Raj V Jain

✉ rajv@iisc.ac.in | ⬤ jainraj | 👤 jainraj.github.io | 𝕜 rajjain | ▶ therajvjainteaching
📑 TheRajVJain | 🐦 TheRajVJain | 💼 TheRajVJain

EDUCATION

🎓 **Indian Institute of Science, Bangalore**   *Feb 2021 - Present*
(Pursuing) PhD @ Cognition Lab in CSA Dept.   CGPA: 9.48/10
    PMRF Scholar since Jan 2022

🎓 **R V College of Engineering, Bangalore**   *Aug 2012 - May 2016*
Bachelor of Engineering in Computer Science and Engineering   CGPA: 9.55/10 (5th Rank)

RESEARCH INTERESTS

My research interests lie primarily at the intersection of neuroscience and AI, in two ways. One is to build AI models which can deepen our **understanding of cognitive processes** like decision-making, attention. The other is to use neuroscience to **build more robust, efficient, explainable and realistic AI models**.

IISc PhD Course Work

📖 **E0 226 - Linear Algebra & Probability**   *10/10*
Dr. Gugan Thoppe   4 Cr
📖 **E0 270 - Machine Learning**   *09/10*
Dr. Ambedkar Dukkipatti   4 Cr
📖 **E9 333 - Advanced Deep Representation Learning**   *Ongoing*
Dr. Prathosh A P   4 Cr
📖 **NS 201 - Systems Neuroscience**   *10/10*
Dr. Supratim Ray, Dr. S. P. Arun, Dr. Aditya Murthy   2 Cr
📖 **NS 203 - Cognitive Neuroscience**   *10/10*
Dr. Sridharan Devarajan, Dr. Srikanth Padmala   2 Cr
📖 **DS 294 - Data Analysis & Visualization**   *10/10*
Dr. Phaneendra Yalavarthy   3 Cr
📖 **E1 277 - Reinforcement Learning**   *10/10*
Dr. Shalabh Bhatnagar, Dr. Gugan Thoppe   4 Cr
📖 **E0 238 - Intelligent Agents**   *08/10*
Dr. Susheela Devi   4 Cr
📖 **E0 230 - Computational Methods of Optimization**   *Audit*
Dr. Chiranjib Bhattacharya   4 Cr
📖 **EC 201 - Theoretical and Mathematical Ecology**   *Audit*
Dr. Vishwesha Guttal   3 Cr

TEACHING EXPERIENCE

👤 **NPTEL TA - Introduction to Machine Learning (CS73)**: Conducted one-hour live sessions every Sat for 12 weeks for doubt clarification or new concepts from Jul - Oct 2022 ▶

👤 **ISSS - Vector Space Linear Algebra**: Taught two-hour lectures on Linear Algebra using Vector Spaces in a self-designed complete course from Sep - Oct 2022 ▶

👤 **UE101 - IISc**: Assisted Prof. Viraj in computer lab and evaluations of algorithms & programming course for IISc Bachelor's students

👤 **AFN**: Taught Mathematics in local language (Kannada) to rural high school students around Bangalore through Aapatsahaya Foundation (AFN) charitable trust.

ACADEMIC PROJECTS @ IISc

1. **Self-Supervised Learning** - MoCo on CIFAR-10 dataset ⬤
2. **Domain Adaptation** - ADDA and Cycle WGAN for Unsupervised Domain Adaptation ⬤
3. **Energy Based Models** - Contrastive Divergence loss for EBM for generating Bitmoji ⬤
4. **Generative Adversarial Networks** - Cycle GAN with Wasserstein loss for CELEBA - Bitmoji & SVHN - MNIST ⬤
5. **Variational Auto-Encoders** - VAEs to generate dSprites and CelebA images ⬤

6. **Natural Language Inference on SNLI Dataset** - Predicted the inference between two sentences using RNNs 🎧
7. **Implementing CISR framework** - Extended CISR framework proposed by Turchetta et al. 2020 for new environments 🎧
8. **Predict MBTI Personality** - Predicted MBTI personality of a person based on the text written on a chat platform ⬤ ⬤ ⬤
9. **Visualise GitHub Messages** - Different ways to visualise (text) commit messages of famous repositories of GitHub ⬤

