ScolioBot: A SMARTPHONE-BASED AI SYSTEM FOR EARLY SCOLIOSIS DETECTION USING DEEP LEARNING MODELS

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Abstract

Scoliosis is a complex spinal deformity characterized by an abnormal lateral curvature, making early detection vital to prevent long-term progression and ensure effective medical intervention. Current diagnostic standards rely heavily on clinical assessments. Additionally, existing artificial intelligence applications predominantly focus on analyzing X-ray based data. Therefore, a research gap remains regarding the use of bareback smartphone-based imagery for initial screenings in non-clinical environments. This study aims to bridge that gap by developing an AI-based image classification system designed to detect early signs of scoliosis using standard smartphone images. The methodology involved using Python within a Google Colab environment to classify images into "normal" and "scoliosis" categories. The study utilized a train-validation-test approach, comprising 200 images for training, 104 for validation, and 101 for independent testing. Four deep learning architectures were compared: ResNet50, VGG16, Xception, and EfficientNetB0. Experimental results, evaluated primarily via F1 scores, identified ResNet50 as the top-performing model with an F1 score of 0.8513, a precision of 0.8512, and a recall of 0.8528. VGG16 followed with an F1 score of 0.8057, while EfficientNetB0 recorded an F1 score of 0.7900. Xception yielded an F1 score of 0.7867. To provide practical utility, the trained models were integrated into a Line Official chatbot named ScolioBot, allowing users to upload images and receive immediate diagnostic predictions. This work demonstrates the significant potential of accessible, mobile-based AI tools to revolutionize scoliosis screening. Future research will focus on further enhancing model accuracy and refining Grad-CAM visualizations for better interpretability.

Keyword: Scoliosis, image classification, artificial intelligence, deep learning