Department of Biotechnology, IIT Madras
PhD admissions July 2022

List of Stream-wise Faculty names, PhD Project titles and vacancies

1) CB- Computational Biology Stream

Si.No	Faculty Name	Project title(s), Number of vacancies
1	Karthik Raman	1. Modelling the evolution of microbial communities (1 student) The goal of this project will be to perform in silico evolution of microbial communities to understand key trajectories of community evolution, e.g. how microbes are gained and lost, and use this understanding to engineer possible therapeutic interventions (e.g. post antibiotic treatment, etc.). A combination of network science and optimisation approaches is expected to be used in this project. 2. Understanding environmental microbiomes (1 student) Recent consortia such as MetaSUB, MetaSEW and MetaAIR have been shedding light on the microbiome present in various public places, sewage or atmosphere, respectively. As part of this project, we will develop new algorithms to identify keystone species in these datasets, and also develop approaches to understand the structure and organisation of these microbiomes. A mixture of both machine learning approaches and network science approaches will be used.
2	V S Chakravarthy	1. Large scale models of brain dynamics using networks of nonlinear oscillators (1 student)
3	Sanjib Senapati	Topic 1. Structure-based designing of a novel class of HIV Protease drugs effective against both apo and mutant variants: A comprehensive study using Molecular Dynamics (MD) Simulations and In-vitro studies (1 Student) Topic 2. Stabilizing DNA and RNA at Room Temperature using a new class of green solvents (1 student)
4	S. Mahalingam	Breast Cancer Genomics: Comprehensive analyses of whole exome and transcriptome sequencing data to identify mutational landscape, biomarkers and drug targets for novel anti-cancer therapeutics- (1 student)
5	Athi Narayanan N	Molecular Simulations of Proteins: Function through the Lens of Folding Mechanisms, (1 student)
6	M. Hamsa Priya	1. Computational Investigation of cyclodextrin-RNA interactions for therapeutics (1 student)
7	Michael Gromiha	1. Large scale analysis and development of AI based tools for identifying cancer causing mutations.(1 student) 2. An integrative approach for understanding the structure, function and dynamics of HIV protease: applications to design novel inhibitors (1 student)
8	Nirav Bhatt	Topic 1: Integrated Modeling and Control of Biological Disease Networks using Omics, Literature Data, and clinical Data: The objective of this project is to develop integrated (regulator-signalling-metabolic) biological networks using omics and literature data. The integrated models will be used for developing optimal therapeutic strategies using networked control approaches (Theory/Computational). (1 student) Topic 2: AI-driven Approaches for De Novo Molecule Generation. In our group, we have developed a chemistry-inspired feature representation technique for property prediction. The objective of this work is to develop an AI-driven approach for generating candidate molecules for the desired application. (Theory/Computational), (1 student)
9	N Manoj	Molecular evolution of membrane associated proteins (1 student)
10	Vani J	Host-pathogen interactions, (1 student)

