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Patent Search

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Abstract:

The invention discloses a hybrid deep-learning architecture that integrates Convolutional Neural Networks (CNNs) with Transformer-based self-attention mechanisms for accurate classification of skin cancer from dermoscopic images. The system includes preprocessing operations such as resizing, normalization, augmentation, and class balancing followed by CNN blocks that extract local lesion features. A Transformer layer applies multi-head self-attention to model global contextual relationships, producing a comprehensive feature representation. A fully connected softmax classifier generates lesion category predictions with high diagnostic accuracy. Through optimized hyperparameters, dropout, and batch normalization, the model achieves robust generalization, outperforming traditional CNN approaches and achieving approximately 90% accuracy on benchmark datasets. The invention supports deployment in clinical, mobile, and telemedicine diagnostic workflows.

Complete Specification

Description:FIELD OF THE INVENTION

[001] The present invention relates to the fields of medical image analysis, artificial intelligence, and computer-aided diagnostic systems, and more particularly to deep learning architectures designed for the automated classification of skin cancer from dermoscopic images. The invention specifically concerns a hybrid neural framework that integrates Convolutional Neural Networks (CNNs) with Transformer-based self-attention mechanisms, enabling simultaneous extraction of local textural features and global contextual dependencies. The invention further relates to the development of optimized preprocessing, data balancing, normalization, and hyperparameter-tuning strategies that enhance diagnostic accuracy, generalization capability, and clinical applicability in telemedicine and large-scale dermatological screening environments.

BACKGROUND OF THE INVENTION

[002] Skin cancer has emerged as one of the fastest-growing public health challenges worldwide, with early diagnosis being critical for improving patient survival rates. Traditional diagnostic practices rely heavily on dermatologists visually interpreting dermoscopic images and identifying malignancy cues such as asymmetry, irregular borders, color variations, and structural abnormalities. Such manual evaluations, while clinically valuable, are inherently subjective, time-consuming, and limited by inter-observer variability. Moreover, in regions with shortages of skilled dermatologists and increasing caseloads, dependence on manual examination results in delays, inconsistent interpretation standards, and reduced opportunities for early detection. These limitations underscore the necessity for automated, objective, and reproducible diagnostic tools.

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