pritish **patil**

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interests

Theoretical Neuroscience, Computational Neuroscience, Stochastic Modeling, Numerical Methods, Systems Biology, Stochastic Differential Equations, Spatial Dynamics, Applied Mathematics in Biology.

education

2012–2016 **Bachelor of Science** Biology Major with Mathematics Minor — Indian Institute of Science, Bangalore
CGPA 6.6/8.0 (After 6 semesters)

2012 **12th Grade** Science Stream — KVN Naik College, Nashik
79.83%

2010 **10th Grade** Matriculation — JDC Bytco High School, Nashik
86.16%

major achievements

2012 Silver Medal at **International Biology Olympiad** — Singapore, Singapore

2011 Silver Medal at **International Biology Olympiad** — Taipei, Taiwan

2010 Silver Medal at **International Astronomy Olympiad** — Crimea, Ukraine

research experience

2015 **Making a realistic model CA1 Pyramidal Neuron in MOOSE (Ongoing)** — NCBS, Bangalore
Guide : Dr. Upi Bhalla, NCBS, Bangalore
Coming up with a distrubution ion channels for the CA1 Pyramidal neurons which has realistic behavior for different morphologies. All coding in MOOSE

2014 **Finding network topologies which show adaptation response** — NCBS, Bangalore
Guide : Dr. Sandeep Krishna, NCBS, Bangalore
Modelled a general three node gene/protein network using a system of differential equations and simulated it. The aim was to find the topologies which show the adaptation response. Programming was done in C. Used variable step-size 4th order Runge-Kutta routine to solve the system of differential equations.

2013 **Modelling of High Energy Cosmic Ray Spectrum** — HBCSE, Mumbai
Guide : Prof. Mayank Vahia, TIFR, Mumbai
Explored the effect of magnetic field on cosmic rays produced inside galaxies and proposed an explanation for the features seen in the cosmic ray spectrum. Tried to explain galactic X-Ray halos using these cosmic rays. Matlab and C were used.

2013 **Lab techniques for isolation and purification of proteins** — IISc Bangalore
Guide : Prof. V. Nagaraja, IISc, Bangalore
Learned various lab techniques like Polyacrylamide Gel Electrophoresis, Ion-exchange Chromatography, Affinity and Immunoaffinity Chromatography, Metal Chelate Affinity Chromatography, Size-exclusion Chromatography. General techniques in microbiology were also learned.

2012 **Constraining Dark Energy Parameters using Supernova-1a data** — IISER, Mohali
Guide : Prof H.K. Jassal, IISER Mohali
Understood standard cosmology, obtained constraints on dark energy parameters of the standard model and evaluated different cosmological models by comparing with SN1A data(Union Supernova Project). Programming and analysis were done in C and MATLAB.

2012 **Karyotyping for screening of chromosomal abnormalities** Genetic Health & Research Centre, Nasik
Guide : Dr. Dnyandeo Chopade, Genetic Health & Research Centre, Nasik
Mastered the basics of Karyotyping. Learned to make karyotypes from blood and from chorionic villi. Apprenticed for detection of defects in chromosomes in the karyotypes.

2011 **A stacking analysis of radio properties of photometrically selected quasars** NCRA, Pune
Guide : Dr. Yogesh Wadadekar, NCRA, Pune
Analysed the radio properties of 1 million quasars (all the known quasars at that time) found by SDSS photometrically. Correlated the optical data to radio data by doing statistics on radio image stacks of quasars. Programmed in Python using SciPy, NumPy, PyFITS as well as some other astronomy specific Python modules.

2010 **Effect of metallicity on the evolution of stellar populations** NCRA, Pune
Guide : Dr. Yogesh Wadadekar, NCRA, Pune
Studied the effects of changes in metallicity of a nebula upon the evolution of clusters of stars within it. Programming and analysis were done using C and shell script.

