

Title: XAI-FusionNet: Diabetic foot ulcer detection based on multi-scale feature fusion with explainable artificial intelligence

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Abstract: Diabetic foot ulcer (DFU) poses a significant threat to individuals affected by diabetes, often leading to limb amputation. Early detection of DFU can greatly improve the chances of survival for diabetic patients. This work introduces FusionNet, a novel multi-scale feature fusion network designed to accurately differentiate DFU skin from healthy skin using multiple pre-trained convolutional neural network (CNN) algorithms. A dataset comprising 6963 skin images (3574 healthy and 3389 ulcer) from various patients was divided into training (6080 images), validation (672 images), and testing (211 images) sets. Initially, three image preprocessing techniques - Gaussian filter, median filter, and motion blur estimation - were applied to eliminate irrelevant, noisy, and blurry data. Subsequently, three pre-trained CNN algorithms - DenseNet201, VGG19, and NASNetMobile - were utilized to extract high-frequency features from the input images. These features were then inputted into a meta-tuner module to predict DFU by selecting the most discriminative features. Statistical tests, including Friedman and analysis of variance (ANOVA), were employed to identify significant

Keywords: Diabetic foot ulcer (DFU) Deep learning FusionNet Multi-scale feature fusion Convolutional neural network (CNN)

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