Advancements and Challenges in Skin Disease Recognition: A Comparative Analysis of CNN-Based Approaches

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Abstract: *Skin illnesses are a serious worldwide health issue, necessitating early and precise diagnosis to avoid dire consequences. Conventional approaches based on dermatological knowledge usually have drawbacks like subjectivity, unsatisfactory access, and heterogeneity in disease presentation. This necessitates using automated diagnostic equipment, especially Convolutional Neural Networks (CNNs), to classify skin illnesses. This review discusses the performance of CNN structures such as VGG16, VGG19, ResNet, DenseNet, and hybrid models on data sets like HAM10000 and ISIC. Measured through metrics such as accuracy, precision, recall, and F1-score, DenseNet emerged as uniformly better in performance with its sophisticated feature extraction ability. Hybrid models like CNN-LSTM and CNN-SVM also improved classification accuracy and generalization. Attention mechanisms, transfer learning, and data augmentation were essential in enhancing model robustness and handling class imbalances. Yet, challenges remain, such as the requirement of diverse datasets, real-world clinical validation, and improved interpretability of deep learning models. This review identifies the revolutionary potential of CNNs in dermatology, focusing on their role in creating efficient, accessible, and scalable diagnostic systems. By filling gaps in current research, such as dataset variety, real-time testing, and multimodal data fusion, further improvements can fine-tune these models for use in clinical practice. The conclusions of this study present a holistic basis for using robust CNN-based systems for accurate, early diagnosis of skin conditions, greatly enhancing patient outcomes and healthcare efficiency globally..*

Keywords: Skin disease classification, Convolutional Neural Networks (CNN), VGG16, VGG19, ResNet, DenseNet, hybrid models, HAM10000, ISIC dataset, transfer learning, attention mechanisms, deep learning, dermatology