ORIGINAL RESEARCH

Skin Diseases Detection Using LBP and WLD: An Ensembling Approach

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Abstract

In all developing and developed countries globally, skin diseases are becoming a prevalent health problem for humans of all age groups. Skin diseases create anxiety, affect mental health, worsen working life, and sometimes cause social isolation. Detecting skin diseases in the early stage is very important because early treatment can be helpful in such cases. There are very few dermatologists in rural and semi-urban areas in a country like India. To overcome the problem, a machine learning technique has been developed to detect three prevalent skin diseases—Leprosy, Tinea versicolor, and Vitiligo from the images of the skin lesions. The proposed approach extracts the texture from the images of the skin regions affected by such diseases using Weber's local descriptor and Local binary pattern. Then the representations are ensembled to prepare the feature vector. This ensemble technique achieved 91.38% accuracy using a multilevel support vector machine, using the features extracted from different regions of the skin lesions area utilising the centre of gravity based rotation invariant Weber local descriptor and Local binary pattern. Some popular deep learning networks such as MobileNet, ResNet152, GoogLeNet, DenseNet121, and ResNet101 were used to compare the performance of the proposed approach with the deep learning models. ResNet101 achieved 89% accuracy, i.e. best among all the deep learning models used in this study. The proposed ensemble technique outperformed the top performing deep learning model by 2.38%. This technique will be helpful for the early screening of these skin diseases.

Keywords Pattern recognition · Leprosy · Tinea versicolor · Vitiligo · STM · WLD · WLDRI · LBP · Multi-SVM

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Introduction

Skin diseases have become a big concern for people living in smart cities and industrial areas worldwide. People with skin diseases have a feeling of being cursed and try to stay away from the community. Skin diseases have a very negative impact on an individual's personal, social, and working lives and their family members' lives. The affected people suffer from depression, stress, anxiety, and low self-confidence, which may culminate into a suicidal tendency. In many cases, it has been observed that early detection of diseases may be helpful for doctors to cure a patient comprehensively. In a highly populated country like India, very few dermatologists are available in rural and semi-urban areas. So, keeping all these in mind, an automatic, non-invasive technique to detect skin diseases is essential. Several research works have been done to automatically identify different skin diseases from the images of skin lesions using different pattern recognition and computer vision-based approaches. Preparing a standard automatic or semiautomatic non-invasive technique for identifying different skin diseases