International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 04 | Apr 2021 www.irjet.net p-ISSN: 2395-0072

Vision Based Dermal Disease Prediction and Diagnosis Using Image Processing

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Abstract - *Dermatology is termed as a visual specialty where in most diagnosis can be performed by visual inspection of the skin. The proposed system 'Vision based dermal disease prediction and diagnosis using image processing' deals with the creation of a desktop application that helps in diagnosis of Skin disease. It is hardware and software-based integrated web architecture which aims to predict skin disease. This system is easy to detect and identify the type of disease at an early stage. It uses image processing and machine learning technology to detect diseases. The patient with dermal disease will upload the blood report and the image of the affected skin area through his login ID. By using CNN algorithm the uploaded image is segmented and further classifies the disease and the image processing helps in identifying the disease so that the doctor can diagnose the skin condition quickly. Thus it will help in better association to predict and diagnose the dermal disease.*

***Key Words*: Image upload, image segmentation, image processing, Convolution Neural Network (CNN), disease prediction, medicine prescription.**

1. INTRODUCTION

Skin diseases are characterized as disorders that mainly begin from inside the skin and outwardly shown on the skin. These diseases are common among people which are even due to the climatic changes. Skin diseases are caused by fungus, bacteria, virus etc. In fact, they are chronic, infectious and sometimes they even develop into skin cancer. So these diseases should be cured immediately in order to reduce its spread all over the body at an early stage itself.

Sometimes it is even hard for the Dermatologist (skin specialist doctor) to identify the type and stage of the skin disease and it might also require high cost laboratory equipment. The advancement of lasers technology has made it possible to diagnose the skin diseases much more quickly and accurately. But the cost of such diagnosis is still not affordable by most of the people.

Therefore, we proposed a system based on image-processing to detect and classify the type of skin disease. This system is broken down into two parts they are image pre-processing and classification. The first part includes the image of the affected skin and it undergoes various pre-processing techniques such as noise removal, image resizing, image enhancement etc. followed by feature extraction. The second part includes Convolution Neural Network in order to classify and identify the disease based on the trained datasets given. This approach that we provide is easy and simple for the dermatologist to diagnose the skin disease at an early stage.

In this way we can reduce the high spread of the disease, high laboratory cost and there is no need of high financial status for the public.

2. LITERATURE SURVEY

The related work on this project shows that there have been several methods of implementing the system under different domain.

[1] The MobileNet model was used by applying transfer learning on the 7 skin disease classification system on Android application. The proponents gathered a total of 3,406 images and it is considered as imbalanced dataset because of the unequal number of images on its classes. Using different sampling method and preprocessing of input data was explored to further improved the accuracy of the MobileNet. Using under-sampling method and the default preprocessing of input data achieved 84.28% accuracy. While, using imbalanced dataset and default preprocessing of input data achieved 93.6% accuracy. Then, researchers explored oversampling the dataset and the model attained a 91.8% accuracy. Lastly, by using oversampling technique and data augmentation on preprocessing the input data provide 94.4% accuracy and this model was deployed on the developed Android application.

[2] Dermatology is one of the most unpredictable and difficult terrains to diagnose due to its complexity. In most developing countries, it is expensive for a large number of people. According to World Health Organization (WHO), skin diseases are the most common non-communicable diseases in India. The ubiquitous use of smartphones in developing countries like India has opened up new avenues for inexpensive diagnosis of diseases. The camera in smartphones can used to exploit the image processing capabilities of the device for diagnosis. The proposed system deals with the creation of an application that helps in diagnosis of Skin disease. It uses image processing and

machine learning technology to detect diseases. The system consists of 2 parts- image processing and the machine learning. The image processing part deals with applying various filters to the images to remove noise and make them uniform. It is necessary to remove the unwanted elements from the image before processing else it will affect the output efficiency. The Machine learning part deals with the processing of data and generation of result.

[3] The prior publication by **Damilola A. Okuboyejo, Oludayo O. Olugbara, and Solomon A. Odunaike**, titled **"Automating Skin Disease Diagnosis Using Image Classification"** examines a similar premise. Here a study has been made to design and model a system that uses medical imaging to reduce heavy dependencies on medical expert for diagnosis procedure of Pigmented skin Lesion (PSL) in patients. The methodology of this work is based on soft science design to realize a prototype system for the diagnosis of skin disease represented by a skin image. The intention being the use of feature based on texture analysis and classifies the lesion using techniques such as thresholding and neural networks to develop and prototype a new algorithm for skin disease diagnosis.

[4] In the paper **"Skin Disease Diagnosis System using Image Processing and Data Mining"** by **R. S. Gound, Priyanka S. Gadre,** a system has been proposed an image obtained from the user is processed and segmented to create a model that can predict the disease for a new image of a skin disease. Feature extraction is done on each image to extract features that can be used to create classification model. With this classification model, system finally can predict the disease for a new image of a skin disease which will be obtained by the user through Android application. And based on this predicted disease, system will ask question from the user and based on answer, system will decide disease type. Finally, the system suggests medical treatment or the advice based on predicted skin disease result. The diseases taken into consideration are Eczema, Fungal infection.

