

# Raj V Jain

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## EDUCATION

### 🎓 Indian Institute of Science, Bangalore

PhD Candidate, Cognition Lab, CSA Dept.

Recipient of Prime Minister's Research Fellows (PMRF) scholarship since Jan 2022

Feb 2021 - Present

CGPA: 9.56/10 (30 credits)

### 🎓 R V College of Engineering, Bangalore

Bachelor of Engineering in Computer Science and Engineering

Aug 2012 - May 2016

CGPA: 9.55/10 (5<sup>th</sup> 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**.

## CONFERENCE PRESENTATIONS

### The posterior parietal cortex mediates serial dependence during visuospatial attention

22nd annual Computational and Systems Neuroscience (COSYNE) conference

Irrelevant historical sensory evidences and choices could be biasing the human PPC in visuospatial attention

Recipient of **COSYNE 2025 Travel Grant**

27 Mar - 1 Apr 2025

Montreal, Canada

### A Causal Role for the Posterior Parietal Cortex in Mediating Serial Dependence during Visuospatial Attention

7th annual conference on Cognitive Computational Neuroscience (CCN)

tACS stimulation over human PPC reduced serial dependence [Abstract](#)

6-9 Aug 2024

MIT, Boston

### Discovering Serial Dependence with Sequence-Aware Neural Networks

10th Annual Conference on Cognitive Science (ACCS)

Building sequence-aware neural networks to detect serial dependence in an experiment-agnostic manner [Abstract](#)

9-11 Dec 2023

IIT Kanpur

## PHD RESEARCH QUESTIONS

1. Can deep recurrent neural networks better **model sequential behavioral effects** such as serial dependence?
2. What can we **infer about the brain** from these models?
3. How can neural networks help us understand the **causal role of brain regions**?
4. How can we deal with **limited experimental data**?
5. How can we improve off-the-shelf latent variable models to **better explain non-invasive neural signals**?

## TEACHING EXPERIENCE

📖 **Neuroscience for undergraduates:** PMRF fellows @ CNS, IISc give an overview of exciting field of neuroscience to undergraduate students on topics ranging from molecular to vision neuroscience to AI: MRIIRS in Sep 2024, Amrita university in Apr 2024, BMSCE and RVCE in Feb 2024, MRIIRS in Aug 2023.

📖 **Self-designed lectures:** slow-paced from basics; recorded

(a) **Generative Modeling:** Two-hour lectures on Generative Modeling: VAEs, GANs, Diffusion Models (May - Aug 2023) [▶](#)

(b) **Vector Space Linear Algebra:** Two-hour lectures on Linear Algebra using Vector Spaces (Sep - Oct 2022) [▶](#)

📖 **TA - NPTEL:** Online live query resolution sessions; recorded

(a) Introduction to Machine Learning (CS87): 09 weeks in Jul - Sep 2023 [▶](#)

(b) Introduction to Machine Learning (CS73): 12 weeks in Jul - Oct 2022 [▶](#)

📖 **TA - IISc:** Computer lab and evaluations of algorithms & programming course for IISc Bachelor course (UE101; Prof. Viraj)

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

## IISc PHD COURSE WORK

### 📖 E0 226 - Linear Algebra & Probability

Dr. Gugan Thoppe

10/10

4 Cr

<b>E0 270 - Machine Learning</b> Dr. Ambedkar Dukkipatti	09/10 4 Cr
<b>E9 333 - Advanced Deep Representation Learning</b> Dr. Prathosh A P	10/10 4 Cr
<b>MG 220 - Introductory Statistics</b> Dr. Chiranjit Mukhopadhyay	10/10 3 Cr
<b>E1 255 - Introduction to Causality Models</b> Dr. P.S. Sastry	Audit 3 Cr
<b>NS 201 - Systems Neuroscience</b> Dr. Supratim Ray, Dr. S. P. Arun, Dr. Aditya Murthy	10/10 2 Cr
<b>NS 203 - Cognitive Neuroscience</b> Dr. Sridharan Devarajan, Dr. Srikanth Padmala	10/10 2 Cr
<b>DS 294 - Data Analysis &amp; Visualization</b> Dr. Phaneendra Yalavarthy	10/10 3 Cr
<b>E1 277 - Reinforcement Learning</b> Dr. Shalabh Bhatnagar, Dr. Gagan Thoppe	10/10 4 Cr
<b>E0 238 - Intelligent Agents</b> Dr. Susheela Devi	08/10 4 Cr
<b>E0 230 - Computational Methods of Optimization</b> Dr. Chiranjib Bhattacharya	Audit 4 Cr
<b>EC 201 - Theoretical and Mathematical Ecology</b> Dr. Vishwesh Guttal	Audit 3 Cr

## ACADEMIC PROJECTS @ IISc

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1. **Variational LSTM Implementation** - Based on Gal & Ghahramani's "A Theoretically Grounded Application of Dropout in Recurrent Neural Networks" paper [🔗](#)
2. **Self-Supervised Learning** - MoCo on CIFAR-10 dataset [🔗](#)
3. **Domain Adaptation** - ADDA and Cycle WGAN for Unsupervised Domain Adaptation [🔗](#)
4. **Energy Based Models** - Contrastive Divergence loss for EBM for generating Bitmoji [🔗](#)
5. **Generative Adversarial Networks** - Cycle GAN with Wasserstein loss for CELEBA - Bitmoji & SVHN - MNIST [🔗](#)
6. **Variational Auto-Encoders** - VAEs to generate dSprites and CelebA images [🔗](#)
7. **Natural Language Inference on SNLI Dataset** - Predicted the inference between two sentences using RNNs [🔗](#)
8. **Implementing CISR framework** - Extended CISR framework proposed by Turchetta et al. 2020 for new environments [🔗](#)
9. **Predict MBTI Personality** - Predicted MBTI personality of a person based on the text written on a chat platform [k](#) [k](#) [k](#)
10. **Visualise GitHub Messages** - Different ways to visualise (text) commit messages of famous repositories of GitHub [k](#)

## HACKATHONS

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### 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. [🔗](#)

## OTHER RESEARCH PROJECTS

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### 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

## PUBLICATIONS

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### HMM Classifier Object Recognizing System in Brain-Computer Interface

*2021*

Evolution in Computational Intelligence

[Link to Paper](#)

Analysed efficiency of modeling 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

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### 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-occurrence (CCO) algorithm with Log Likelihood Ratio (LLR) as the measure for correlation.

## TECHNICAL STRENGTHS

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- 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