# Ishaan Singh Rawal

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https://israwal.github.io/


## Education

- **Birla Institute of Technology and Science** — Pilani, India
  *Integrated B.Engg. Computer Science and M.Sc. Biological Science; GPA: 8.84/10* — *Aug. 2017 – May. 2022*
- **Hislop Junior College** — Nagpur, India
  *Class XII, (Electronics); Percentage: 90.44% (top 1 percentile)* — *Jun. 2015 – May 2017*

## Programming Skills

- **Languages**: C, Python, Java, MATLAB, Verilog, LaTeX
- **Libraries and Software Skills**: PyTorch, Keras, MS SQL, scikit-learn, NumPy, Matplotlib, pandas

## Publications

- **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

## Work Experience

- **Neural Dynamics of Visual Cognition Group, Freie University Berlin** — Berlin, Germany
  *Guest Scientist* — *Dec. 2020 – Present*
  - Working with Prof. Radoslaw Martin Cichy and Prof. Gemma Roig (CVAI Lab, Goethe University) on **inverse reconstruction** of natural videos from fMRI signals using deep learning.
  - Using deep neural network activations as a proxy to map the fMRI features to the video space to decode, understand and compare the hierarchical representation of features in the brain and neural network.
- **Advanced Data Analytics and Parallel Technologies Lab, BITS Pilani** — Pilani, India
  *Research Assistant* — *Jan. 2021 – Present*
  - Working under the guidance of Prof. Poonam Goyal to build a distributed and parallelizable **graph compaction** module for de-novo genome sequencer using greedy-like approach.
  - Developing an efficient solution for the problem, modelled as a partial **string reconstruction** (NP-Hard) problem, by designing unitigs and other statistically relevant features for the merge phase.
- **Laboratory for Orthopaedic Biomechanics, ETH Zürich** — Zürich, Switzerland
  *Remote Project Assistant* — *May 2020 - Jul 2020*
  - Constructed a Deep Learning model for segmenting intervertebral discs from MRI scans of the spinal cord.
  - Implemented and compared the architectural variants of **U-Net** (viz. vanilla, skip connections, inception) on the basis of IoU and accuracy scores.
  - Achieved the state of the art dice score of **94.1%** using skip connections and inception modules in the architecture and a weighted combination of MSE and dice loss for optimization. The work has been submitted to Journal of Orthopaedic Research in April 2021

## Projects

- **Computational modelling of gene regulatory networks using formal methods**
  *Supervisor: Prof. Rajesh Kumar, BITS Pilani* — *Aug 2020 - Dec 2020*
  - Implemented a Boolean model of stochastic gene regulatory network using context-sensitive Probabilistic Boolean Networks (**cs-PBN**) to identify stable attractor cycles on ASSA-PBN.
  - Proved Stochasticity in Nodes and Stochasticity in Function models as special cases of cs-PBN.

- **Optimizing structure of novel heavy metal complexes for cancer detection**
  *Supervisor: Prof. Shibasish Chowdhury, BITS Pilani* *Aug 2020 - Dec 2020*
  - Identified a set of candidate cancer biomarkers with unique hydrophobic pockets compatible with the in-house developed novel aggregation induced emission complexes
  - Conducted **molecular docking** studies to find the docking sites and hence to predict ligand aggregation which drove the experimental framework for the future course of the project
- **Analysis of long-distance linked selection in Indian variants of SARS-CoV-2**
  *Supervisor: Prof. Arun Sethuraman, Sethuraman Lab, CSU San Marcos* *Jun 2020 - Sept 2020*
  - Analyzed over 1,200 sequences of SARS-CoV-2 sequences from India amidst the COVID-19 pandemic.
  - Mined and identified 14 significant non-synonymous mutations and conducted homology modelling-based analysis to understand their downstream effects.
  - Re-purposed **apriori algorithm** to understand the long-distance association of mutations in SARS-CoV-2.

## Awards and Scholarships

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

## Extra Curricular

- **Students' Academic Cell, BITS Pilani**
  *Senior Member* *Aug 2018 – Present*
  - Impacted over 500 students via mentorship and open house sessions, under the guidance of the Director, BITS Pilani to enhance the research and the academic environment.
  - Conducted placement talks and gyaan sessions to expose the students to various available opportunities.
- **BITS Embryo**
  *Secretary* *Aug 2017 – May 2020*
  - Worked to augment the academic culture by extending the bounds beyond textbooks and classrooms.
  - Organized over 30 live and virtual talks on topics ranging from journalism to science and technology
  - Organized technical competitions in collaboration with industrial partners like GE Healthcare, Zulip receiving a participation of 50+ teams per year.
- **National Service Scheme, BITS Pilani**
  *Core Team Member, Project Umang* *Aug 2017 – May 2019*
  - Worked to improve the reach and quality of education for underprivileged kids of Pilani village.
  - Raised INR 1.7 million for scholarships of needy students through week-long crowdfunding campaigns.
  - Conducted counselling and academic guidance sessions for 200+ poor students.