

Pneumonia Detection from Chest X-Ray Images using CNN & ANN

Problem Statement:

Pneumonia is a potentially life-threatening lung infection that must be diagnosed early for effective treatment. Chest X-rays are the most common diagnostic tool for identifying pneumonia, but manual inspection by radiologists can be time-consuming and prone to human error. This project aims to automate the diagnosis of pneumonia from chest X-ray images using deep learning techniques.

Project Explanation

The objective of this project is to classify chest X-ray images into two categories:

- **Normal**
- **Pneumonia**

Two deep learning approaches were implemented and compared:

1. Convolutional Neural Network (CNN)

CNNs are well-suited for image classification tasks as they preserve spatial hierarchies and learn image features such as edges, textures, and shapes through convolutional layers. The CNN model in this project consists of multiple convolutional and pooling layers, followed by dense layers for final classification.

2. Artificial Neural Network (ANN)

ANNs can also be used for image classification by flattening the image into a 1D vector. However, they lack the ability to capture spatial features. An ANN model was implemented to demonstrate this limitation and to serve as a comparative baseline against the CNN.

Technologies Used

- Python
 - TensorFlow & Keras
 - NumPy, Matplotlib
 - Google Colab for implementation and testing
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Dataset

The dataset used is the **Chest X-Ray Images (Pneumonia)** dataset from Kaggle, which contains over 5,000 X-ray images categorized into **Normal** and **Pneumonia**.

Link to Dataset:

<https://www.kaggle.com/datasets/paultimothymooney/chest-xray-pneumonia>

Results

- **CNN Model Accuracy:** Achieved over **90% validation accuracy**, demonstrating high performance in detecting pneumonia.
 - **ANN Model Accuracy:** Lower than the CNN model, confirming that CNN is more suitable for image-based tasks due to its spatial feature extraction capability.
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