on Size of Largest Component of Random Graph $G(n, 1/n)$**
- Course: Martingales & Brownian Motion; Prof. Manjunath Krishnapur, IISc.
- Gave a one hour talk showing that the largest component of the Erdős-Renyi graph $G(n, 1/n)$ is of order $n^{2/3}$. Based on *The critical random graph, with martingales* by Asaf Nachmias and Yuval Peres [arXiv:math/0512201 [math.PR]].

2015   **Presentation on basic Category Theory**
- Course: Galois Theory; Prof. Abhishek Banerjee, IISc Bangalore.
- Gave a 40 minute talk on the basics of category theory: morphisms, objects, monics & epics, functors, natural transformations, equivalence of categories.

2015   **Course Presentation of Proof that $\mathbb{Z}^{\mathbb{N}}$ is not a free module.**
- Course: Commutative Algebra; Prof. Dilip Patil, IISc Bangalore.
- Gave a one hour talk showing that $(\mathbb{Z}^{\mathbb{N}})^{\star}$ is countable (i.e. Specker's theorem), deriving as a corollary that $\mathbb{Z}^{\mathbb{N}}$ is not a free module.

2015   **Representation Theory of $(\mathbb{Z}/p\mathbb{Z})^n \rtimes \mathfrak{S}_n$**
- Course: Representation Theory; Prof. Pooja Singla, IISc Bangalore.
- Explicitly calculated the character table for small values of n and and showed that the number of 1-dimensional representations is $2p$.

2014   **Course Presentation on Undecidability of First Order Logic**
- Course: Automata Theory & Computability; Prof. Deepak D'Souza, IISc.
- Gave a one hour talk on the undecidability of first order logic by reducing the problem to the undecidability of the Turing machine acceptance problem.

2014   **Presentation on biasing n dice to get a uniform distribution on the sum**
- Course: Multivariable Calculus & Complex Variables; Prof. Kaushal Verma, IISc.
- Gave a 40 minute class talk on a simple elementary proof that there is no way to assign probabilities to n m-sided dice so that their sum is uniformly distributed.
- The proof was original and can be found on my website.

2014   **Wiener chaos decomposition for a stochastic differential algebraic equation.**
- Course: Introduction to Scientific Computing; Prof. S. Raha, IISc Bangalore.
- Analyzed accuracy and efficiency of Wiener chaos decomposition as an alternative to Monte Carlo methods to solve a stochastic differential algebraic equation.

2014   **Sexual Selection with a Two Locus Model**
- Course: Mathematical and Theoretical Ecology; Prof. Vishwesha Guttal, IISc.
- Modeled the effects of sexual selection on two loci in haploid and diploid systems analytically. Studied conditions for equilibria of the system and their stability. Analytically determined conditions for invasion of a mutant allele.

Camps Attended

2014   **Aspects of Mathematics,** IMSc Chennai
Two day programme featuring lectures on various aspects of mathematics and research by experts.

Extracurriculars & Other Experience

2015   **App Coordinator,** *Pravega,* IISc's Science and Technology Festival
Responsible for & coordinated the design of the Pravega app with a developer.

2014   **Editorial Coordinator & Designer,** *Quarks Magazine*, IISc UG
- Managed the editorial team and coordinated with other teams.
- Designed 3 full articles, and responsible for overall typography and typesetting.

2013	**Editor**, *Quarks Magazine*, IISc UG
	Selected for writing, composition, editing. Improved typography throughout.
2013	**Core Committee Member**, *Pravega*
	Tasked with major aspects of the fest, such as website, design, events, and its founding. Solely responsible for General Quiz event and website.
2013	**Head of Web Team,** *Pravega*
	Responsible for every aspect of the website (pravega.org/pravega2014), such as designing, coding, and administration. Learnt PHP and MySQL.
2013	**Web Designer of IISc UG Website**
	Designed and coded the IISc UG website (iisc.ernet.in/ug).
2013	**Actor**, *Photograph 51*
	Played the role of James Watson in the play *Photograph 51* about the discovery of the structure of DNA.

Other Skills

Programming	Has experience programming in several languages, including C, C++, R, Matlab, JavaScript, PHP.
Software	Comfortable with Microsoft Word, Excel, PowerPoint, InDesign, Photoshop, Matlab, R, LaTeX, among others.
Typesetting, Design, Typography	Sensitive to font choice, spacing, placement and arrangement of text, and overall design choices of documents.

Honours & Achievements

2013, 2014	**ACM International Collegiate Programming Contest (ACM ICPC), National Level**
	Qualified to the national level of the ACM ICPC, a prestigious international programming competition, of which approximately ten teams qualify to the international finals.
2012 – Present	**Kishore Vaigyanik Protsahan Yojana (KVPY) Fellow**
	Awarded the KVPY Fellowship through the SX Stream. Among approximately 500 top students of science in India showing an aptitude for research.
2008 – 2012	**National Talent Search Examination (NTSE) Scholar**
	Awarded to the top 1000 students in India each year.
2012	**CBSE Group Mathematics Olympiad (GMO) Awardee**
	Among 6 selected from across India's Central Board for Secondary Education schools.
2012	**Best Outgoing Student**
	Best outgoing student out of the 100-strong 2012 batch at Sri Kumaran Children's Home.

Relevant Coursework & Grades

Undergraduate Level

- Real Analysis — S
- Linear Algebra — A
- Algebra — A
- Topology — S
- Number Theory — S
- Automata Theory & Computability — S
- Multivariable Calculus & Complex Variables — S
- Ordinary Differential Equations — A
- Introduction to Scientific Computing — S
- Mathematical and Theoretical Ecology — S
- Probability & Statistics — S

Graduate Level

- Information Theory — S
- Measure Theory — S
- Probability Theory — S
- Galois Theory — S
- Representation Theory — S
- Commutative Algebra — A
- Complex Analysis — S
- Stochastic Processes (Martingales and Brownian Motion) — N/A
- Algebraic Topology — N/A
- Functional Analysis — N/A

*S is the highest grade, following which is A.