

Project Abstract

Title: *Interpretable Deep Learning (AI) for Pneumonia Detection in Chest X-Rays*

Submitted by: Ratan Ghosh

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Problem Statement

Detecting pneumonia from chest X-ray images is critical for timely treatment, especially in low-resource settings where radiologist availability is limited. Manual examination of X-rays is time-consuming and subject to human error. This project aims to automate pneumonia detection using deep learning techniques to improve diagnostic efficiency and accuracy.

Dataset

I will use the **NIH Chest X-ray Dataset**, which contains over 100,000 labeled chest X-ray images across 14 disease categories, including pneumonia. The dataset is publicly available and widely used for medical imaging research.

Proposed Techniques to be Used

We will use **Convolutional Neural Networks (CNNs)** with **Transfer Learning** leveraging a pre-trained ResNet50 model, fine-tuned on the pneumonia classification task. The model will be implemented using **TensorFlow and Keras** for efficient experimentation and deployment.

Steps to Complete the Project

- **Data Preprocessing:** Load and preprocess X-ray images (resize, normalization, augmentation).
 - **Data Splitting:** Divide data into **training**, **validation**, and **test** sets.
 - **Model Development:** Build and fine-tune the ResNet50 CNN model.
 - **Model Training:** Train using appropriate hyperparameters and callbacks.
 - **Evaluation:** Assess model performance using accuracy, precision, recall, and AUC.
 - **Visualization:** Generate Grad-CAM visualizations to interpret model predictions.
 - **Reporting:** Document methodology, results, and analysis for submission.
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Expected Output/Results

We expect the deep learning model to achieve **over 90% classification accuracy** in detecting pneumonia on unseen chest X-ray images. The project aims to provide a reliable, automated screening tool to assist healthcare professionals in rapid diagnosis, reducing manual workload and improving early detection rates in clinical settings.