Yukta Subramanian

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Education

Indian Institute of Science, Bengaluru, India

Bachelors of Science (Research) 2022 - 2026*(expected)*

Major: Biology, Minor: Bioengineering

Jaipuriar School, Navi Mumbai, India

Central Board of Secondary Education 2020 - 2022

Research Interests

I am interested in molecular and cellular neurobiology, as well as studying cancer. Narrowly, I am curious about the metabolism of neurons in normal physiology and in pathological conditions, such as neurodegenerative diseases and epilepsy, and how these molecular changes can affect circuit-level behavior. I am fascinated by the emerging field of cancer neuroscience. I am keen on applying mathematical and computational tools, alongside wet lab techniques to better understand complex biological systems.

Publications

Meena, R. K., Fan, Y., R, S., Pandey, A. J., Kannan, A., Subramanian, Y., Subramanian, Y., George, J. T., Jolly, M. K. (2025). Interconnected axes of phenotypic plasticity drive coordinated cellular behaviour and worse clinical outcomes in breast cancer.
https://doi.org/10.1101/2025.11.23.688595 [archive]

Research Experience

AMPK-TXNIP interplay in epithelial-mesenchymal transition (EMT) in Breast cancer

Prof. Annapoorni Rangarajan and Prof. Mohit Kumar Jolly, IISc May 2025 – Present

Surveyed literature on metabolism and cancer progression in the context of metabolic disorders and drugs to identify a potential gap for my thesis. Performed Western Blots and ICC to study the role of key metabolic proteins in matrix-deprived cells. Presented a summary of known literature and lacunae in the field of metabolism in epithelial-mesenchymal transition (EMT). Designing a mathematical model to elucidate and quantify the metabolism-EMT crosstalk. Performing Western Blot, ICC, and metabolic assays to study metabolic changes in EMT.

Modulating PV Interneurons to explore Memory Interference during Systems Consolidation in Mice

Prof. Balaji Jayaprakash, IISc May 2024 – Dec 2024

Trained in performing perfusion, slicing on microtome, IHC, and imaging. Independently analyzed previously collected mice trajectory data to quantify learning using tools such as ImageJ, Java CoAT Library and idtracker.ai. Conducted Morris Water Maze experiments and quantified learning in different mice groups. Presented the findings and contributed to discussions leading to the design of the experiments to study the role of PV interneurons through chemogenetics inactivation. Wrote Python scripts to automate many repetitive tasks in our analysis pipeline for mice movement data.

Modeling Gene Regulatory Networks in Breast Cancer

Prof. Mohit Kumar Jolly, IISc — May 2024 – Aug 2024

Constructed and simulated the dynamics of a minimalistic regulatory network encompassing the known associations among regulators from multiple axes of cancer plasticity – epithelial-mesenchymal plasticity, metabolism, stemness, immune evasion, and drug resistance using Boolean simulators coded in Python and Random Circuit Perturbation techniques (RaCiPe) as an ODE-based simulator, presenting the results as a team.

Training SLEAP software to track rat behaviour

Prof. Ashesh Dhawale — Dec 2023 – Jan 2024

Trained in and worked on optimizing a deep neural network on SLEAP (Social LEAP Estimates Animal Poses) software to track the movement of rats while making and executing choice-based decisions. Studied reinforcement learning in mice and the basics of machine learning.

Lab Internship

Prof. Dipshikha Chakravortty, IISc — Jan 2023 – Sept 2023

Gained expertise in molecular biology and microbiology techniques, mostly in bacteria *Salmonella* and *E. coli*. Performed plasmid isolation and chemical transformation to prepare more RFP-containing plasmids for the study of the effect of shockwaves in bacterial transformation.

Presentations

Poster presentation at National Conference for Undergraduate Research is Bioscience by IISER-Tirupati on Modulating PV Interneurons to explore Memory Interference during Systems Consolidation in Mice, in Dec 2025(selected)

Student talk at Science Undergraduate Research Conference (SURC) by Azim Premji University on Modulating PV Interneurons to explore Memory Interference during Systems Consolidation in Mice, in Dec 2025

Student talk and Poster presentation at National Conference for Undergraduate Research is Bioscience by IISER-Tirupati on Effect of Ageing on Memory Interference studied through Spatial Learning Task (Best Student Talk), Dec 2024

Poster presentation at Annual Symposium by Centre for Neuroscience, IISc on Effect of Ageing on Memory Interference studied through Spatial Learning Task, Aug 2024

Skills

Wet Lab Techniques	Western Blot, IHC, ICC, bacterial culture and transformation, plasmid isolation and quantification, in-vitro transcription, RNA isolation and quantification, protein isolation, ELISA, fluorescence spectroscopy, CD spectroscopy, mass spectroscopy (MS-MS analysis)
Animal Work	Handling mice, stereotactic surgery of mouse brain, perfusion, and brain extraction
Programming Language	R, Python, Java, C, MATLAB
Software Tools	Social LEAP, ImageJ, idtracker.ai

Course Projects

Studying Non-Linear Connectivity Changes in Alzheimer's Disease Progression Apr 2024

NS 212 Neural Signal Processing
Surveyed literature and rationalized the use of non-linear methods of EEG analysis. Coded mutual information calculation in MATLAB to quantify differences between the patients and healthy controls. Presented the results in the format of a research grant and a presentation with two of my team members.