2009 **Study of Irregularities in the Spiral Structure of M101** HBCSE, Mumbai
Guide : Prof. Mayank Vahia, TIFR, Mumbai
Analysed the spiral structure of M101 Pinwheel galaxy, examined the irregularities and proposed explanations for them. Analysis was done in MATLAB.

course projects

2015 **Analysis of dendritic transmission using synaptic input and somatic output spike trains** Theoretical and Computational Neuroscience
Prof. Rishikesh Narayanan and Prof. SP Arun, IISc Bangalore
Using a realistic detailed neuronal model, studied dendritic transmission and computation. Using only poisson input and corresponding output spike trains, calculated time for dendritic transmission, and after correcting for this delay, analyzed how synaptic processing.

2014 **Spatial Dynamics of Sympatric Speciation** Theoretical and Mathematical Ecology
Prof. Vishwesha Guttal, IISc Bangalore
Studied spatial dynamics of sympatric speciation due to disruptive selection.

2014 **Leeches: Animal movements and random walks** Experiment in Ecology
Dr. Farah Ishtiaq, IISc Bangalore
Explored how the leeches could be locating their prey in absence of stimulus. Found that the leeches perform a correlated random walk, which emulate a Levy random walk.

2014 **Comparing Weiner chaos decomposition and Monte Carlo methods for solving stochastic differential equations.** Introduction to Scientific Computing
Prof. S. Raha, IISc Bangalore
Used Weiner Chaos Decomposition and Monte Carlo method to find the solutions of a system of stochastic differential equations numerically. Compared the accuracy of and the time taken by these methods. Programming and analysis were done in MATLAB.

2014 **Sexual Selection with a Two Locus Model** Theoretical and Mathematical Ecology
Prof. Vishwesha Guttal, IISc Bangalore
Modelled the effects of sexual selection on two loci in haploid and diploid systems analytically, and in more complex cases numerically. Studied various equilibria of the system and determined their stability. Analysed the dynamics of invasion of one genotype by another. Programming and analysis were done in MATLAB.

programming and computers

Common programming

C, R, Python, MATLAB, LaTeX, shell/bash, linux.

Neuroscience related

MOOSE, NEURON, BRIAN

relevant courses [grad level]

biology

- Topics in Systems Neuroscience
- Theoretical and Computational Neuroscience
- Theoretical and Mathematical Ecology
- Spatial Dynamics in Biology
- Cellular Neurophysiology
- Fundamentals of Systems and Cognitive Neuroscience
- Fundamentals of Molecular and Cellular Neuroscience

mathematics

- Stochastic Processes [martingales and brownian motion]
- Probability Theory [measure theoretic]
- Measure theory
- Algebra
- Topology
- Linear Algebra
- Real Analysis

engineering

- Information Theory

relevant introductory courses

- Physics (3 courses)
- Chemistry (3 courses)
- Mathematics (3 courses)
- Biology (3 courses)

relevant courses [undergrad level]

biology

- Introductory Structural Biology
- General Biochemistry
- Introductory Physiology
- Developmental Biology

mathematics

- Multivariable Calculus and Complex Variables
- Elementary Algebra and Number Theory
- Probability and Statistics

engineering

- Introduction to Scientific Computing
- Algorithms and Programming
- Introduction to Electrical and Electronics Engineering
- Introduction to Material Sciences
- Introduction to Environmental Sciences

laboratory courses

- Experiments in Biochemistry and Physiology
- Experiments in Microbiology and Ecology
- Experiments in Molecular Biophysics
- Experiments in Neurobiology

other notable achievements

2011 **Selected as a member of Indian team for International Earth Science Olympiad** Modena, Italy
One of top 4 from India to get selected.

2011 – 2014 **Recipient of KVPY (Kishore Vaigyanik Protsahan Yojana) Scholarship**
Awarded to the top 200 science students from India each year.

2009 – 2011 **Recipient of NTSE (National Talent Search Exam) Scholarship**
Awarded to the top 1000 students from India each year.

2013 **Regionals of ACM International Collegiate Programming Contest** Amrita University Coimbatore
One of the top 389 teams selected from across the country

2013 **Won MIMAMSA, a national inter-college science quiz** IISER, Pune
Qualified for the final quiz from amongst more than 100 teams and WON the 14 hours long quiz.

