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Machine Learning Approach for Monkeypox Detection System from Medical Images

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Abstract

The rapid global spread of monkeypox, including outbreaks in non-endemic regions, has raised public health concerns and highlighted the need for rapid, accessible and reliable diagnostic tools. This need is especially critical in resource-limited settings, where conventional methods such as Polymerase Chain Reaction (PCR) face limitations due to high cost, equipment dependency and time consumption. This study proposes a deep learning-based multiclass classification system using GoogLeNet to detect monkeypox from medical skin images. The Monkeypox Skin Image Dataset (MSID), consisting of 770 images across four categories: monkeypox, chickenpox, measles, and normal, is used for model training and evaluation. Through transfer learning and image preprocessing technique, the proposed model achieved an overall accuracy of 91.56%, with precision, recall, and F1-score at 91.64%, 91.56% and 91.43% respectively. Comparative analysis with EfficientNet-B0 and ResNet-18 demonstrates that GoogLeNet outperforms both in terms of generalization and class-wise detection accuracy, which suggest its suitability as a lightweight and effective tool for early monkeypox diagnosis. Furthermore, GoogLeNet was also evaluated against models reported in a benchmark study, including VGG16, ResNet50, MobileNetV1, InceptionV3, Xception, and the custom MonkeyNet architecture. GoogLeNet achieved competitive results with minimal fine-tuning, highlighting its practicality and strong performance despite being a standard open-source model. © 2025 IEEE.

Author keywords

Convolutional Neural Networks (CNNs); Deep Learning; GoogLeNet; Medical Image Classification; Monkeypox

Indexed keywords

Engineering controlled terms

Benchmarking; Classification (of information); Computer aided diagnosis; Convolutional neural networks; Deep neural networks; Learning systems; Medical image processing; Open systems; Public health; Transfer learning

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