2) **BS- Biological Sciences Stream**

Si.No	Faculty Name	Project title(s), Number of vacancies
1	Ninitha AJ	Role of PARP in cardiovascular disease development and treatment. (1 student)
2	Greeshma Thrivikraman	Deciphering neurovascular guidance in 3D hydrogel systems, (1 student)
3	Nathiya	Role of MEN1 in pancreatic cancer progression, (1 student)
4	Guhan Jayaraman	Recombinant Antibody Engineering (1 student)
5	Santhosh Sethuramanujam	1) Investigating the mechanisms by which neuropeptides modulate retinal circuits. (1 student) 2) Investigating the mechanisms by which diabetic retinopathy compromise retinal function. (1 student)
6	Madhulika Dixit	1) A molecular and cellular biology approach to elucidate the role of PTPN members in cardiovascular diseases (1 student) 2) 2. Biochemical and biophysical characterization of human Protein tyrosine phosphatase-PEST (PTP-PEST). (1 student)
7	Sanjib senapati	Topic 1. Stabilizing DNA and RNA at Room Temperature using a new class of green solvents (1 student) Topic 2. Structure-based designing of a novel class of HIV Protease drugs effective against both apo and mutant variants: A comprehensive study using Molecular Dynamics (MD) Simulations and In-vitro studies (1 Student)
8	Baskar	1) Estimating meiotic recombination rates in naturalized Arabidopsis accessions (1 student) 2) Molecular genetic characterization of a ubiquitin ligase in Dictyostelium (1 student). 3) A study to find the role of neurotransmitters in plant movement (1 student) 4) A study on serotonin biosynthesis in the social amoebae Dictyostelium (1 student), 5) A study to find the mechanisms of bacterial volatile mediated chemotaxis in Dictyostelium (1 student)
9	S. Mahalingam	RAS effector dependent epigenetic regulation in cancer (1 student)
10	Nitish Mahapatra	Genetic and molecular bases of early myocardial infarction in Indian population (1 student)
11	N.Manoj	Biochemical and biophysical characterization of industrial enzymes (1 student)
12	Suresh Rayala	Targeting signaling kinases in Triple Negative breast Cancer (1 student) Secretory molecules influencing tumor microenvironment in Pancreatic Cancer (1 student) Targeting inflammatory interactome in Breast cancer (1 student)
13	K.Subramaniam	Regulation of germline stem cells in C. elegans (1 student)
14	Krithika Ravi	Microbial valorization of polyethylene terephthalate plastics to platform chemicals (1 student).
15	Richa Karmakar	Modulation of cytoskeletal protein during the development of eukaryotic cells (1 student) Actin protein is a very essential part of the cell. Actin is made of globular monomers (G-actin) that polymerize into helical filaments (F-actin). The actin cytoskeleton, the network of actin and actin-binding proteins, is essential for cells to change their shape, perform cell motility, development and signal transduction, phagocytosis, cytoplasmic streaming and organelle, cellular and tissue reorganization. Our aim is to study how actin and myosin modulate during development. We will use *Dictyostelium discoideum* as a model organism.
16	Himanshu Sinha	Role of yeast ribosomal protein variants in phenotypic adaptation and evolution: (1 student) Ribosomal proteins are among the most conserved proteins across eukaryotes, and ribosomes are considered invariant in structure and

		function. However, recent evidence shows that ribosomal proteins are structurally variable and have a phenotypic function beyond translation. We have identified several yeast ribosomal protein-coding variants, which we are testing for their novel role in adaptation to diverse environments. The outcome of this project will be to uncover the role of universal and essential cell machinery, ribosome, in regulating phenotypic variation in genetically variable populations in response to changing environments – providing evidence for the concept of "specialized ribosome", which proposes that across organisms, variable ribosome exist to differentially regulate translation, modifying phenotypic outcomes.

3) **BE- Biological Engineering Stream**

Si.No	Faculty Name	Project title(s), Number of vacancies
1	Greeshma Thrivikraman	Topic 1. Development of tissue engineered vasculature to study age-related vascular pathologies (1 student) Topic 2. Neuroimmunomodulation-on-a-chip for infectious and inflammatory diseases (1 student)
2	Guhan Jayaraman	Metabolic and Bioprocess Engineering for conversion of lignocellulosic biomass to value-added chemicals. (1 student)
3	Smita Srivastava	To decipher the biosynthesis pathway of camptothecin in the endophyte Alternaria burnsii (1 student)
4	M. Hamsa Priya	Modeling of protein aggregation and phase separation (1 student)
5	G. K. Suraishkumar	Shear stress related strategies for disease management, (1 student)
6	Nirav Bhatt	Automated 3D Printed On-Demand Bio-manufacturing Processes. The objective of the project is to develop an approach for online monitoring and control of 3D printed bioreactors using low-cost NIR spectroscopy. (Nature of work: Computational/Experimental), 1 Student
7	M. S. Narayanan	Biosensor development for precise early detection of epithelial ovarian cancer. (1 student)
8.	Krithika Ravi	Bacterial conversion of low molecular weight lignin to muconic acid (1 student)
9	Richa Karmakar	Lab-on-chip technology for biomedical applications (1 student) A lab-on-a-chip is a device, mostly in the size of millimeters to a few square centimeters, that integrates one or several laboratory functions on a single integrated chip. We plan to build microfluidic devices that we can use for biomedical applications. One example is diagnosing resistant bacteria or performing an antibiotic susceptibility test.