RESEARCH STATEMENT

Chanchal Saha

Machine Learning • Medical AI • NLP • Large Language Models

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1. Background & Motivation

My research interest developed from the desire to apply Artificial Intelligence to solve real-world problems in healthcare. During my undergraduate studies, I explored machine learning and deep learning through several self-driven projects in medical imaging and NLP. My first-author Q1 publication in Elsevier's Heliyon strengthened my motivation to pursue research in intelligent systems, interpretable models, and data-efficient learning.

2. Current Research

(a) Medical Image Analysis

I am currently working on cancer image classification tasks including brain tumor MRI, lung and colon cancer, and breast cancer histopathology image analysis. My approach involves transfer learning and fine-tuning of CNN architectures such as ResNet50, EfficientNetB0, and VGG. I focus on domain-specific augmentation, robustness, and interpretable visual explanations.

(b) NLP for Mental Health

My parallel work involves NLP-based emotion and stress-level classification using Logistic Regression, Naive Bayes, Random Forest, and LSTMs. The goal is to develop models capable of identifying early mental health signals in noisy real-world text.

3. Future Research Direction

My future research is oriented toward transformer-based models and Large Language Models (LLMs). I plan to work on domain-specific LLM fine-tuning, clinical text understanding, medical report summarization, and multimodal medical reasoning.

I also aim to combine CNN-based medical imaging models with LLM-powered textual reasoning to develop unified multimodal diagnostic systems for healthcare.

4. Long-Term Vision

I aim to pursue graduate research leading to contributions in medical AI, interpretable ML, and domain-focused LLM technologies. In the long term, I hope to work in academia as a researcher and educator, contributing to AI innovations and training future engineers.