Pneumonia Classification in X-Rays

This presentation describes the results of a project to classify chest X-ray images for pneumonia detection using convolutional neural networks.

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Study Problem

Pneumonia is a common respiratory infection that affects the lungs. Early detection is crucial for effective treatment.

Accurate Diagnosis

Classification of X-ray images can help doctors diagnose pneumonia more quickly and accurately.

Early Intervention

Early detection enables timely medical intervention, which can improve patient outcomes.

Dataset

The dataset used in this project consisted of chest X-ray images of patients with and without pneumonia.

Number of Images

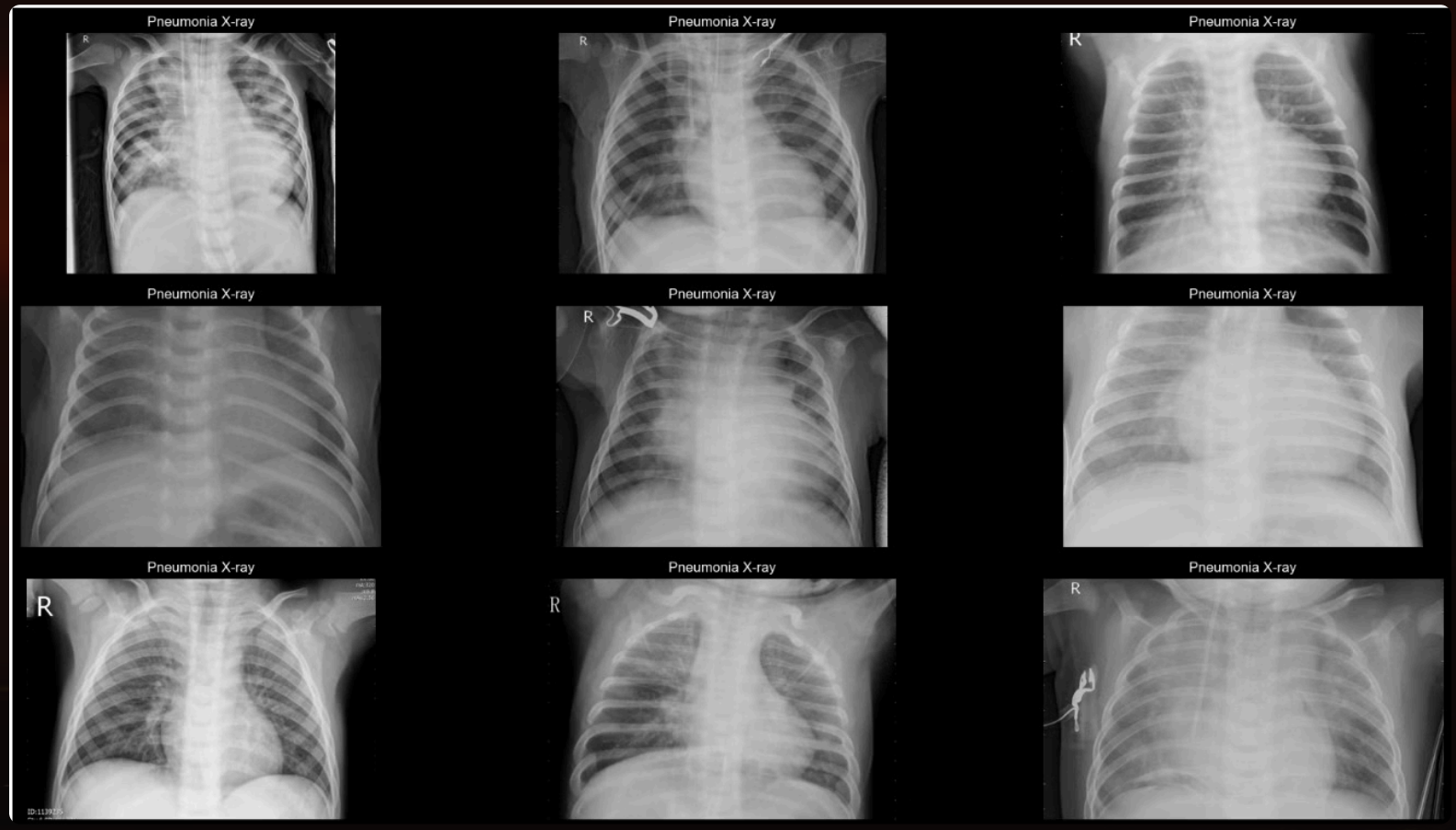
The training dataset includes 5,232 X-ray images, with 3,883 images of pneumonia cases and 1,349 images of healthy cases. The test set has 624 images in total.

Data Source

The images were obtained from Kaggle and is a 2018 dataset released for research studies.

Preprocessing

The images were preprocessed to standardize dimensions, adjust numerical scale, and generate new images from small perturbations (data augmentation).



Model Architecture

The model used was a convolutional neural network (CNN) designed for medical image classification.

1

3 Convolutional Layers

The convolutional layers extract features from the images, such as edges and textures.

2

2 Pooling Layers

The pooling layers reduce the size of the features, improving computational efficiency.

3

Activation Functions (relu and sigmoid at the end)

The activation functions introduce non-linearity to the model, improving its ability to learn complex patterns.

4

Classification

The final layer of the model predicts the probability that an image corresponds to a pneumonia or healthy class.

The training performed very well and overfitting is ruled out given the obtained metrics:

Accuracy: 0.926

Val_Accuracy: 0.8878

Results & interpretation

The model achieved high accuracy in classifying X-ray images to detect pneumonia, although if more computational resources were available, more complex (perhaps pre-designed) architectures could be tested and the images could be trained at higher resolutions in an effort to optimize the classification.

The model has a high precision for the normal class (95%) and a high recall for the pneumonia class (98%), suggesting it is a robust model for classifying chest radiographs. This high precision for the normal class also indicates that it **is rare for the model to have false positives**, meaning it is unlikely to incorrectly identify a normal image as having pneumonia. However, the recall for the normal class (67%) is relatively low, meaning the model is missing some normal cases. This could be an area for improvement in future iterations of the model.

	Precision	Recall	F1-Score
0 (Normal)	0.95	0.67	0.78
1 (Pneumonia)	0.83	0.98	0.9
Accuracy			0.86