Skin cancer and deep learning for dermoscopic images classification: A pilot study

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Abstract

Background: The prevalence of skin cancer is increasing worldwide. According to World Health Organization (WHO),there is one in every three cancers diagnosed in US is a skin cancer. Traditional ways for skin cancer diagnosis have shown many limitations: inadequate accuracy, consume much time, and effort. In order to assist dermatologists for earlier and accurate diagnosis, we propose to develop a computer aided diagnosis systems for automatic classification of skin lesions. Deep learning architectures are used in this area based on a new convolutional neural network that can classify skin lesions with improved accuracy.

Methods: A public dataset of skin lesions HAM10000 ("Human Against Machine with 10000 training images") is used for training and testing. For the validation of our work, a private dataset is collected from a dermatology office in Besançon (France). This dataset contains 45 different dermatoscopic images of skin lesions (Basal cell carcinoma, squamous cell carcinoma and Actinic keratosis) with their histology results. In this research, a three-phase approach was proposed and implemented: Phase one is preprocessing the data; by amputate missing values using the mean filling method. The dermoscopy images in the dataset were downscaled to 224X224 pixels. Then, data augmentation was applied to solve the imbalanced data problem. Finally, the ten-fold cross-validation method was applied to compare the performance of three CNN architectures used in literature: DenseNet 201, ResNet 152, and VGGNet with our proposed architecture.

Results: Results obtained with our model show the highest classification accuracy 0.95, a sensitivity of 0, 96, a specificity of 0.94, and outperforms other algorithms in classifying these skin lesions.

Conclusions: Our research improves the performance of computer aided diagnosis systems for skin lesions by giving an accurate classification. The use of this system helps dermatologists to make accurate classification with lower time, cost, and effort. Our future work will focus on generalizing the domain by developing a model that can classify various lesions using various types of data (dermoscopic images, histological images, clinical data, sensors data, etc) using the advanced techniques in literature of transfer learning and adaptors models.