Boston, USA

Subhrangshu Bit

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Github : https://github.com/SubhrangshuBit

Computer Science PhD student

Research Interests

Representation learning, continual learning and biomedical applications.

Education

Boston University, Boston
PhD, Computer Science — *Sep' 23 - Present*

Ramakrishna Mission Vivekananda Educational & Research Institute, Kolkata
Master of Big Data Analytics, Computer Science — *Jul' 19 - Jun' 21*
GPA: 9.93/10

St. Xavier's College, Kolkata
Bachelor of Statistics, Statistics — *Jul' 16 - Jun' 19*
GPA: 7.6/10

Research Experience

Kolachalama Laboratory
Research fellow, with Prof. Vijaya Kolachalama — *Fall 2023 - Present*

Working on foundation models and robust representation learning of multi-modal data, focusing on clinical applications.

Work Experience

Data Scientist
Dr. Reddy's Laboratories — *Apr' 22 - Jul' 23*

- Developed a new application to predict the humaneness and immunogenic potential of proteins using *hierarchical cluster analysis* and *neural networks*.
- Designed a *generative model* for pruning chemical space, drug designing, and screening. Leveraged *Monte Carlo Tree Search* and graph-based algorithms on top of *Bayesian Optimization*.
- Built a signal processing module for automatic integration of chromatographic signals leveraging *nearest neighbor* methods.

Assistant System Engineer Trainee (AI & ML)
Tata Consultancy Services — *Jul' 21 - Apr' 22*

- Built a *Recommendation Engine* based on a cosine distance and fuzzy matching techniques between associate and project requirements/competencies for associate mapping.

Data Analyst Intern
Dr. Reddy's Laboratories — *Feb '21 - Jul' 21*

- Developed a framework to provide statistical estimates of quantitative distribution of ingredients of a drug from its *hyperspectral image*.
- Incorporated Beer Lambert's law to perform multiple linear regression of acquired Raman spectra on pure spectral signatures of the components. The coefficients of regression were interpreted as the proportional quantitative estimates.
- Github Link

Research Work

MedPodGPT: A multilingual audio-augmented large language model for medical research and education
Supervisor: Dr. Vijaya B. Kolachalama — *Feb'24 - Jul'24*

- MedPodGPT, integrates the varied dialogue found in medical podcasts to improve understanding of natural language nuances, cultural contexts, and medical knowledge.
- Evaluated across multiple benchmarks, MedPodGPT demonstrated an average improvement of 2.31% over standard open-source benchmarks and showcased an improvement of 2.58% in its zero-shot multilingual transfer ability, effectively generalizing to different linguistic contexts.

Alzheimer's prediction and progression using a mixture of class Restricted Boltzmann Machines

Supervisors: Prof. Swami Vidyapradananda and Dr. Tapan K. Khan *Sep'21 - Apr'22*

- Used 3D structural MRI scans to determine the current stage of dementia (CN/MCI/AD) and the probabilistic progression to advanced stages.
- Addressed the challenge of the high dimensionality by extracting the reduced dimensional latent feature vectors using a *Variational Autoencoder*.
- The extracted feature vectors were then used as input conditions to a *mixture of class Restricted Boltzmann Machines* for classification.

Academic Projects

Comparative evaluation of deep learning models for multi-domain medical image classification

Supervisor: Dr. Margrit Betke *May'24*

We seek to address two key questions:
- Performance: How do statistical methods, Transformers, zero-shot learning strategies, few-shot fine-tuning, and low-rank adaptation techniques compare in terms of accuracy and robustness across different medical imaging datasets?
- Generalization: To what extent can existing state-of-the-art methods be leveraged to perform inference in unseen settings specifically in the medical domain?
- Github Link

Implementation of improved second-order optimization algorithms

Supervisor: Prof. Swami Vidyapradananda *Jul '20*

- Explored a Quasi-Newton optimization approach to solve a quadratic function using *Davidon-Fletcher-Powell* Method and *Fletcher-Reeves* Conjugate Gradient method
- With the same initialization we analytically and theoretically show that both the methods generate identical gradient directions.
- Github Link

Comparative Study of Bayesian Estimators & Maximum Likelihood Estimators

Supervisor: Prof. Surabhi Dasgupta *Jan '19 - Mar' 19*

- Studied the behavior of Maximum Likelihood Estimators and Bayesian Estimators of three standard theoretical distributions - *Binomial*, *Poisson*, and *Normal* with increasing sample size.
- The prior information for Bayesian estimators considered under this study were: *Jeffreys' Invariant prior* and *Natural Conjugate (NC) prior*
- Found that Bayesian estimators with NC prior although being same as MLE are an improvement since, unlike MLE, it encapsulates the past information whereas those with Jeffreys' prior were consistent and tend to be the same as MLE for large sample sizes
- Github Link

Zero Inflated Time Series Analysis of Terrorism in India

Course : Time Series Analysis | Supervisor : Prof. Sudipta Das *Jul '21 - Dec '21*

- Bypassed *ARMA* models, which are generally restricted to continuous state-space by utilizing an observation-driven model.
- Handled overdispersion using a Gamma distribution resulting in a *zero-inflated Negative Binomial regression* model. - Incorporated ARMA-type structure to model the mean of the distribution.
- Github Link

Automation of Pacman game for single and multi-agent

Course : Artificial Intelligence | Supervisor : Prof. Br. Tamal *Jul '21 - Dec '21*

- Implemented search algorithms: Breadth First Search, Depth First Search, A^* search for single agent optimal pathfinding.
- Implemented Q-Learning and Value Iteration to make the Pacman learn the optimal solution.
- Project Overview

Awards & Achievements

CIO Special Award 2022, Dr. Reddy's Laboratories
First Rank Holder (Gold Medallist) 2019-21, RKMVERI
Awarded the **INSPIRE Scholarship** by DST, Govt. of India
Secured a **Rank of 2** in School in Higher Secondary Education