

# Milind Hegde

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## Education

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2012 – Present

**Bachelor of Science, Indian Institute of Science, Bangalore**

Major in Mathematics, expected to graduate in May 2016. In the top 2 of the mathematics majors group of 21.

Latest Term GPA: 7.8/8

Cumulative GPA: 7.6/8

Has taken and 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

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GRE (Revised General)	Verbal 170/170 (99 percentile)	Quantitative 170/170 (98 percentile)	Analytic Writing 5/6 (93 percentile)	
GRE Subject (Mathematics)	To fill when made available officially.			
TOEFL	Reading 30/30	Listening 30/30	Speaking 30/30	Writing 28/30

## Research Experience

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August 2015 –  
Present

**Final Year Research Project, IISc**

- Studying harmonic analysis, singular operators, and the Fock space.
- Working on an open problem regarding the boundedness of a certain class of integral operators on the Fock space (see 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 briefly sketching some of the important theorems mentioned 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 expository article explaining the 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 & Seminars

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- 2015     **Talk on basic Category Theory**
- Course: Galois Theory; Prof. Abhishek Banerjee, IISc Bangalore.
  - Gave a 40 minute talk on the fundamentals of category theory, including morphisms, objects, monics & epics, functors, natural transformations, equivalence of categories.
- 2015     **Seminar Talk: 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  $(\mathbb{Z}^{\mathbb{N}})^*$  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  $(\mathbb{Z}/p\mathbb{Z})^n \ltimes \mathfrak{S}_n$**
- Course: Representation Theory; Prof. Pooja Singla, IISc Bangalore
  - Explicitly calculated the character table for small values of  $n$  and showed that the number of 1-dimensional representations is  $2p$ .
- 2014     **Seminar Talk on Undecidability of First Order Logic**
- Course: Automata Theory & Computability; Prof. Deepak D'Souza, IISc Bangalore.
  - 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     **Talk on biasing  $n$  dice to get a uniform distribution on the sum**
- Course: Multivariable Calculus and Complex Variables; Prof. Kaushal Verma, IISc.
  - Gave a 40 minute class talk giving a simple elementary proof that there is no way to assign probabilities to  $n$   $m$ -sided dice such that their sum has a uniform distribution.
  - 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 the accuracy and efficiency of Wiener chaos decomposition as an alternative to Monte Carlo methods to solve a stochastic differential algebraic equation numerically.
- 2014     **Sexual Selection with a Two Locus Model**
- Course: Mathematical and Theoretical Ecology; Prof. Vishwesh Guttal, IISc Bangalore.
  - Modeled the effects of sexual selection on two loci in haploid and diploid systems analytically. Studied conditions for equilibria of the system and determined their stability.
  - Analytically determined conditions for invasion of a mutant allele into the population.

## Camps Attended

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- 2014     **Aspects of Mathematics, IMSc Chennai**
- Two day programme featuring lectures on various aspects of mathematics and research by experts.
- 2012     **Vijyoshi Camp, IISc Bangalore**
- Three day series of talks by experts on a wide range of fields of science and mathematics. The top approximately 600 students of India are selected to attend.

## Extracurriculars & Other Experience

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- 2015     **App Coordinator, Pravega, IISc's Science and Technology Festival**
- Was responsible for and coordinated the development of the Pravega app with an external developer.
- 2014     **Editorial Coordinator & Designer, Quarks Magazine, IISc UG**
- Managed the editorial team and coordinated with other teams to bring out the magazine.
  - Designed 3 articles in full, and was responsible for overall typography and typesetting.
- 2013     **Editor, Quarks Magazine, IISc UG**
- Selected for skill in writing, composition, editing. Further contributed by ensuring that typographic rules were followed throughout.

- 2013 **Core Committee Member, Pravega**  
Tasked with major aspects of the fest, including website, design, events, and its founding.
- 2013 **Head of Web Team, Pravega**  
Responsible for every aspect of the website (pravega.org/pravega2014), such as designing, coding, and administration. In particular,
- Implemented a login system with industry-standard cryptographic practices.
  - Learnt PHP and MySQL for the purpose.
- 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.

## Skills & Strengths

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

## Honours & Achievements

2013, 2014	<b>ACM ICPC</b> 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	<b>Kishore Vaigyanik Protsahan Yojana (KVPY) Fellow</b> Awarded the KVPY Fellowship through the SX Stream. Among approximately 500 top students of science in India showing an aptitude for research.
2008 – 2012	<b>National Talent Search Examination (NTSE) Scholar</b> Awarded to the top 1000 students in India each year.
2012	<b>CBSE Group Mathematics Olympiad (GMO) Awardee</b> Qualified the GMO to write the INMO (Indian National Mathematics Olympiad). Among 6 selected from across the country's CBSE schools.
2012	<b>Best Outgoing Student</b> Was best outgoing student out of the 100-strong 2012 batch at Sri Kumaran Children's Home.

## Relevant Coursework & Grades

Undergraduate Level		Graduate Level	
• Real Analysis	S	• Information Theory	S
• Linear Algebra	A	• Measure Theory	S
• Algebra	A	• Probability Theory	S
• Topology	S	• Galois Theory	S
• Number Theory	S	• Representation Theory	S
• Automata Theory & Computability	S	• Commutative Algebra	A
• Multivariable Calculus	S	• Complex Analysis	S
• Ordinary Differential Equations	A	• Stochastic Processes (martingales and Brownian motion)	N/A
• Intro to Scientific Computing	S	• Algebraic Topology	N/A
• Mathematical and Theoretical Ecology	S	• Functional Analysis	N/A
• Probability & Statistics	S		

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