Pranav Rai

Contact Information

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Education

Indian Institute of Technology Kanpur

- Master of Science (by Research), Cognitive Science — *July 2019 - July 2021*
  CPI - 10/10 (Rank 1)
- Bachelor of Technology, Aerospace Engineering — *July 2012 - July 2016*

Professional Experience

Scientific Programmer, Blue Brain Project, EPFL — *April 2022 - Present*

Developed tools to build, analyze and validate computational models of various brain regions of multiple species in collaboration with neuroscientists and high-performance computing engineers.

- **Model building** - Contributed significantly to all phases of the pipeline for constructing brain circuit models for various regions, including cortex, hippocampus, and cerebellum. Developed and successfully implemented custom algorithms tailored to specific brain subregions for precise neuron placement within voxelized spaces, ensuring accurate structural and functional connectivity. Efficiently managed **voxel-based** and **HDF5** file formats through parallelized computing to enhance data processing performance for **multi-terabyte** file sizes.
- **Analysis** - Designed and implemented a Python-based pipeline to extract key properties from an existing hippocampus circuit model. Used scientific libraries like Pandas, NumPy, SQLAlchemy to implement the computational logic. Leveraged **SLURM**-based cluster computing to parallelize computations across different subregions, ensuring faster calculations.
- **Validations** - Conceptualized and executed robust statistical tests to validate the circuit model. Conducted virtual experiments on the circuit model to test if the model matches results for over 20 experimental studies, culminating in my contributions to a publication - **Community-based Reconstruction and Simulation of a Full-scale Model of Region CA1 of Rat Hippocampus**
- **Neural activity viewer** - Developed as part of hackathon a modern time series viewer for a binary HDF5 based file format in neuroscience. We built a fast and responsive UI tool using **Rust**. The tool can be accessed at **nwbview**

Consultant, EXL Analytics , Gurgaon — *September 2016 - July 2019*

Worked as a Data Science Consultant for a Fortune 100 Financial Company and a Media Network.

- **ROI Model Development** - Developed a Machine Learning framework using GBM to calculate predicted default rates for various credit card offerings, providing a basis for ROI analysis and helping the marketing team select optimal card offers.
- **Sales Incentive Optimization** - Revamped the Sales Incentive framework by developing a VBA program and integrating anomaly detection using Time Series analysis to prevent malpractice, saving the client $1M$.

Scholastic Achievements

- Ranked 1st across the department in the postgraduate program.
- Secured All India Rank 1 in COGJET 2019 (Entrance test for Cognitive Science Admission Programs)

Skills

- **Programming Languages:** Python, Rust, Shell scripting, C, C++ , R, HTML, MATLAB, SAS, LaTeX, SQL, Excel VBA
- **Libraries:** HDF5, MPI, snakemake, luigi, pyspark, joblib, pymc3, pytorch, numpy, scipy, pandas, SQLAlchemy, matplotlib, seaborn, scikit-learn