RUDRAMANI SINGHA

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EDUCATION

Columbia University — New York City, NY
Master of Science in Biomedical Engineering — Expected Dec 2023

- Won Shardashish Interschool Fellowship, worth $50,000, nominated by Dean of Columbia Engineering
- Won Data Science Institute Scholar award for Developing MLOps Tools for Researchers
- Coursework: High Performance Machine Learning, Deep Learning for Computer Vision, Competitive Programming

University of Mumbai — Mumbai, IN
Bachelor of Engineering in Information Technology — Jul 2022

- Undergraduate Researcher; Head Of ABIT-RGIT & IEEE-RGIT; Technical Consultant & Trainer at RGIT-CodeCell

EXPERIENCE

Columbia University - Summer @ School of Engineering and Applied Science — New York City, NY
Research Assistant — Jun 2023 – Present

- Interpreting high-dimensional perceptual decision-making neural data from single-channel recordings, EEG, and fMRI in lower dimensions to understand the computations performed in the brain
- Identifying patterns and hidden states in decision-making using state space models, such as hidden Markov models, and representational analysis methods

Columbia University - Department of Biomedical Engineering — New York City, NY
Student Researcher — Mar 2023 - Present

- Leading the extraction of representational content from neural activities in the brain as the project lead at NuttidaLab
- Utilizing dimensionality reduction and embeddings, successfully characterizing latent semantic features in biophysically realistic deep learning models trained for cognitive tasks, including working memory retention
- Quantifying the efficacy of diverse Representational Similarity Analysis (RSA) techniques, identifying their strengths, limitations, and sensitivity to noise, in order to gain insights into the underlying neural processes

Columbia University - Irving Medical Center — New York City, NY
Student Researcher — Mar 2023 - Present

- Developing Vision Transformers leveraging eye-tracking data to increase glaucoma detection accuracy and interpretability in Dr. Kaveri Thakoor's Artificial Intelligence for Vision Science Lab
- Creating model interpretability frameworks encompassing activation, weight, gradient, feature, and attention visualization techniques to enhance model transparency and trustworthiness between medical professionals

Columbia University - Zuckerman Institute — New York City, NY
Student Researcher — Jan 2023 - May 2023

- Developed denoised Artificial Fourier Transformers (AFT-Net) to reconstruct accelerated MRI images
- Demonstrated the generalizability of AFT-Net across multiple modalities and species, including T1, T2, and T2ce-weighted MRIs of human and mouse brains
- Conducted a comprehensive study of the performance of AFT-Net at increasing degrees of acceleration, from 1x to 32x, showing that it can consistently reconstruct high-quality MRI images with significantly fewer measurements

Columbia University - ISERP — New York City, NY
Student Researcher — Oct 2022 - Feb 2023

- Developed new features for AI Model Share MLOps platform, including model deployment, continuous improvement, and ML analytics, as well as automated machine learning model replication toolkit for enhanced reproducibility research
- Integrated state-of-the-art deep learning models from ML Reproducibility Challenge 2022 using AWS Lambda, resulting in increased efficient deployments and access to ML models

VAO Labs — San Francisco, CA
Machine Learning Consultant — Dec 2021 - Mar 2022

- Led a team of founding engineers to design NLP solutions for supply chain predictability and visibility, yielding high-impact pitches to investors and clients
- Engineered decision graph frameworks for hierarchical classification of over 500 classes, with parallel traversals and Q&A justifications
- Devised techniques for model inspection, logging, and data caching, resulting in an 80% improvement in R&D performance and enabling rapid development of a working prototype within one month

AZYO — San Diego, CA
Machine Learning Engineer - Intern — Mar 2021 - Dec 2021

- Designed an authentication system using facial recognition and anti-spoofing countermeasures against presentation attacks
- Constructed an exam proctoring system detecting head, gestures, and eye movements to generate a confidence metric with RNNs
- Led development of sign language recognition project from data collection, processing, implementation, to deployment; Achieved 95% accuracy on in-house benchmarks with every batch vocabulary R&D cycle

CSKA Automation Services Pvt Ltd New Delhi, IN
Machine Learning Engineer - Intern Oct 2020 - Feb 2021

- Refactored entire OCR API pipeline and integrated it with Google Vision API for up to 30% faster performance and better accuracy
- Created post-processing engine to support 11+ different document formats with Named Entity Recognition and REGEX

PROJECTS

- NeuralJAXwork: GPU Accelerated Lightweight ML Framework from Scratch with JAX
- ChatGPT but it cites its sources: Retriever Augmented Abstractive Summarization in the Wild
- Representational Similarity Analysis: Decoding Representations in Neuromorphic Deep Learning Models
- GraphWelder: High-Performance MLOps Framework For Open-Source Research
- LiveCAPTCHA: In-Browser Live Challenge-Response Authentication with Face and Hand Landmarks

SKILLS

- Tools: PyTorch, TensorFlow, Scikit-learn, Keras, Spark, JAX, Elasticsearch, Pandas, NumPy, Git, Flask, Django, Docker, AWS, GCP
- Languages: Python, R, C/C++, Java, MATLAB, CUDA, SQL, JavaScript, LaTeX, Markdown, HTML, CSS, Bootstrap
- Tasks/Pipelines: Retriever-Reader, Abstractive Summarization, Object Detection, Image Segmentation, Question Answering (IRQA)

PUBLICATIONS

- R. G. Singha (2018, September 27-30). Extracting representational content in deep learning models through second-order isomorphism-based tools [Poster presentation]. Data Science Day, Data Science Institute, Columbia University. https://rb.gy/fuowt
- R. G. Singha et al., "Dynamic Pose Diagnosis with BlazePose and LSTM for Spinal Dysfunction Risk Estimation," 2022 4th International Conference on Smart Systems and Inventive Technology (ICSSIT), 2022, pp. 1547-1552, doi: 10.1109/ICSSIT53264.2022.9716509
- R. G. Singha et al., "Vehicle Speed Detection Using Multi-Branch Networks From Temporal Image Pairs," 2022 4th International Conference on Smart Systems and Inventive Technology (ICSSIT), 2022, pp. 301-308, doi: 10.1109/ICSSIT53264.2022.9716386