ABSTRACT

Enhanced Chest X-Ray Image Classification for Diagnosis of Lung Diseases: A Deep Learning unveils RadiantX introduces a deep learning framework RadiantX, tailored for accurate classification of lung diseases from chest X-ray images. Leveraging advanced image enhancement techniques such as Contrast Limited Adaptive Histogram Equalization (CLAHE) and a diverse range of image filters, the system significantly enhances image quality and contrast, crucial for precise diagnostic analysis. With a comprehensive dataset comprising 80,000 images across ten distinct disease categories alongside a control group, the model undergoes rigorous evaluation against eight pre-trained CNN models. Through meticulous fine-tuning and parameter optimization facilitated by extensive ablation studies, RadiantX emerges as the frontrunner, showcasing unparalleled efficacy in both validation and test sets.Furthermore, the integration of Gradient-weighted Class Activation Mapping (Grad-CAM) augments diagnostic capabilities by pinpointing salient disease-related regions within X-ray images, enhancing interpretability and facilitating clinical decision-making. RadiantX's exceptional performance and augmented diagnostic capabilities position it as a pivotal tool poised to revolutionize clinical practice and drive advancements in medical research. Its potential extends beyond diagnosis, offering opportunities for automated screening and population-level health monitoring, thereby contributing to improved patient outcomes and healthcare efficiency.