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Cancer Diagnosis in Medical Imaging Using Advanced Deep Learning and Feature Selection Models

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Abstract:

The advancement of medical imaging technologies has revolutionized cancer diagnosis, yet the complexity and high dimensionality of imaging data pose challenges for accurate and timely detection. This study presents a comprehensive framework that combines advanced deep learning architectures with robust feature selection models to improve diagnostic performance. Convolutional Neural Networks (CNNs) and Deep Residual Networks (ResNets) are employed to extract hierarchical features from various imaging modalities, including MRI, CT, and histopathology images. To reduce redundancy and enhance classification accuracy, feature selection techniques such as Recursive Feature Elimination (RFE), Principal Component Analysis (PCA), and mutual information-based selection are integrated. The optimized feature subsets are then utilized in ensemble classifiers for final diagnosis. Experimental results show superior accuracy, sensitivity, and specificity compared to conventional approaches, highlighting the effectiveness of the proposed system in supporting clinical decision-making for early and precise cancer detection.

Keywords:

Cancer diagnosis, medical imaging, deep learning, feature selection, CNN, ResNet.

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