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MELANOMA/SARCOMA/CNS/LYMPHOMA/OTHERS

PP233 MeDerm: Deep learning framework for automated screening of melanoma from dermoscopic images

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Background: Melanoma is the most lethal type of skin cancer with an average 5-year survival rate of 93%, increasing to over 99% in case of early discovery. For quick diagnosis and screening, examining the changes and growth of moles and skin lesions can be crucial early-on. For this purpose a ruler based monitoring scheme is used to precisely follow and evaluate the gradual alterations of the skin lesions. In this work we have adopted machine learning models to both characterize existing rulers or synthesize ruler masks on existing images.

Methods: We utilize the ISIC 2018 and 2019 competition data which contains 27925 images with manual labeling, 5704 images with a ruler, and 19627 images without a ruler. Using five rulers designed similarly to real-world samples and employing the images without a ruler, 39254 images with rulers and a ruler mask were synthesized. A U-Net model based on MobileNet-V2 was trained to perform the task of ruler segmentation. The output mask was fed to the Two-Point Correlation Function (TPCF) and its result was directed into a one-dimensional CNN to predict how many image pixels occupy one millimeter. Next, a different MobileNet-V2-based U-Net model was trained on 2594 images from the 2018 competition Task1 annotated dataset for the lesion segmentation task. Finally, given the pixel size in millimeters and lesion region in the image, one can measure the changes in statistical and geometrical properties such as area and diameter of a lesion over time.

Results: In this work, three neural networks and one statistical tool were used. The DICE similarity score of the ruler segmentation task model was 0.904. The output of this model was fed to TPCF and the result was driven as the input of a neural network, whose MSE and MAE errors regarding the number of pixels occupying one millimeter were 6.6 and 1.5, respectively, which is marginally small in retrospective to the actual number of pixels that occupy one millimeter (which is 35-70). Finally, the DICE similarity score for the lesion segmentation task model was 0.908.

Conclusions: Considering the importance of the screening of moles and skin lesions, we have developed a framework that can measure the actual size of a skin lesion using a ruler embedded within the image and predict its changes using various methods. In addition, we adopted a lightweight neural network so that the framework could be used in edge devices. Finally, our framework can measure and report the changes in various skin lesions over time utilizing follow-up data.

Keywords: *Melanoma, Deep Learning, Statistics*

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