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
2012 **12th Grade** Science Stream — KVN Naik College, Nashik
2010 **10th Grade** Matriculation — JDC Bytco High School, Nashik

major achievements

2012 Silver Medal@**International Biology Olympiad** — Singapore, Singapore
2011 Silver Medal@**International Biology Olympiad** — Taipei, Taiwan
2010 Silver Medal@**International Astronomy Olympiad** — Crimea, Ukraine

research experience

2015 – pres **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.

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 the features of cosmic ray spectrum. Tried to explain galactic X-Ray halos using these cosmic rays.

2013 **Lab techniques for isolation and purification of proteins** — IISc Bangalore
Guide : Prof. V. Nagaraja, IISc, Bangalore
Learned various lab techniques like PAGE, various types of chromatography and Genenreal techniques in microbiology.

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).

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 found by SDSS photometrically. Correlated the optical data to radio data and did statistics on radio image stacks of quasars.

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.

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.

course projects

2015 **Analysis of Dendritic transmission** 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. Reproduced some of the results in "Speciation along environmental gradients" by Michael Doebeli and Ulf Dieckmann.

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 emulates 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.

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 other complex cases. Studied the equilibria of the system and determined their stability. Analysed the dynamics of invasion of one genotype by another.

programming and computers

Common programming

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

Neuroscience related

MOOSE, NEURON, BRIAN

camps and workshops 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; information processing and decision making; stochastic processes in molecules or populations; dynamical systems models of genetic networks or biomechanical systems.

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

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 – pres **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 **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.

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