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A REVIEW ON FACE SKIN DISEASE USING IMAGE PROCESSING TOOLS AND MACHINE LEARNING TECHNIQUES

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Abstract - *Face is one of the most fundamental part of body for individual recognition. People are more concerned about facial disorders than diseases that affect other parts of body. The clinical diagnosis and identification of different disease is much time consuming and require help from clinical experts. This can be solved by using a computer based method for the identification and classification of disease. Different image processing techniques such as k-means clustering, texture analysis, FCM etc. can be used for feature extraction. Using these extracted features from different images, diseases can be identified with the help of different machine learning algorithms like SVM, CNN, PNN, ANN etc.*

Key Words: deep learning, skin diseases, CNN, PNN, SVM classifier, medical image processing, dermatology

1. INTRODUCTION

All human faces are unique and contribute to individual identity. It is the part of body that other people notice about a person. Vision, hearing, olfaction, eating, and breathing are considered the primary functions of the face. In addition, the face is important for expression.

Different studies and survey shows that people who experience facial deformities due to trauma or burns or other diseases possess a negative self-image compared to those with normal faces. Chronic skin conditions are well recognized to cause problems with self-esteem and low confidence. For each individual, skin problems can have adverse effects on all aspects of life, including interpersonal relationships, work, social functioning, physical activity and mental health. Skin diseases had the fourth leading cause of nonfatal disease burden in the world, and three of the world's most common diseases were skin diseases. Skin diseases have caused enormous economic burdens both in high-income and low-income countries [9].

In this paper review of different techniques which help in the early diagnosis of skin diseases is carried out as literature survey.

2. LITERATURE REVIEW

There has been a great improvement in image processing and machine learning techniques for the past years in many fields including medical field. Various methodologies which is used for identification and classification of different skin disease are discussed below:

Among machine learning techniques CNN is the one which achieve better performance. In [1] , Zhe wu et al, compare efficiency of five different CNN algorithms for six facial skin diseases. The diseases include Basal cell carcinoma(BCC), squamous cell carcinoma(SCC), LE(lupus erythematosus), seborrheic keratosis(SK), actinic keratosis(AK), and rosacea. First of all, they created dataset Xiangya-Derm which contain images of these six diseases by making use of other dataset such as AtlasDerm, DermlS, the ISIC Archive, Derm101 and Dermnet. The basic architecture of CNN generally consist of an input layer, many convolutional layers and ouput layer. The five algorithms used here are ResNet-50, Inception-v3, DenseNet121, Xception and Inception-ResNet-v2.

ResNet-50 is a type of network which add connections between the shallow and deep layers of network, which transmit the information directly. The inception network contains different kernals, whose outputs are combined to obtain output of classifier. Densenet add connection between each layer in which output of one layer is used as output for subsequent input layers. This improves the performance. Xception is an updated version of inception. It improves the inception module by with depth wise separable convolution which attain better performance than Inception. Inception-ResNet is a combination of inception and ResNet structures which can train deeper network by maintaining diversity of network. In this paper they used same 300∗300 input images for each network. It includes 2,656 facial images for a total of 4,394 images. Inception-resnet-v2 achieved the highest performance among the different structures.

The papers [2], [3] discuss about the use of CNN for identification of face skin diseases and other skin diseases. Image acquisition is done using camera or images from dataset. The acquired image is pre-processed by converting into standard size, noise removal etc. In [2], Soft-max image classifier is used to diagnose diseases. Its initial training gave output accuracy of 70% with images in the dataset. [3] made use of the CNN architecture VGG-16 for the identification and classification of facial skin diseases. The model was trained and validated by a database that containing 12000 images. It

achieves an accuracy of 88% and classifies successfully the facial skin images given for test with an accuracy of 98.5%. Accuracy of both methods can be improved by increasing the number of images in dataset and new neural network architecture.

The recognition of skin disease using texture analysis is described in [4]. Some disease share common symptoms which can lead to confusion in detecting and recognizing exact type of skin diseases. Hence the computer aided diagnosis with the help of GLCM and ANN is implemented. Three commonly occurring diseases - Eczema, Impetigo and Psoriasis is considered here. The images from dermnet, whose texture analysis is done using GLCM. GLCM is a better statistical method for texture analysis and it also indicates the probability of object's pattern. The classification of pre-processed images is done using ANN, which make use of back propagation. By using the limited number of images in the dataset, the system acquired 80% accuracy, 71% sensitivity, and 87% specificity approximately.

In [5] diagnosis of skin disease is done based on classification of sonogram using neural network. The sonography images acquired are used to propose a new method using ultrasound waves and intelligent artificial systems for diagnosing skin disease. Feature extraction is done using different image processing techniques such as filtering, fuzzy techniques and other methods. The classification and diagnosis is done using neural network. The system succeeded in detecting benign or malignant skin lesions from healthy skin. It also isolated BCC and melanoma from each other, which shares some common symptoms. The system had shown higher performance with lower error rate.

In [6], the automatic segmentation of psoriasis images is done using MRF and SVM. It is a chronic skin disease that affects an estimated 125 million people worldwide as scaly and red patches of itchy skin. The scaling contrast map created is used for necessary feature extraction using different techniques. The segment scaling is done using semi-supervised algorithm to ensure invariance of segmentation and skin changes from different patients. This paper proposed a general framework for automatic localizing scaling psoriasis images, implemented by semi-supervised classification. It used dataset containing 722 images, of which 103 images are used for testing. SVM and MRF are combined here to classify the images with higher performance rate.

In [7], PNN is used for the classification based on texture analysis of skin diseases which have similar characteristics. The image processing section includes conversion of colour images into HSV, use of wavelet transform to reduce redundancy etc. DRLBP techniques along with GLCM are employed for function extraction. GMM segmented data is classified into normal or abnormal skin using neural network.

The system present several image segmentation methods to detect acne lesions and machine learning methods used to distinguish different acne lesions from each other [8]. Different datasets from various dermatology resources were used. The three different image processing techniques-texture analysis, HSV model, K-means clustering are used and their results are compared. Images are classified using FCM method and for classification, SVM is used. The average accuracy of classification to distinguish acne scarring from inflammatory acne for FCM is 80% and linear SVM method is 66.6%.

3. CONCLUSION

This paper discusses various methods for skin diseases identification and classification. Different image processing techniques and machine learning techniques are employed for this. Most of the proposed system make use of CNN which is considered as one of the best method for classification and also good in feature extraction which reduce human labour. One of the challenges to most of the method is availability of exact dataset. The performance of the system can be increased by increasing the number of images for training the classifier. By making use of this study further improvement can be brought to existing methods with higher performance and to reduce the time required for the diagnosis.

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