Milind Hegde

+91-99-8670-8610 ✶ milind.hegde@gmail.com ✶ milindhegde.github.io

Education

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

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

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

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 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. Vishwesha 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

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

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

Programming — Has experience programming in several languages, including *C, C++*, R, Matlab, JavaScript, PHP.

Software — Comfortable with Microsoft Word, Excel, PowerPoint, Adobe InDesign, Adobe 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 ICPC**
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**
Qualified the GMO to write the INMO (Indian National Mathematics Olympiad). Among 6 selected from across the country's CBSE schools.

2012 **Best Outgoing Student**
Was 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 — S
- Ordinary Differential Equations — A
- Intro 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.