Pneumonia Detection Using Transfer Learning on Chest X-ray Images

Mini Project Presentation

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Introduction

Pneumonia is a serious lung infection requiring early diagnosis.

Manual diagnosis is time-consuming and error-prone.

Goal: Build a deep learning model for automated diagnosis.

Tools: EfficientNetB0, DenseNet121, Xception.

Problem Statement

Manual interpretation of X-rays is prone to variability.

Rural areas lack radiology expertise.

Objective: A binary classifier for Pneumonia vs Normal using chest X-rays.

Literature Review

Earlier models: SVM, k-NN – limited performance.

CNNs + Transfer Learning = state-of-the-art results.

Successful models: VGG16, ResNet50, InceptionV3, EfficientNet, DenseNet, Xception.

Dataset

Source: Kaggle Chest X-ray Dataset (Paul Timothy Mooney).

5,000+ labeled X-rays (Pneumonia, Normal).

Split into training, validation, and test folders.

Why We Chose These 3 Models

1.

EfficientNetB0

– Fast & Lightweight

It trains quickly and works well on limited systems like Google Colab.

Best if you want speed **and** good accuracy.

DenseNet121 – *Feature Expert*

- **Connects layers smartly to reuse features.**
- **Very good at learning detailed patterns in X-ray images.**

3. **Xception** – *High Accuracy King*

Uses modern layers for better performance.

Best for high accuracy — even if training takes longer.

In Short:

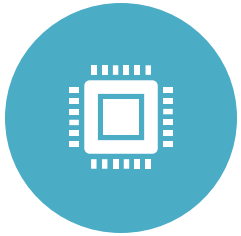
Model	What It's Good For
EfficientNetB0	Fast, light, easy to train
DenseNet121	Deep, efficient, good features
Xception	Most accurate for complex tasks

Data Preprocessing

RESIZED ALL IMAGES TO 150X150 PIXELS.

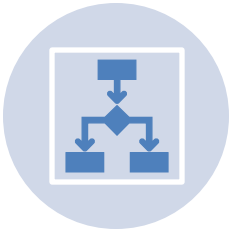
NORMALIZED PIXEL VALUES TO RANGE [0, 1].

USED IMAGEDATAGENERATOR FOR REAL-TIME DATA AUGMENTATION.



BATCH SIZE: 32; CLASS MODE: BINARY.

Model Development

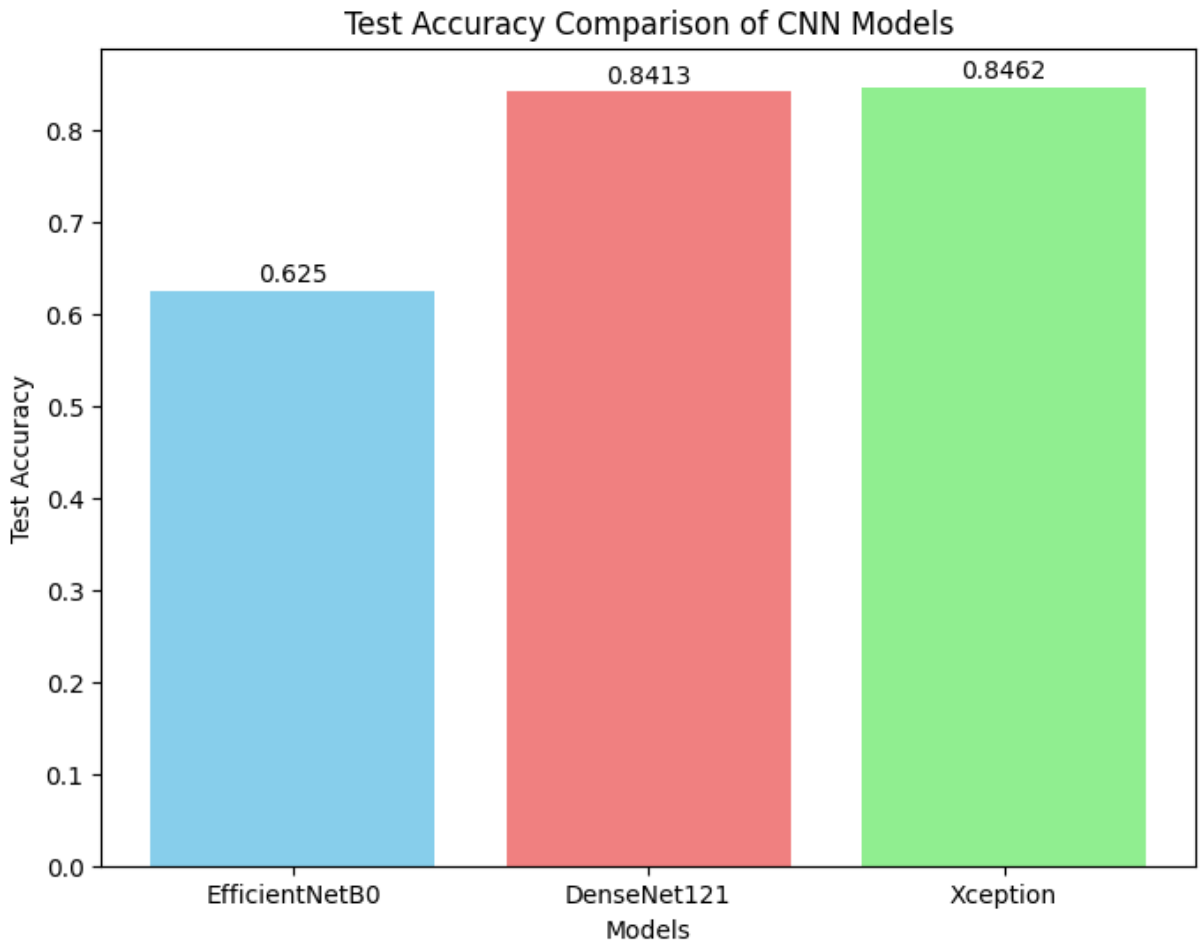


Models: EfficientNetB0, DenseNet121, Xception.

Used pre-trained ImageNet weights (transfer learning).

Added Flatten, Dense(128), Dropout(0.5), Sigmoid layers.

Optimizer: Adam; Loss: Binary Crossentropy; Epochs: 10.


Test Accuracy Comparison of CNN Models
0.625
0.8413
0.8462
Test Accuracy
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
EfficientNetB0
DenseNet121
Xception
Models

Model Evaluation

- Evaluated on unseen test dataset.
- Metrics: Training/Validation/Test Accuracy.
- Xception performed best overall.
- Visualization: Accuracy graphs, confidence score outputs.

Conclusion

Built and evaluated models: **EfficientNetB0**, **DenseNet121**, and **Xception**.

Xception achieved the highest accuracy.

Transfer learning proved effective for medical image classification.

The system can assist radiologists and improve early pneumonia detection.

Future scope includes explainability (Grad-CAM) and deployment as a web/mobile app.