Ishaan Rawal

Bachelor of Computer Science and Master of Biological Science (Dual Degree)
Birla Institute of Technology and Science (BITS), Pilani
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Education

B.E. Computer Science and M.Sc. Biological Science **BITS Pilani, India**
- *Intergrated Dual Degree Program*
  Current CGPA: 8.84/10 *Aug 2017–May 2022*

Maharashtra Higher Secondary Certificate Examination **Hislop College, Nagpur, India**
- *Top 1 percentile*
  Secured 90.77% (590/650) *2015–2017*

Technical Skills

- **Programming Languages:** C, Python, Java, MATLAB, Verilog, LaTeX
- **Libraries and Software Skills:** Docker, Kubernetes, TensorFlow, MS SQL, scikit-learn, NumPy, Matplotlib, pandas, PyMOL, AutoDock Vina
- **Laboratory Skills :** PCR, SDS-PAGE, Gel Electrophoresis, Flow Cytometry, Field Emission Scanning Electron Microscopy, ELISA, Chromatography, Spectroscopy.

Work Experience

Guest Scientist **Dec 2020–Present**
Goethe University (Frankfurt) and FU Berlin (Berlin) *Germany*
- Working with Dr Gemma Roig and Dr Radoslaw Martin Cichy to decode and reconstruct features of natural videos from brain MRI signals using Deep Learning techniques.
- This project will contribute to the master thesis

Remote Research Intern **May–Jul 2020**
Laboratory for Orthopedic Biomechanics, ETH Zürich *Zürich, Switzerland (Remote)*
- Constructed a Deep Learning model for segmenting intervertebral discs from MRI scans of the spinal cord
- Implemented and compared architectural variants of **U-Net** (viz. vanilla, skip connections, inception)
- Achieved a dice score of **94.1%**, which is comparable to the state of the art literature.

Development and Operations Intern **May–Jul 2019**
Infinity Labs, UST Global *Trivandrum, Kerala, India*
- Built a proof of concept development environment for the developers, with no premise software installation.
- Deployed a containerized model of JupyterHub on the local system using **Docker** and **Kubernetes**.
- Studied and proposed the architecture for scaling up the model for cloud deployment.

Summer School

Neuromatch Academy, Neuromatch Jul 2020
- Participated in the virtual computational neuroscience summer school for over 95 hours.
- Developed theoretical reasoning with hands-on coding in core concepts like Bayesian Systems, Machine Learning, Network Causality and Dynamic Systems.
- Presented a poster on 'Deriving patterns between the spatial location of the neuron and its firing rates from **neuropixel recordings** for decision making task.'

Scholarships

- Received young investigator scholarship for attending and presenting poster at the COVID-19 Dynamics and Evolution Virtual Conference, organised by UCSD CME
- Recipient of INSPIRE- Scholarship of Higher Education (**INSPIRE-SHE**), Department of Science and Technology, Govt of India, for meritorious performance and pursuing research in life sciences.

Projects

- **Computational modelling of gene regulatory networks in diseased conditions and drug intervention using formal methods**
  Guide: Dr. Rajesh Kumar, Computer Science Dept., BITS Pilani Aug 2020–Present
  - Implementing a stochastic boolean model of gene regulatory network using context-sensitive Probabilistic Boolean Networks (**cs-PBN**) to identify stable attractor cycles
  - Modelling drug interventions in the network to conduct **network stability analysis** and to analyze the rescue from unfavourable attractor cycles
- **Optimizing structure of novel aggregation induced emission (AIE) active heavy metal complexes for cancer biomarker detection using molecular docking**
  Guide: Dr. Shibasish Chowdhury, Biological Science Dept., BITS Pilani Aug–Dec 2020
  - Identified a set of candidate **cancer biomarkers** with unique and compatible hydrophobic pockets
  - Conducting molecular **docking** studies to find the docking sites and hence to predict ligand aggregation
  - Working closely with the wet lab group involved in compound synthesis and hypothesis testing
- **Analysis of long-distance linked selection in Indian variants of SARS-CoV-2**
  Guide: Dr. Arun Sethuraman, Biological Science Dept., CSU San Marcos Jun–Sept 2020
  - Analyzed over **1200** sequences of SARS-CoV-2 genomic sequences from India amidst the pandemic
  - Identified **14** significant non-synonymous mutations and conducted homology modelling-based analysis
  - Re-purposed **apriori algorithm** to describe and understand the mechanism of long-distance association
- **Study and literature review of Computational Neuroscience**
  Guide: Dr. Shibasish Chowdhury, Biological Science Dept., BITS Pilani Aug–Dec 2018
  - Conducted an **interdisciplinary** study of the brain at different levels of abstraction.
  - Developed understanding of computational and mathematical models of **biophysics** and **plasticity**
  - Studied the theoretical framework for analysis and simulation of neural data
- **In silico study of mouse podocytes for understanding the epigenetics of renal dysfunction**
  Guide: Dr. Syamantak Majumder, Biological Science Dept., BITS Pilani Aug–Nov 2018
  - Studied the epigenetics of renal failure in mouse podocyte cells induced by DZNep- a HMT inhibitor
  - Analyzed **ChIP-Seq** and **microarray** data of podocytes exposed to varying concentrations of DZNep to find upregulated genes
  - Confirmed the role of epigenetic landscape modelling, specifically due to **H3K27me3** modification, in renal dysfunction with similar reportings in the literature

Presentations, Proceedings and Papers

- **Rawal, I.**,Sethuraman, A., Assessing linked selection and long-distance association of functional mutations in SARS-CoV-2 variants in India. Poster presented at COVID-19 Dynamics and Evolution Virtual Conference, organised by UCSD CME; 2020 Sep 19-20

Relevant Courses

- **Computer Science:** Calculus, Linear Algebra, Probability and Statistics, Discrete Mathematics, Data Structures and Algorithms, Object Oriented Programming, Data Mining, Fuzzy Logic
- **Biology:** Bioinformatics, Biophysics, Genetics, Recombinant DNA Tech, Animal Physiology
- **MOOCs:** Machine Learning, Neural Networks and Deep Learning, Improving Deep Neural Networks: Hyper-parameter Tuning, Regularization and Optimization, Structuring ML Projects