ABSTRACT

Malignant melanoma is the most dangerous type of skin cancer, yet it is the most treatable kind of cancer, conditioned by its early diagnosis which is a challenging task for clinicians and dermatologists. In this regard, CAD systems based on machine learning and image processing techniques are developed to differentiate melanoma lesions from benign and dysplastic nevi in dermoscopic images. Generally, these frameworks are composed of sequential processes: pre-processing, segmentation and classification. This architecture faces some challenges: each stage is complex with the need to tune a set of parameters, and moreover is specific to a given dataset; the performance of each stage dependent on the previous stage, and the errors are accumulated through the framework. In this paper, we propose a framework for melanoma classification based on sparse coding which does not rely on any pre-processing or lesion segmentation. Our proposed framework uses Random Forests classifier and sparse representation of three features: SIFT, color histograms and statistics, and RGB intensities. Our experiments are carried out on the public PH^2 dataset using a 10-fold cross-validation. The results show that SIFT sparse-coded feature achieves the highest performance with sensitivity and specificity of 100% and 90.3% respectively, with a dictionary size of 800 atoms and a sparsity level of 2. Furthermore, the descriptor based on RGB intensities achieves similar results with sensitivity and specificity of 100% and 71.3%, respectively for a smaller dictionary size of 100 atoms. In conclusion, dictionary learning techniques encode strong structures of dermoscopic images and provide discriminant descriptors.