Consequences of acute radiation side effects on cancer invasion Mar 2024

BE 228 Introduction to Mathematical Oncology
Developed a reaction-diffusion-based model that was adapted from Gatenby et al. (1996) and performed linear stability analysis to obtain qualitative inferences about the system. Presented our results in the form of a short manuscript and a presentation.

Sexual Selection and Mate Choice in Female Guppies Oct 2024

UB 301L: Experiments in Microbiology and Ecology
Designed an experimental paradigm using differently coloured males and two similar females in a fish tank. Collected video data on fish movement and used idtracker.ai to quantify the amount of time spent around each male as a proxy for mate preference.

Species Richness and Distribution of Mushrooms in IISc Campus Nov 2024

UB 301L: Experiments in Microbiology and Ecology
Designed a field study to understand the underlying environmental and anthropogenic factors shaping mushroom diversity in the campus. Identified mushroom species and noted the environmental conditions (moisture content and orientation of the substrate and shade) they were growing in to validate our hypothesis that the diversity would be greater in natural habitats than in human-perturbed habitats.

Additional Projects

iGEM Venture Capital Labs 2024 Apr 2024

Participated in a 4-week workshop on venture capital where we learned about and drafted a Lean Business Model, Gantt charts, and a pitch to convert the iGEM project *Metramorpheus* into a venture, an mRNA-based therapeutics platform - *Mercurial*, leading to our selection for the next stage of the Venture Foundry, the Mentorship Program.

iGEM (International Genetically Engineered Machine) Competition Dec 2022 – Nov 2023

Participated in ideation and creation of "Metramorpheus" - an mRNA-based therapeutic to deal with endometriosis. Carried out and troubleshooted experiments, including bacterial work – plasmid extraction from *E.coli* DH5-α and transformed into BL-21 strain for better protein yield. Conducted experiments including purification of IL-8 protein from bacterial lysate, in-vitro transcription, and lipid nanoparticle characterisation by DLS. Compiled the documentation for the website. Presented the work to a bench of judges at the Jamboree, where we won a Gold medal.

Previous Work

Science Writing Internship

Office of Communications (OoC), IISc July 2024 – Nov 2024

Crafted research stories for website the institute's website, press release, Kernel after critical review of research articles and interview of the researchers involved. Addressed the issue of environmental impact of scientific activities in an article featured in the institute's magazine Connect based on thorough research and insights from scientists across many fields and information from OLSEH, IISc.

Leadership

Vice Chair

IISc ACM-W Students Chapter, IISc — Mar 2023 – Aug 2024

Founded the Chapter and conducted activities for students from IISc and outside. Organized seminars, workshops, and exhibits on various topics in computer science. Involved in team building, supervising chapter management, including recruiting members, election to the core team, outreach, etc., and communication with the Faculty Advisor. Assisted with the organization of the ACM-W India Grad Cohort 2023.

Awards and Honors

Best Student Talk at the National Conference for Undergraduate Research in Bioscience (NCURB) 2024 by IISER-Tirupati

Winner Team of Mimamsa 2023, one of the toughest national-level annual science competition organized by the IISER Pune

Kishore Vaigyanik Protsahan Yojna (KVPY) Fellowship

Molecular Frontiers Inquiry Prize, 2022 by Molecular Frontiers Foundation

Relevant Coursework and Certification

Introduction to Biomaterials, Fundamentals of Bioengineering 1 (Systems biology, Biosensors), Introduction to Mathematical Oncology, Systems Neuroscience, Molecular Neuroscience, Neural Signal Processing, Neuronal Physiology and Plasticity, Topics in Molecular and Cellular Neuroscience, Neuronal Ion Transport in Health and Disease

Cleared General Safety Module and Biological Safety Module administered by Office of Lab Safety and Environmental Health (OLSEH, IISc)

Training in Basic Life Support (BLS) by 3S Akademie

References

Prof. Balaji Jayaprakash, Centre for Neurosciences, IISc — jbalaji@iisc.ac.in

Prof. Mohit Kumar Jolly, Department of Bioengineering, IISc — mkjolly@iisc.ac.in