

Problem & Approach

Problem: Using transfer learning based approach, use a Convolutional Neural Network (ResNet50) to classify (distinguish) lungs infected with pneumonia vs. healthy lungs.

Approach: Using python, pytorch (torch), and the given dataset, trained the model. Utilizing the established pipeline, data preprocessing, training (along with testing), handling class-imbalance issues and finally performance evaluation was done to understand model performance.

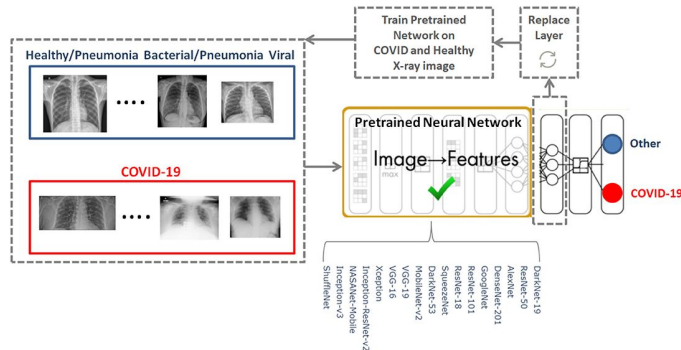


Figure 1. Model Diagram

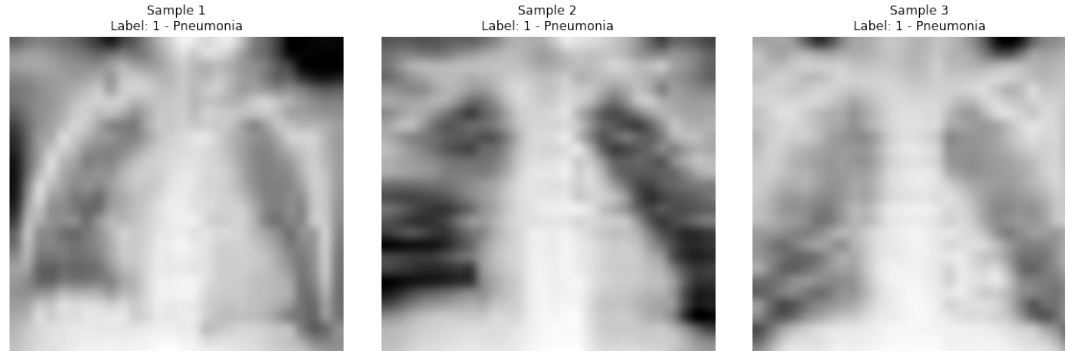


Figure 2. Chest X-Rays

Model Architecture & Workflow

Model Architecture: Below is ResNet 50 model's architecture, with various layers illustrated.

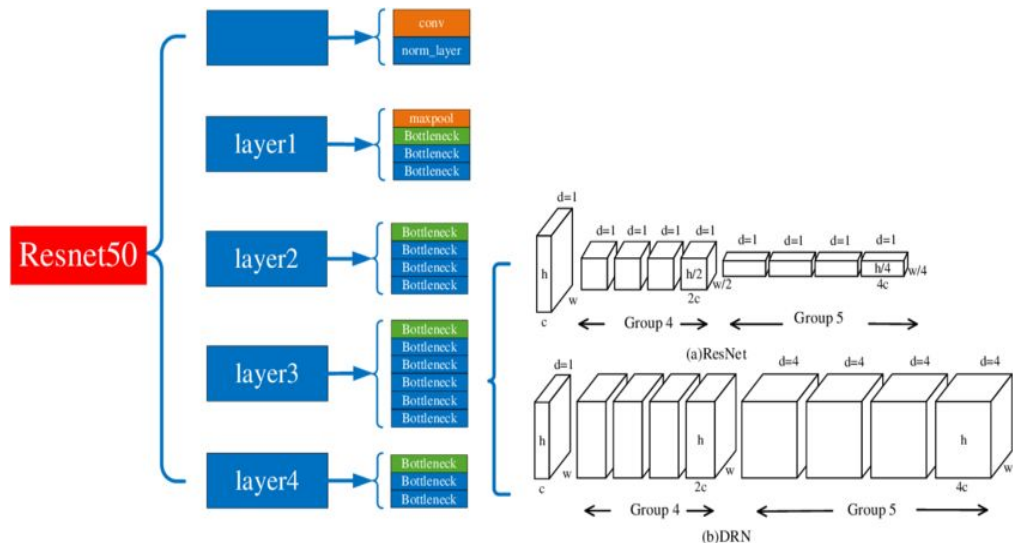


Figure 1.

