EfficientNet for Medical Image Classification: Performance vs. Efficiency in Skin Cancer Detection

Title	EfficientNet for Medical Image Classification: Performance vs. Efficiency in Skin Cancer Detection
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Abstract	This study applies EfficientNetB2, a computationally efficient convolutional neural network (CNN), to improve the accuracy of skin cancer detection using the heterogeneous HAM10000 dataset. Skin cancer classification poses challenges, including overfitting and class imbalance, which we address through data augmentation, class weighting, and SMOTE (Synthetic Minority Over-sampling Technique). Our model achieved accuracy of 86%, precision of 0.87, recall of 0.85, and an AUC of 0.90. These results outperform comparable architectures, such as ResNet50 and GoogleNet, while maintaining lower computational complexity. The proposed model demonstrates high precision in detecting actinic keratoses and basal cell carcinoma, which require timely treatment, but faces difficulties in differentiating melanoma from benign nevi because of their similar visual appearance. This study highlights the potential of EfficientNetB2 for real-world deployment in resource-limited settings, such as mobile health applications and telemedicine platforms. Future research will focus on integrating attention mechanisms and exploring cross-dataset validation to enhance model generalizability and performance.
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