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SKIN DISEASE PREDITION USING DEEP LEARNING INTEGRATED WITH LLM

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***Abstract*—Skin diseases, which affect millions of individuals worldwide, pose a significant health risk if not diagnosed and treated promptly. Early detection of skin diseases such as melanoma, eczema, and psoriasis is crucial for improving patient outcomes. Recent advancements in deep learning, particularly Convolutional Neural Networks (CNNs), have shown remarkable promise in automating the diagnosis of skin diseases through image analysis. This paper presents a CNN-based approach to detect and classify various skin conditions from clinical images. The proposed system uses a deep convolutional architecture to extract meaningful features from high-resolution skin images and classify them into different categories. The model is trained on a large dataset of labeled images, incorporating both dermatological knowledge and neural network capabilities. The results demonstrate that the CNN model achieves high accuracy and efficiency in detecting skin diseases, outperforming traditional image processing techniques and providing a potential tool for assisting dermatologists in clinical settings**

Keywords— Skin disease detection, Convolutional neural network, Multimodel learning, Deep learning, Image classification

I. INTRODUCTION

Skin diseases are among the most prevalent health conditions globally, affecting millions of people regardless of age, gender, or geographical location. These conditions range from benign issues, such as acne and eczema, to more severe diseases like melanoma, which is one of the deadliest forms of skin cancer. Early and accurate detection of these diseases is essential for timely treatment and better patient outcomes. However, diagnosing skin diseases often requires the expertise of dermatologists, and the manual examination of skin lesions can be time-consuming and prone to human error. As a result, there is an increasing demand for automated systems that can assist healthcare professionals in diagnosing skin diseases efficiently and accurately.

II. LITERATURE SURVEY

Several researchers have proposed image processing-based techniques to detect the type of skin diseases. Here we briefly review some of the techniques as reported in the literature.

In [1], a system is proposed for the dissection of skin diseases using color images without the need for doctor intervention. The system consists of two stages, the first the detection of the infected skin by uses color image processing

techniques, k-means clustering and color gradient techniques to identify the diseased skin and the second the classification of the disease type using artificial neural networks. The system was tested on six types of skin diseases with average accuracy of first stage 95.99% and the second stage 94.016%.

In the method of [2], extraction of image features is the first step in detection of skin diseases. In this method, the greater number of features extracted from the image, better the accuracy of system.

The author of [2] applied the method to nine types of skin diseases with accuracy up to 90%.

Melanoma is type of skin cancer that can cause death, if not diagnose and treat in the early stages. The author of [3], focused on the study of various segmentation techniques that could be applied to detect melanoma using image processing. Segmentation process is described that falls on the infected spot boundaries to extract more features.

The work of [4] proposed the development of a Melanoma diagnosis tool for dark skin using specialized algorithm databases including images from a variety of Melanoma resources. Similarly, [5] discussed classification of skin diseases such as Melanoma, Basal cell carcinoma (BCC), Nevus and Seborrheic keratosis (SK) by using the technique support vector machine (SVM). It yields the best accuracy from a range of other techniques.

On the other hand, the spread of chronic skin diseases in different regions may lead to severe consequences. Therefore, [6] proposed a computer system that automatically detects eczema and determines its severity. The system consists of three stages, the first effective segmentation by detecting the skin, the second extract a set of features, namely color, texture, borders and third determine the severity of eczema using Support Vector Machine (SVM).

In [7], a new approach is proposed to detect skin diseases, which combines computer vision with machine learning. The role of computer vision is to extract the features from the image while the machine learning is used to detect skin diseases. The system was tested on six types of skin diseases with accurately 95%.

III. Description of The Dataset

We compiled our dataset by collecting images from different websites specific to skin diseases. The database has 80 images of every disease (20 Normal images, 20 Melanoma images, 20 Eczema images and 20 Psoriasis images). Fig 1 shows some of the sample images from our dataset.

Fig. 1. The first image is eczema, the second Melanoma; the third is psoriasis, and finally healthy skin.

1. IV. Methodology

In this section, the methodology of the proposed system for detection, extraction and classification of skin diseases images is described.

The system will help significantly in the detection of melanoma, Eczema and Psoriasis. The whole architecture can be divided into several modules comprising of preprocessing, feature extraction, and classification.

4.1 Preprocessing

Achieving high performance of skin disease detection system requires overcoming some major difficulties. Such as creating a database and unifying image dimensions. In the following section, the technique used in image resizing is explained.

- *Image Resizing:*

2. To resolve the problem of different image sizes in the database an input image is either increase or decrease in size. Unifying the image size will get the same number of features from all images. Moreover, resizing the image reduces processing time and thus increases system performance. Fig 3 shows the original image of size is 260×325 pixels. Fig 4 shows the resized image with the new size of 227×227 pixels.

Fig. 3. Example of Original image of Eczema database.

Fig. 4. Example of resizing image of Eczema database.

2.1. Feature Extraction:

3. At the beginning, Convolutional Neural Network (CNN) is a set of stacked layers involving both nonlinear and linear processes. These layers are learned in a joint manner. The main building blocks of any CNN model are: convolutional layer, pooling layer, nonlinear Rectified Linear Units (ReLU) layer connected to a regular multilayer neural network called fully connected layer, and a loss layer at the backend. CNN has known for its significant performance in applications as the visual tasks and natural language processing [8].

