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Deep Learning Algorithms for Foot Ulcer Segmentation

Diabetic Foot Ulcer (DFU) is a common complication of diabetes mellitus, which may result in a patient's lower limb amputation if it is not timely detected and promptly treated. Nowadays, the most common practice to evaluate the grade of severity of the diabetic foot ulcer is done manually by specialists, which is time-consuming, laborious, and non-robust. Computerized approaches based on machine learning algorithms to assist healthcare professionals in visual inspection have been emerging to improve their diagnosis and help them to formulate more accurate treatment plans.

Existing computerized image-based methods are focused on detection, segmentation and classification of morphological features associated with DFU. Solely high resolution images for foot-ulceration inspection is not simply enough to assist specialists in this complex task, and extra aid is needed. This project proposes to explore and evaluate the performance of multiple deep learning methods such as Convolutional Neural Networks for

a supervised DFU segmentation, and propose a standardized procedure to avoid noise in the image analysis and improve the accuracy of the deep learning models. For this study, we used the public dataset done by University of Wisconsin-Milwaukee with the collaboration Advancing the Zenith of Healthcare Wound and Vascular Center which contains 1010 labeled foot ulcers images (MICCAI 2021 Foot Ulcer Segmentation Challenge).

We implement different deep neural architectures such as U-Net, ResNet, and LinkNet for Foot Ulcer Segmentation. A comparative study was conducted using Jaccard Score, Dice Coefficient, and Pratt's Figure of Merit (PFOM). In future, we would like to explore more deep neural architectures into segmentation framework and tailoring the proposed algorithms for other medical imaging problems.

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