# Automated Process for Identifying Intrathoracic Pathological Conditions in Chest X-Rays Using Deep Learning

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**Abstract**: In the world of radiology, the interpretation of Chest X-rays (CXR) plays a pivotal role in diagnosing various intrathoracic pathological conditions. Traditionally, this task heavily relies on the expertise of radiologists and clinicians, which can lead to delays and subjective results. However, with recent advancements in deep learning and digital image processing techniques, there lies a promising opportunity to enhance the accuracy, efficiency, and speed of diagnosing these conditions. This study aims to develop and evaluate an automated system that detects intrathoracic pathologies in chest X-ray images using deep learning models and digital image processing techniques, specifically focusing on Pneumonia, Pleural effusion, and Cardiomegaly. Our models, VGG-16 and two customized models, were built using the VGG architecture and a custom convolutional neural network (CNN) developed with the Sequential API in Keras. The first model was based on the ResNet architecture, and the second was built upon the AlexNet architecture. However, the ResNet-based model did not perform as well, likely due to overfitting caused by the limited variability of our dataset, which hindered its ability to generalize effectively to new data. In contrast, our AlexNet-based custom model demonstrated strong performance, achieving accuracy similar to that of the widely used VGG-16 model, highlighting its effectiveness in this specific task. Both the VGG-16 model and the customized model achieved the same accuracy of 0.79 and the VGG-16 model demonstrates a slight advantage in chest X-ray interpretation with improved performance in detecting Pleural Effusion and Cardiomegaly, while the customized model excels in identifying normal cases and shows comparable results for Pneumonia detection. The findings of this research project hold substantial importance as they have the potential to transform chest X-ray analysis, leading to better patient outcomes, more effective clinical decision-making, and enhanced workflow efficiency for healthcare providers.

**Keywords**: Chest X-rays, CNN, Custom Model, Pathologies, VGG-16.

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