Research Projects

Modelling Sequential Effects in Behavior *Feb 2021 - Present*
IISc, Bangalore

1. Investigating whether LSTMs can model sequential effects in behavior better than statistical models
2. Investigating whether embedding layers can capture subject and experiment specific aspects
3. Investigating whether adding neural signals help in prediction

Concurrent Multi-Output Visio-Auditory BCI *Jan 2016 - May 2016*
Axxonet, Bangalore

1. Combining Steady State Visually Evoked Potential (SSVEP) and Steady State Auditory Evoked Potential (SSAEP) Brain Computer Interface (BCI) paradigms for efficient communication by paralysed people
2. Implemented neuroscience related feature extraction techniques and ML algorithms in MATLAB on data obtained from subjects and compared accuracies of different combinations

Hackathons

AOMIC Dataset Exploration @ [NeuroHackademy 2022](#)

Exploring how MRI & anatomical data could predict audio features with [Amsterdam Open MRI Collection (AOMIC)](#) dataset using nibabel and sklearn. Networking with people interested in the intersection of neuroscience and AI. Informative lectures regarding issues plaguing these fields. 🎧

Publications

HMM Classifier Object Recognizing System in Brain–Computer Interface *2021*
Evolution in Computational Intelligence [Link to Paper](#)

Analysed efficiency of modelling the CMOVA BCI paradigm as a Hidden Markov Model

Implementing and analysing different Machine Learning Algorithms using EEG based BCI *May 2017*
International Journal of Applied Engineering Research (IJAER) [Link to Paper](#)

Introduced a new Brain Computer Interface paradigm named Concurrent Multi-Output Visio-Auditory BCI (CMOVA BCI) Analysed different machine learning algorithms viz., Naive Bayes, SVM, KNN, Random Forest, HMM for improving accuracy in the CMOVA BCI paradigm

Implementing and analysing different Feature Extraction Techniques using EEG based BCI *Jun 2017*
5th International Conference on Advanced Computing, Networking and Informatics (ICACNI 2017) [Link to Paper](#)

Analysed different feature extraction techniques viz., Spectral F-Test, Canonical Correlation Analysis, FFT and Continuous Wavelet Transform for improving accuracy in the CMOVA BCI paradigm

Industry Experience

Amazon.com, Inc. *Aug 2018 - Feb 2021*
SDE I, Amazon Pay | Bangalore

1. **Amazon Pay Movies**: Designed and built movies discovery system through which movies, and their details are surfaced using ElasticSearch, Spring framework, ReactJS and React Native; monitoring using ELK.

Tapzo *Jun 2016 - Aug 2018*
Data Scientist | Bangalore

1. **Notification Recommendation Engine**: Built a notification category predictor for ∼5 million users based on past interactions with the app, current weather, user's location, current sports schedule etc.
2. **News Clustering**: Real-time clustering for detecting upcoming news stories from articles based on TF-IDF similarity between the titles of the news articles.
3. **Food Recommendation Engine**: Built a food recommendation engine based on user's current cart items using Universal Recommender, an open-source ML framework using Cross Co-occurence (CCO) algorithm with Log Likelihood Ratio (LLR) as the measure for correlation.

Technical Strengths

- Proficient in pandas, numpy, scikit-learn, PyTorch (with GPU/TPU), Keras (with GPU/TPU), NLTK, Plotly, Matplotlib, Jupyter, Excel and SQL
- Strong knowledge of Java Spring, Scala, HTML, CSS, JS, ReactJS & React Native
- Strong experience with Django + Celery + MySQL (RDS) + ElasticSearch + Redis (AWS ElastiCache) + RabbitMQ (AWS SQS) + Gunicorn + Supervisor (Circus) + Elastic-Logstash-Kibana as dev stack
- Building ML models, deploying to production and monitoring