Shaurya Goyal

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Education

École Normale Supérieure – PSL, Paris **Incoming 2024**
MS in Cognitive Science, Diploma ENS

IST Austria **2023 - 2024**
Gap Year Internship Coursework in Neuroscience and Computer Science

Indian Institute of Technology (IIT), Kharagpur **2020 - 2023**
BS-MS in Economics Minor : Math and CS Micro: Artificial Intelligence CGPA: 8.3
Transferred to ENS

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

Awards and Scholarships

ENS International Selection Scholarship	2024
Erasmus+ Training Mobility Grant	2024
COSYNE Undergraduate Travel Award	2024
ISTern, IST Austria Summer Program and Oead Scholarship	2023
MITACS Globalink Summer Internship [Declined]	2023
Summer Research Award, Next Gen Scientists Foundation	2022
International Research Fellowship, IIT Kharagpur Foundation	2022
Selected for PhD-level inStem workshop on Stem Cells and funded by Govt. of India	2022
Selected for PhD-level ICTP-ICTS Winter School in Sensorimotor Control	2021
IIT Kharagpur Student Excellence Award [declined for MCM]	2021
Merit-Cum-Means (MCM) Scholarship, IIT Kharagpur [full tuition + stipend]	2020-2023
Top 1% in JEE Advanced from 150,000 selected students across India	2020
Top 0.8% 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

Publication

A. Cumpelik, **S.Goyal**, J. L. Csicsvari; IST Austria, Klosterneuburg, Austria. The role of prefrontal spatial coding in supporting a contextual association task. Program No. PSTR436.01. 2023 Neuroscience Meeting Planner. Washington, D.C.: Society for Neuroscience, 2023. Online.

Subbalakshmi, A.R., Sahoo, S., Manjunatha, P., **Goyal, S.**, et al. The ELF3 transcription factor is associated with an epithelial phenotype and represses epithelial-mesenchymal transition. J Biol Eng 17, 17 (2023). https://doi.org/10.1186/s13036-023-00333-z

Research Experience

Role of mPFC Spatial Coding in Context Association **October 2023 – Ongoing**
IST Austria — Prof Jozsef Csicsvari In-Person

- Analyzing mPFC and CA1 neural data using single cell, population and LFP methods
- Developing behavioral classifications for learning stages using modelling and error type analysis
- Analyzing representation geometry and trajectories using state space and dimensionality reduction methods

Cell-type Specific Replay and Remapping **October 2022 – Ongoing**
University College London — Prof Dan Bendor In-Person/Remote

- Developed a novel bayesian decoding model to track spatial representations in sharp-wave ripples
- Analyzing rat CA1 data during wake and sleep to study memory stabilization in novel environments
- Spike sorting and clustering using Kilosort, KlustaKwik and Phy

Reactivation of Goal Locations **May – August 2023**
IST Austria — Prof Jozsef Csicsvari In-Person

- Analyzed how CA1 reactivation events code for context dependent goals using bayesian methods

Neuro Inspired Reinforcement Learning **February – September 2022**
Brown University — Prof Michael J Frank Remote

- 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 – October 2022**
Indian Institute of Science (IISc), Bangalore — Prof Mohit Kumar Jolly Remote

- Constructed gene network controlling white-grey-opaque plasticity in Candida Albicans using literature
- Used non-linear differential equations and machine learning to identify critical links controlling grey state
- Analzyed 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 Remote

- 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 Remote

- Conducted a phylogenetic analysis of proteomes to test the inside-out and outside-in cell evolution models
- Developed the analysis pipeline and used information criterion and bootstrapping for selecting best fit

Skills

Programming: Python, MATLAB, Linux (Bash), HPC (SLURM), PyTorch, C/C++
Biology (Beginner): Cell Culturing, RT-PCR, Immunocytochemistry, Gel Electrophoresis

Relevant Coursework

Brain: Neural Computation[2], Computational Cognitive Neuroscience[2], Introductory Psychology, Introductory Neuroscience[1], Schizophrenia[3], Human Behavioral Biology[3]
CS: Machine Learning[1], Algorithms 1[2], Methods of Data Analysis[1], Artificial Intelligence[1], Deep Learning[2]
Math: Non-Linear Dynamics[2], Probability, Statistics, Linear Algebra, Numerical Analysis
Bio: Systems Biology[1], Molecular and Cell Biology, Cancer Biology[1]
Other: Econometrics 1 & 2, Experimental Economics, Linear Programming, Power and Politics[3]

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

Selected Projects

Simulation & Classification of Theta-Gamma Oscillations **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 **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

Impact of Environment on Food Production in India **2022**

- Used time series econometrics to investigate the combined effect of environmental factors on Indian agriculture

Do bike lanes increase bike commuter rates ? **2022**

- Used two-stage multivariate regression and error testing to investigate the causal impact of bike lanes

Reinforcement Learning to Play Pong **2021**

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

Workshops / Conferences Attended

COSYNE Main Meeting and Workshops	2024
Vienna Biocenter PhD Symposium	2023
Young Scientist's Symposium - IST Austria	2023
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, IIT Kharagpur **2022 – 2023**

- Mentored 6 students (2022) and 3 students (2023) in their 1st year to ensure they have a smooth integration to university life and assisting with academic and non-academic matters

English Mentor, IIT Kharagpur **2022**

- Guided 4 students who struggled with English to learn and get better by providing feedback and solving doubts based on weekly exercises for 1 semester

Teacher(Independent) **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

- Co-Founder of Biotechnology Reading Group and iGEM Team, IIT Kharagpur
- National level debate tournaments as a member of the Debating Society, IIT Kharagpur
- Represented institute in the Inter-IIT Scrabble Tournament
- Silver Medal in National Taekwondo Championship (2017) and 1st Dan Black Belt

Other Interests: Guitar, Hiking, Cooking, Running, Frisbee, Volleyball, Biking, Board Games, Bouldering