Title: Performance Benchmarking of Transformer-based Pretrained Deep Learning Models for Keratoconus Disease Identification

Author names: Nayeem Ahmed; Md Maruf Rahman; Md Fatin Ishrak; Md Imran Kabir Joy; Md Sanowar Hossain Sabuj; Md. Sadekur Rahman

Abastact: Keratoconus is a progressive eye disorder in which the cornea thins and bulges into a cone shape, causing increasing visual distortion that often begins in adolescence or early adulthood, and the purpose of this research is to present a comprehensive comparison of eight CNNs (pre-trained) that detect keratoconus. The experiment utilized a meticulously put-together dataset comprising keratoconus, normal, and suspect samples. The models assessed were DenseNet121, EfficientNetB0, InceptionResNetV2, InceptionV3, MobileNetV2, ResNet50, VGG16, and VGG19. A rigorous preprocessing pipeline, including sample removal, resizing, rescaling, and augmentation, was developed to ensure consistent and optimized model training. The same hyperparameters, activation functions, and optimizers were used for training all models to ensure a fair comparison. Performance was evaluated based on accuracy, precision, recall, and F1-score. Among the architectures, MobileNetV2 was the best performer, demonstrating its ability to make the fewest incorrect predictions in distinguishing between keratoconus cases and normal ones. InceptionV3 and DenseNet121 were also highly accurate, particularly in the case of keratoconus detection, although both models had issues with the suspect class. On the other hand, the models EfficientNetB0, ResNet50, and VGG19 struggled, especially in distinguishing between suspect and normal samples, which suggests that they still require refinement.

Keywords: Training, Deep learning Hands, Visualization, Accuracy, Shape, Image processing Pipelines, Transformers, Residual neural networks

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