Resume

nrao20@iitk.ac.in | narein97 | @rao$_{n}arein$ | Narein Rao

Education

Indian Institute of Technology (IIT), Kanpur — *Kanpur, India*

MS by Research in Computer Science and Engineering — *Sept. 2020 - Jul. 2023 (Expected)*

CPI: 9.0/10.0

MVJ College of Engineering (MVJCE), Bangalore — *Bangalore, India*

B.Tech in Computer Science and Engineering — *June. 2015 - June. 2019*

CGPA: 8.04/10.0

Research Interests

Scalable and efficient computational techniques involving aspects of probabilistic machine learning, statistics, and algorithms for analyzing genomic data.

Publications

TransLIST: A Transformer-Based Linguistically Informed Sanskrit Tokenizer

Jivnesh Sandhan, Rathin Singha, Narein Rao, Suvendu Samanta, Laxmidhar Behera, Pawan Goyal

EMNLP22 (Findings) - DOI: arXiv:2210.11753

Charting spatial ligand-target activity using Renoir

Narein Rao, Rhea Pai, Archita Mishra, Florent Ginhoux, Jerry Chan, Ankur Sharma, Hamim Zafar

biorxiv - DOI: doi.org/10.1101/2023.04.14.536833

Research Experience

Charting spatial ligand-target activity — *IIT Kanpur*

Graduate Thesis | Supervisor : Dr. Hamim Zafar — *Oct. 2021 - Oct. 2022*

- Developed a novel approach to chart ligand target activity across spatial transcriptomic data.
- Allows inference of spatially resolved ligand-target interaction domains, colocalized celltype interactions and signalling pathways.

Gene Regulatory Networks for Spatial Transcriptomic Data — *IIT Kanpur*

Research Assistant | Supervisor: Dr. Hamim Zafar — *Mar. 2021 - Present*

- Working on developing an algorithm to extend gene regulatory network inference for spatial transcriptomic data.
- Discovering gene regulatory networks for domains defined by spatial gene expression and celltype distribution.

Sanskrit Word Segmentation — *IIT Kanpur*

Independent Collaboration — *Jun. 2021 - Jan. 2022*

- Developed a Transformer based Linguistically Informed Sanskrit Tokenizer capable of tackling Sandhi phenomenon.
- Outperformed the current state of the art system by an average 7.2 points absolute gain in terms of perfect match (PM) metric

Academic / Research Projects

Predicting drug resistance in Mycobacterium Tuberculosis — *Course: Computational Genomics*

Mentor: Dr. Hamim Zafar — *Oct. 2020 - Nov. 2020*

- Developed statistical models to predict the resistance of Mycobacterium tuberculosis (MTB) towards several first and second line drugs commonly used for treating tuberculosis.
- Showcased an average predictive accuracy of 92% across 10 first and second line drugs.

Analysis of degree of contribution of mutations in Mycobacterium Tuberculosis — *Undergraduate Thesis*

Mentor: Dr. Manju Khanna — *Sept. 2018 - May. 2019*

- Developed an algorithm to understand the relation between mutations and drug susceptibility exhibited by mycobacterium tuberculosis
- The implementation is based on “Machine learning for classifying tuberculosis drug-resistance from DNA sequencing data” by Yang Yang et al.

Comparison of GAN and VAE in continual learning

Course: Probabilistic Modeling and Inference

Mentor: Dr. Piyush Rai — *Mar. 2021 - May. 2021*

- Provided a measure of realism for the images generated by GAN/VAE
- Found the relation between no. of tasks and forgetfullness in GAN/VAE
- Generated images over a domain perceptually-distant from the domain the models have been trained over

Study on the effect of Covid-19 lockdown on Air Quality in India

Course: Data Mining

Mentor: Dr. Arnab Bhattacharya — *Sept. 2020 - Nov. 2020*

- Integrated Air Quality Index (AQI) and air borne disease data from multiple data sources.
- Performed time series predictions, statistical and probablistic analysis to gain further insights between AQI, air borne diseases and number of Covid-19 cases.

Bluetooth attendance system

Research Project

Independent project — *Feb. 2018 - Apr. 2018*

- Developed a multi-agent based bluetooth attendance system (Proxy) using JADE framework with a user friendly android application.
- Proxy is a bluetooth-based attendance system that employs smart phones and (optionally) bluetooth tags to speed up attendance calls and automate student registrations and provide log reports.

Multi agent system for power regulation

Research Project

Mentor: Dr. Manju Khanna — *Feb. 2018 - Apr. 2018*

- A multi-agent system that regulated power supplied by wind and solar energy sources was simulated and developed as a prototype. The simulation was executed over existing data sources.
- Anylogic simulations were used to examine the behaviour of the agents in the environment, and a prototype system was developed using the JADE framework.

Notable Achievements

- Cleared GATE 2020 entrance with an overall standing within the top 0.6 % of total participating students.
- Proxy (bluetooth attendance system) gained press attention from five publications, including some of India's most prominent news organisations (Times of India, 2018).

Relevant Coursework

- Computational Genomics
- Probablistic Modeling and Inference
- Introduction to Machine Learning
- Data Mining
- Big data analytics
- Design and analysis of algorithms
- Programming and Data Structures
- Unix and shell programming

Technical Skills

Programming	Python, R, C, Java, Bash, Latex
DevOps	Docker, Git, Firebird
Cloud Platforms	Microsoft Azure
Tools	PyTorch, Seurat, Scanpy, Tableu, JADE

Teaching Experience

Fundamentals of Computing (ESC101)

IIT Kanpur

Teaching Assistant — *Jun. 2021 - Jun. 2022*

- Core responsibilities included conducting first-year undergrad labs, quizzes and grading lab solutions.

Discrete Mathematics

Freelance

Tutor — *Sep. 2022 - Present*

- Held one-to-one tutoring sessions for students which involved lectures, assignments and quizzes.

Operating Systems

Freelance

Tutor — *Jun. 2022 - Jul. 2022*

- Held one-to-one tutoring sessions for students which involved lectures and assignments.