

Shaurya Goyal

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Education

Indian Institute of Technology (IIT), Kharagpur **2020 - 2025**
BS-MS in Economics Minors : Math, Biology, Artificial Intelligence CGPA: 8.89

Grade 12 (HSC): 92% **Grade 10 (ICSE):** 95%

Awards and Scholarships

Summer Research Award, Next Gen Scientists Foundation 2022
International Research Fellowship, IIT Kharagpur Foundation 2022
Selected for the graduate-level inStem workshop on Stem Cell research [funded by Govt. of India] 2022
Selected for the ICTP-ICTS graduate-level Winter School in Quantitative Systems Biology 2021
Shortlisted for Chandralekha Singh and Jeremy Levy Student Excellence Award [declined for MCM] 2021
Top 5% grade across batch of 1800 students in the institute at the end of 1st year 2021
Merit-Cum-Means (MCM) Scholarship, IIT Kharagpur [full tuition + stipend] 2020-Ongoing
Top 1% in JEE Advanced from 150,000 selected students across India 2020
Top 0.4% in JEE Mains from over 1 million students across India 2020
Selected as Times Scholar from 300,000+ students and felicitated by Vice-President of India 2019

Preprints

Subbalakshmi, A.R.*, Sahoo, S.*, Manjunatha, P., **Goyal, S.**, . . . , Somarelli, J.[#] and Jolly, M.K.[#], 2022.
The ELF3 transcription factor is associated with an epithelial phenotype and represses
epithelial-mesenchymal transition. bioRxiv. doi: <https://doi.org/10.1101/2022.08.19.504435>

Research Experience

Neuro Inspired Reinforcement Learning **February – September 2022**

Brown University — Prof Michael J Frank

- Developed an actor-critic deep reinforcement learning model motivated by striatum dopamine circuits
- Created a base deep learning architecture using CNNs and RNNs and implemented the model and A2C
- Compared performance with A2C on Atari games sparse rewards and varying reward statistics

White-Grey-Opaque Plasticity in Candida Albicans **June 2022 – Ongoing**

Indian Institute of Science (IISc), Bangalore — Prof Mohit Kumar Jolly

- Constructed gene network controlling white-grey-opaque plasticity in Candida Albicans using literature
- Using non-linear differential equations and machine learning to identify critical links controlling grey state
- Analyzing switching dynamics and multistability using bifurcations and stochastic simulations

Epithelial-Mesenchymal (EMT) Plasticity in Cancer **November 2021 – June 2022**

Indian Institute of Science (IISc), Bangalore — Prof Mohit Kumar Jolly

- Examined the effect of ELF3 gene on EMT and compared the MET capacity with KLF4 and GRHL2
- Investigated the clinical outcome of ELF3 expression in ER+ breast cancer and tamoxifen resistance
- Found increased PD-L1 induced immune evasion that was driven by increasing ELF3 levels
- Used Gaussian Mixture Modelling, K-Means Clustering, UMAP, PCA, Regression and bulk & single cell RNA analysis methods like MAGIC algorithm, AUCell, Gene Set Enrichment etc

Phylogenetic Analysis of Eukaryote Evolution **April 2021 – May 2022**

IIT Kharagpur — Prof Riddhiman Dhar

- Conducted a phylogenetic analysis of proteomes to test the inside-out and outside-in cell evolution models
- Developed a pipeline for multiple sequence alignments and phylogentic trees generation
- Used information criterion and bootstrapping for selecting best fit

Graph Fourier Transform

July – October 2021

IIT Kharagpur — Prof Sanand Athalye

- Implemented an empirically faster version of the parallel approximate graph fourier transform
- Compared running time of single and parallel approximate graph fourier transform for small graph networks
- Theoretically analysed a faster exact graph fourier transform by Haar unit and Givens rotation factoring of graph laplacian eigenspace and reconstructing the graph network

Skills

Programming: Python, R, MATLAB, C/C++, Linux (Bash), HPC (SLURM), PyTorch

Wet Lab: Cell Culturing, RNA Isolation, RT-PCR, Immunocytochemistry, Gel Electrophoresis

Relevant Coursework

Neuro: Computational Neuroscience¹, Computational Cognitive Neuroscience², General Psychology

CS: Machine Learning², Artificial Intelligence¹, Deep Learning², Signals and Systems², Algorithms^{1 2}

Math: Probability, Statistics, Non-Linear Dynamics², Numerical Analysis, Linear Algebra, Advanced Calculus, Ordinary/Partial Differential Equations, Complex Analysis, Discrete Maths²

Bio: Systems Biology¹, Computational Biology², Molecular and Cell Biology, Genetics², Cancer¹

Other: Econometrics 1 & 2, Data Analysis Lab, Linear Programming, Modern Robotics³

Selected Projects

1 PhD level course, 2 Online from Stanford, MITOCW etc, 3 Coursera

Simulation & Classification of Theta-Gamma Oscillations

May – June 2022

- Simulated LFP signals with multiple slow and fast components corresponding to theta-gamma frequencies
- Identified distinct phase - frequency coupled states using clustering and neural signal processing

Computational Neuroscience Mini-Projects

Jan - March 2022

- Analyzed epilepsy - normal EEG data, Analyzed tuning curve of visual neurons, Estimated auditory receptive field, Perceptron classification, Dimensionality reduction and decoding activity, Simulated a LIF neuron

Reinforcement Learning to Play Pong

October 2021

- Built a reinforcement learning agent that uses deep Q-learning and learns from pixel data to play Pong

Workshops / Conferences Attended

Neuromatch Conference 5.0 2022

Alzheimer's Disease (Biology, Pathology & Clinical Treatments) - IIT Kharagpur 2022

Computational Neuroscience - Neuromatch Academy 2022

Essential Stem Cell Lab Techniques - inStem and NCBS, Bangalore, India 2022

Sensorimotor Control - ICTP & ICTS 2021

Neuromatch Conference 4.0 2021

High Performance Computing and AI for Biology - IIT Kharagpur 2021

Volunteer Work

Academic Mentor

January 2022 – Ongoing

UG Council, IIT Kharagpur

- Mentoring 6 students in their 1st year (now 2nd) to ensure they have a smooth integration to university life and assisting with academic and non-academic matters

English Mentor

January – July 2022

Student Welfare Group, IIT Kharagpur

- Guided 4 students who struggled with English to learn and get better by providing feedback and solving doubts based on weekly exercises

Teacher(Independent)

October 2019 – December 2020

- Taught 2 under privileged kids in my locality of grade 5 (to grade 6) math, science and english.
- Led to improved understanding and skill and their grade also improved by nearly 20 percent.

Leadership / Extracurricular

- Active member of Biotechnology Reading Group, IIT Kharagpur
- Represented institute at various national level debate tournaments as a member of the Debating Society, IIT Kharagpur
- Represented institute in the Inter-IIT Scrabble Tournament
- Selected as Times Scholar (2019) by Times of India Group from 300,000+ students across India
- Silver Medal in National Taekwondo Championship (2017) and 1st Dan Black Belt

Other Interests: Guitar, Piano, Trekking, Cooking, Running, Star Wars, Making memes