ABSTRACT

The growing incidences of respiratory diseases such as pneumonia, tuberculosis, and COVID-19 have made efficient and accurate diagnostic tools important in the health sector. Current radiology practices are generally based on manual interpretation of chest X-rays (CXRs), which is labor-intensive and vulnerable to human error. This paper outlines an automated radiology report generation system based on deep learning and natural language processing to solve the problems outlined above.  
  
The system integrates CNNs with the latest architectures like EfficientNet, ResNet, and VGG in order to classify CXRs and ascertain the presence of the three target diseases to have a robust and generalizing model, the training will be performed on a varied dataset derived from public libraries such as Kaggle. Techniques for data preprocessing-augmentation and normalization-improve the performance of the model. The best one with regard to accuracy, precision, recall, and F1-score is deployed with GPT-4 for generating reports automatically.  
  
The application is built in Python and hosted on a user-friendly interface developed using Gradio. This enables patients to upload CXRs, view disease predictions, and download detailed radiology reports. The effectiveness of the system is validated by confusion matrices, learning curves, and qualitative analysis of the generated reports.  
This solution indicates the potential of introducing AI into medical workflows by showing its scalable, accurate, and time-efficient diagnostic support capability. Future improvements might involve extending the scope of the classification of diseases, enhancement of explainability, and integration of the system with hospital information systems for enhanced clinical decision-making processes.