Workflow: Utilized the following pipeline for transfer learning, using ResNet50:

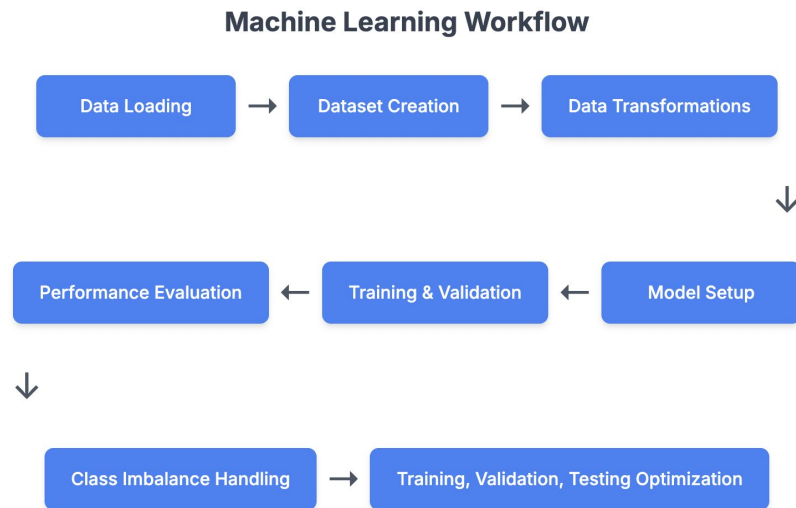


Figure 2.

Results & Key Insights

Results:

- Model's Test Accuracy is 84% after class imbalance mitigation
- Model has 98% recall for Pneumonia Detection
- Model has an AUC-ROC: 0.92 [fairly good discriminator between Pneumonia vs Healthy]
- Implemented data augmentation, weight decay regularization, early stopping to minimize effects of overfitting.

Key Insights:

- Integration of class imbalance mitigation techniques, changes model's behaviour.
- tSNE, UMAP demonstrate the model learned to distinguish between Normal and Pneumonia Chest X-Rays.

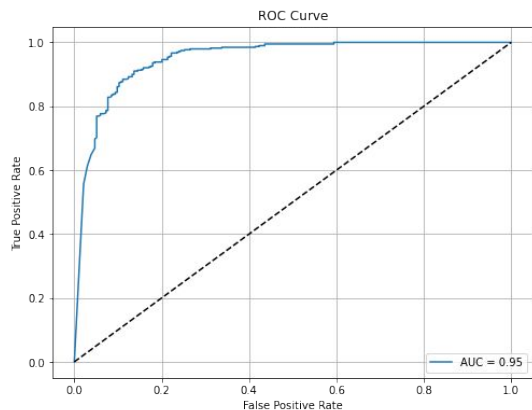


Figure 1.

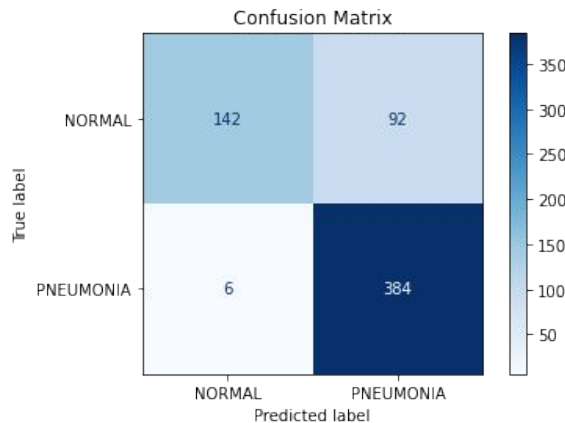


Figure 2.

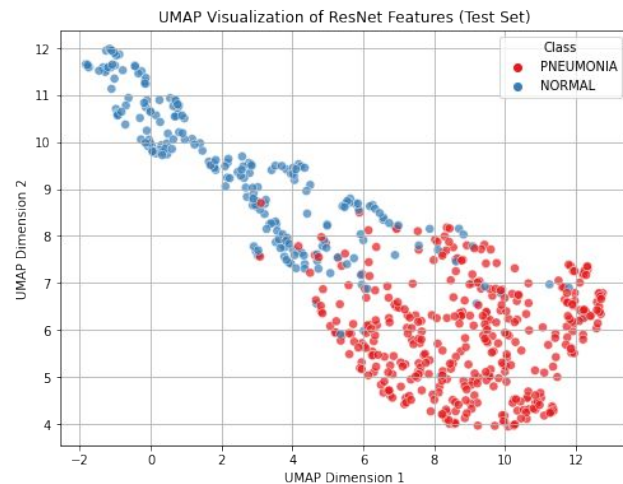


Figure 3.