[5] **A Image analysis System to Detect Skin Diseases"** by **Pravin S. Ambad and S. Shirsat** presents the image analysis system to detect different skin diseases, where user will be able to take images of different moles or skin patches and the system will analyse and process the image and classifies the image to a variety of skin disease. This system captures image from standard database and put in to the system to inform the user for preventing the threats linked to skin diseases. The system will analyse and process the image and classifies the image to normal, melanoma, psoriasis or dermo case based extraction the image features. An alert will be provided to the user to seek medical help if the mole belongs to the atypical or melanoma category. This methodology also suffers from the issues with segmentation.

3. PROPOSED SYSTEM

This system is easy to detect and identify the type of disease at an early stage. By using CNN algorithm it classifies the disease and the image processing helps in identifying the disease so that the doctor can diagnose the skin condition quickly.

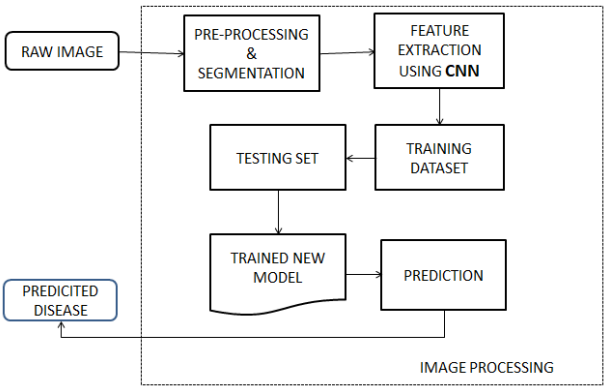

Fig -1: Block diagram

3.1 Image Preprocessing and Segmentation

In image pre-processing, image is converted into a more useful form and it also removes unwanted noise and distortions. Neighboring pixels of a single object in an image has the same or similar brightness which helps the system to recognize the object and separate it. The ultimate goal of image segmentation is to convert the image into a form which clearly identifies and marks the region of interest. As far as disease detection is concerned, segmentation defines the boundaries and region of affected part of the body. It clearly identifies the affected region. The image is converted into a binary image ie black and white. The black region is the normal skin or the unaffected region. The white region is the area of interest. It depicts the affected or diseased region. More precisely, the purpose of segmentation is to assign a value or a tag to each pixel in a digital image. All the pixels with the similar tag or value shares similar properties and attributes and features with the rest of them.

The consequence or outcome of segmentation is a group of sections or chunks in the image that altogether form the entire image. Similar regions in the segmented image share similar attributed within them. These features can be color, shape, size, edges, textures etc. Different regions have different attributes in the segmented image.

3.2 Feature Extraction

Feature extraction is a part of the dimensionality reduction process, in which, an initial set of the raw data is divided and reduced to more manageable groups. So when you want to process it will be easier. The most important characteristic of these large data sets is that they have a large number of variables. These variables require a lot of computing resources to process them. So Feature extraction helps to get the best feature from those big data sets by select and combine variables into features, thus, effectively reducing the amount of data. These features are easy to process, but still able to describe the actual data set with the

accuracy and originality. Feature extraction is carried out using Convolutional Neural Network (CNN).

3.3.1 CNN

A Convolutional Neural Network (CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. The Convolutional Neural Networks are deep artificial neural networks used primarily for classifying images. It contains different layer like Convolutional layer, pooling layer and fully connected layers. An image is given as input and it is processed by these layers to extract he featured. The applications of CNN are image and video recognition, recommender systems, image classification and medical image analysis.

3.4 Disease Identification

After Image Segmentation is done, next comes detecting the disease. After segmentation, analyze the segmented image for either the shape or color or size or texture. This image is then compared to that of the healthy database already created in advance. The database has the features of the healthy skin. These features include the color of the healthy skin, its texture, shape and size. If the features do not match the ones present in the database, then the image is deemed to have the disease. The database also has the features of different diseases. The features of the input image that most closely match that of the diseases in database; the disease is declared with the most closely related features. After comparing the input image to that of the database, the disease can be detected.

4. CONCLUSIONS

The **Vision based dermal disease prediction and diagnosis using image processing** is implemented using convolutional neural networks(CNN). The result is proper sets of training data are able to predict the skin disease. A hybrid approach is recommended in solving properly the detection and prediction of skin disease by image processing. Our method is used to predict the diseases accurately. Then these methods are used to predict the disease is affected or not affected by using a comparison method. These methodologies are validated by a comprehensive set of comparisons against competing and well-established image registration methods, by using real training datasets and our proposed method is mostly used in medical field. It is used to easily detect the skin disease.

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