Medical Image Analysis: Deep Learning Models for Pneumonia Detection

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Abstract:

Pneumonia is one of the most common causes of death globally, especially for individuals over 65 and children under five. Even with improvements in medical technology, diagnosing pneumonia from chest X-rays is still difficult and frequently calls for qualified radiologists. This paper offers a thorough deep learning-based framework for the identification of pneumonia from chest X-ray images in order to overcome these difficulties. A Convolutional Neural Network (CNN), Transfer Learning models (EfficientNet, VGG19, and ResNet), and Machine Learning classifiers like Support Vector Machine (SVM) are among the models included in the suggested framework. model was 94.2%, but the accuracies of the Transfer Learning models, ResNet, VGG19, and EfficientNet, were 80.4%, 89.6%, and 79.6%, respectively. Furthermore, the resilience of the SVM classifier using a Radial Basis Function (RBF) kernel was demonstrated by its 92.4% performance. To improve diagnostic accuracy even more, this approach incorporates an ensemble of classifiers. The system offers a dependable, effective, and scalable approach to early pneumonia detection by utilizing these models. The findings show how the suggested approach might help radiologists by prioritizing cases and expediting the diagnosis process, which would eventually improve patient outcomes and save lives.

Keywords:

Pneumonia detection, CNN, transfer learning, EfficientNet, VGG19, ResNet, SVM, CAD systems, ensemble models, medical imaging, early diagnosis, healthcare AI.