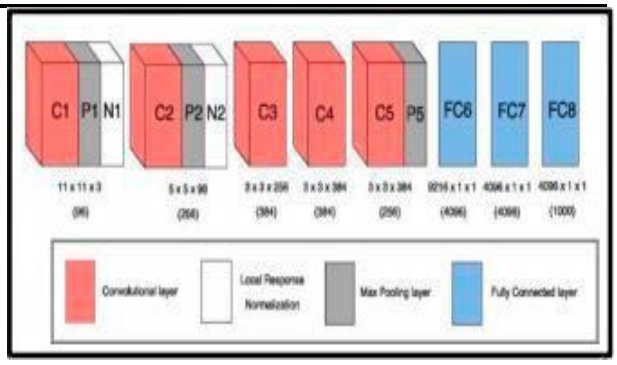

Fig. 5. AlexNet block diagram [8].

AlexNet is a deep CNN model, developed by Krizhevsky et al. [8], to model the 2012 ImageNet for the Large Scale Visual Recognition Challenge (ILSVRC-2012). AlexNet consists of five convolutional layers; where a nonlinear ReLU layer is stacked after each convolutional layer. In addition, the first, second, and fifth layers contain maxpooling layers, as shown in Figure 5. Moreover, two normalization layers are stacked after the first and the second convolutional layers. Furthermore, two fully connected layers at the top of the model preceded by softmax layer. AlexNet was trained using more than 1.2 million images belonging to 1000 classes [8].

We proposed feature extraction from a pretrained convolutional neural network. Because it is the easiest and robust approach to use the power of pretrained deep learning networks.

4.3 Classification:

Classification is a computer vision method. After extracting features, the role of classification is to classy the image via Support Vector Machine (SVM). A SVM can train classifier using extracted features from the training set [9].

5.Result:

The system is implemented in MATLAB 2018b. We used a platform of Intel Core i3 processor 2.10 GHz with 4- GB RAM.

The Implementation results are shown in Figure 6. Initially, the input images are preprocessed, then features are extracted using pretrained CNN. Finally, classification is performed using SVM classifier.

this study, 100 skin images were used by several dermatological disease patients, also were taken from the Internet. The proposed system can successfully detect 3 different skin diseases with an accuracy In of 100%

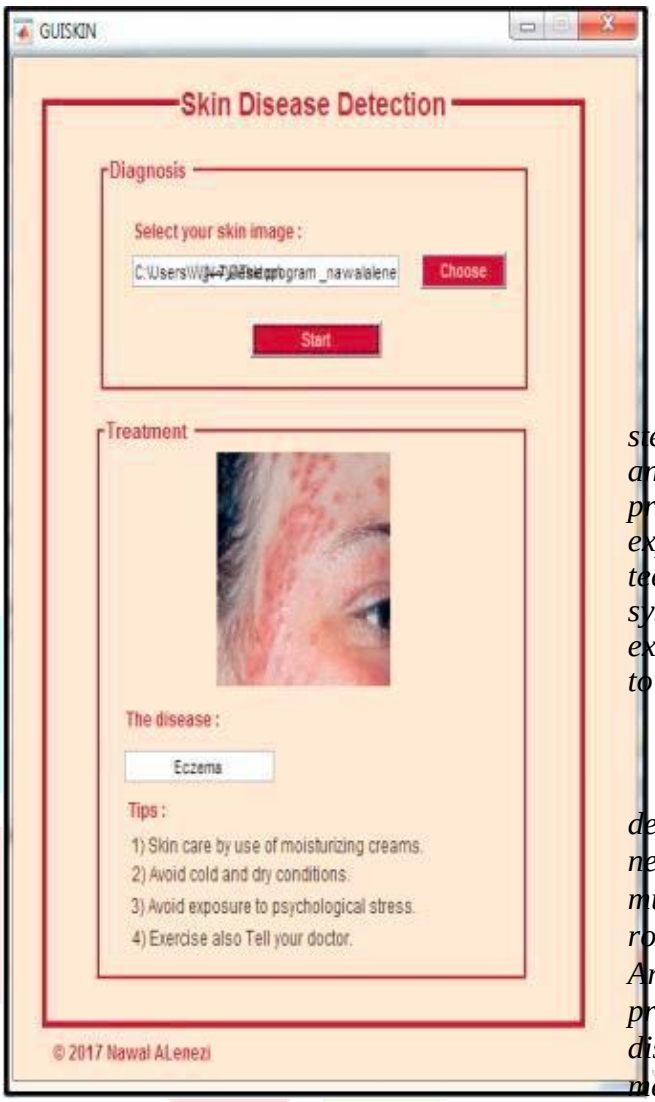

Fig. 6. Result Screen.

We have used 20 of images for validation purpose and 80 images for training purpose. The system works well.

The detection rate of our system is 100%. In the Table 5.1 we can see different detection rate for 3 different diseases.

The detection rate of diseases is very high 100%

6.*Future Work:*

Jason Fried says, "When is your product or service finished? When should you put it out on the market? When is it safe to let people have it? Probably a lot sooner than you are comfortable with. Once your product does what it needs to do, get it out there [10].

Just because you have still got a list of things to do does not mean it is not done. Do not hold everything else up because of a few leftovers. You can do them later. And doing them later may mean doing them better, too. [10]. There are many enhancements and extensions which will be added in the future, first, the method of detect skin disease must be on the mobile application developed, then detection the skin lesion in Dermis layer of the skin, finally must detect all the skin disease in the world and degree of disease.

7.Conclusion:

Detection of skin diseases is a very important step to reduce death rates, disease transmission and the development of the skin disease. Clinical procedures to detect skin diseases are very expensive and time-consuming. Image processing techniques help to build automated screening system for dermatology at an initial stage. The extraction of features plays a key role in helping to classify skin diseases.

In this research the method of detection was designed by using pretrained convolutional neural network (AlexNet) and SVM. In conclusion, we must not forget that this research has an effective role in the detection of skin diseases in Saudi Arabia because it has a very hot weather for the presence of deserts; this indicates that skin diseases are widespread. This research supports medical efficiency in Saudi Arabia.

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