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Syndrome Scan: Automated Facial Analysis for Early Detection of Down Syndrome in Children

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Abstract: Early and accurate diagnosis of Down syndrome is essential for timely intervention and support. This study presents Syndrome Scan, a novel approach that utilizes facial images and advanced deep learning techniques to enhance diagnostic precision. The proposed VNL-Net architecture integrates VGG16 for spatial feature extraction, Non-Negative Matrix Factorization for dimensionality reduction, and Light Gradient Boosting Machine for feature enhancement, followed by classification using Logistic Regression. To enable real-time diagnosis on mobile and edge devices, a MobileNet + SVM hybrid model is introduced, balancing efficiency and accuracy. Experimental results demonstrate improved performance over traditional methods, showcasing the model's potential for practical deployment in automated medical diagnosis.

Keywords: Down Syndrome Diagnosis, Facial Analysis, Feature Extraction, MobileNet, SVM