2010 **The C.L. Bhat Memorial Award for the Best Student** Indian Astronomy Olympiad Camp
Awarded to the best overall performer in the Indian Astronomy Olympiad Camp

2010-2012 **INFOSYS Award for Olympiad Medalists**
Awarded to all the Olympiad medallists every year.

2010 **Rural Electrification Corp. Award for Olympiad Medalists**
Awarded to all the International Olympiad from India.

2011–2012 **Orientation Cum Selection Camp of Indian National Biology Olympiad** HBCSE, Mumbai
In top 35 selected from ≈6000 from across the country

2010 **Orientation Cum Selection Camp of Indian Junior Science Olympiad** HBCSE, Mumbai
In top 35 selected from ≈10000 from across the country

2009–2011 **Orientation Cum Selection Camp of Indian Astronomy Olympiad** HBCSE, Mumbai
In top 35 selected from ≈6000 from across the country

2011 **Selected for Indian National Mathematics Olympiad**
In top 250 selected from more than 10000 from across the country

2009–2012 **Selected for Indian National Olympiad in Informatics**
In top 250 selected from across the country

2007–2010 **Australian National Chemistry Quiz**
Certificate Of Excellence with Plaque / High Distinction (One from top 7-8 from India every year)

camps attended

2015 **Computational Approaches to Memory and Plasticity** NCBS, Bangalore
16-day summer school on the theory and simulation of learning, memory and plasticity in the brain.

2014 **Physics of Life, NCBS-Simons Annual Monsoon School** NCBS, Bangalore
Topics included: biophysics and soft-matter physics, ranging from aspects molecules to those of cells and tissues; information processing and decision making, at the level of cells or of the brain; stochastic processes in molecules or populations; dynamical systems models of genetic networks or biomechanical systems.

2012 2013 **NIUS Astronomy Nurture Camp** HBCSE Mumbai
Worked on various astronomical projects listed above.

2011, 2012 **Vijyoshi Camp** IISc, Bangalore
Similar to Lindau Meet with Noble Laureates for students. For top ≈600 science students across India

2011, 2012 **Biology Olympiad Pre-Departure Training Camp** HBCSE Mumbai
Had training session in theoretical and practical aspects of biology as preparation for the IBO.

2011, 2012 **Biology Olympiad Orientation Cum Selection Camp** HBCSE Mumbai
Lectures and practical training by various faculty. Selection exam in both theory and practicals.

2011 **Earth Science Olympiad Orientation Cum Selection Camp** University of Hyderabad
Lectures and practical training by various faculty. Selection exam in both theory and practicals.

2010 **Astronomy Olympiad Pre-Departure Training Camp** HBCSE Mumbai
Had training session in theoretical and practical aspects of astronomy as preparation for the IAO.

2009, 2010 **NIUS Astronomy Nurture Camp** HBCSE Mumbai
Worked on various astronomical projects listed above.

2009, 2010 **Astronomy Olympiad Orientation Cum Selection Camp** HBCSE Mumbai
Lectures and practical training by various faculty. Selection exam in both theory and practicals.

extracurricular activities

2014 **Programming Events Manager for Pravega, the annual college festival** IISc, Bangalore
Reverse coding: given the executable, write the source code
Online programming contest: a standard programming contest
Connect the dots: a programming treasure hunt, which requires you to solve programming questions to get to the next question

2013–2014 **Convener and founder of Scipher** Bangalore
Scipher is a mock test for the KVPY scholarship exam. We set a model question paper and conducted the model exam across various states in India. 3,500 students took the mock exam Coordinated with 30 people for setting and designing question paper. Co-ordinated with 70 people for conduction and supervision of the examination.

2013 **Acted in the play "Photograph 51"** IISc, Bangalore
Character played : Francis Crick

2012 **Acted in and gave sound effects to the play "Safar"** Alliance Française, Bangalore
Character played : Software engineer

2013–2014 **Active member of Samasya, IISc Math club** IISc, Bangalore

2012–2013 **On the committee of Marathi Mandal** IISc, Bangalore
Group of people in IISc following Maharashtrian traditions and ethnicity