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Skin Disease Detection Using Machine Learning

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***Abstract*—Skin illnesses are more prevalent than other diseases. Skin disorders can be caused by a variety of things, including viruses, bacteria, allergies, and fungi. Thanks to advancements in laser and photonics-based medical technology, skin diseases can now be detected much more quickly and precisely.However, the expense of such a diagnostic is still very high. Therefore, image processing methods aid in the beginning development of automated dermatology screening systems. The classification of skin diseases relies heavily on the extraction of features. In a number of methods, computer vision plays a part in the identification of skin conditions. Skin infections are prevalent in Saudi Arabia as a result of the deserts and the hot climate. The study of diseases of the skin detection is aided by this work. We suggested a method for identifying skin conditions based on image processing. This technique uses analysis of images to determine the sort of disease after taking a digital photograph of the affected skin area. A digital camera and a personal computer are the only pricey pieces of equipment needed for our straightforward, quick method. The method uses a color image's inputs as its basis. Then, using a convolutional neural network that has already been trained, resize the picture in order to extract features. After that, a multiclass SVM was used to classify the feature. The user is then presented the results, which include the kind of disease, its distribution, and its severity. With a 100% accuracy rate, the system can accurately identify three different kinds of skin illnesses.**

Keywords—skin disease, cause, solution, svm.

I. Introduction

More people have skin conditions than other illnesses. Skin conditions can be brought on by viruses, germs, allergies, fungal infections, and more. Skin conditions can alter the tone or texture of the skin. Skin conditions tend to be persistent, contagious, and occasionally carcinogenic. Thus, early detection of skin conditions is necessary to limit their emergence and spread. Skin disease diagnosis and treatment are more time-consuming, costly, and physically taxing for the patient.

The majority of regular people often are not aware of the various stages and types of a skin illness. Some skin conditions don't manifest symptoms for several months, which allows the illness to grow and spread.

Skin illnesses can now be identified much more rapidly and precisely because of improvements in laser and photonics-based medical technologies. However, the expense of such a diagnostic is still very high. Therefore, we suggest a skin disease diagnosis method based on image processing. This technique uses the analysis of images to determine the sort of disease after taking a digital photograph of the affected skin area. A digital camera and a computing device are the only pricey pieces of equipment needed for our straightforward, quick method.

II. Research And Development

Future endeavors in skin disease detection using ML will focus on enhancing the accuracy, efficiency, and comprehensiveness of existing algorithms. Researchers will collaborate to collect and curate large-scale datasets encompassing diverse skin conditions, ethnicities, and environmental factors. These datasets will be used to train ML models, leveraging advanced techniques such as deep learning and transfer learning to improve classification performance.

To address the challenge of interpretability in ML models, researchers will investigate techniques for generating explanations and visualizations to enhance the transparency of predictions. This will not only provide clinicians with confidence in the accuracy of the diagnosis but also facilitate the understanding of underlying disease mechanisms. Please do not revise any of the current designations.

III. Possible Procedures

It involves locating and recognizing items in an image or video, which is a computer's vision challenge. The processes that go into object detection generally entail the following steps:

A. ***Image Acquisition* :** The process begins with capturing or obtaining an image or a frame from a video source. This could be from a camera, a pre-recorded video, or any other image source.

B. ***Preprocessing:*** Before performing object detection, it is often necessary to preprocess the image to enhance its quality and make it more suitable for analysis. Common preprocessing techniques include resizing, normalization, and noise reduction.

C. ***Feature Extraction:*** In order to detect objects, meaningful features need to be extracted from the image. Feature extraction involves identifying distinctive patterns or characteristics that can help distinguish objects from the background. Various techniques can be used for feature extraction, such as edge detection, texture analysis, or local feature descriptors like SIFT, SURF, or ORB.

D. ***Object Localization***: Object localization aims to determine the position and extent of each object within the image. This typically involves drawing bounding boxes around the objects to indicate their location and shape. Localization can be achieved using techniques like sliding window-based approaches, region proposal methods (e.g., selective search, region-based convolutional neural networks), or anchor-based methods (e.g., single-shot detectors, two-stage detectors).

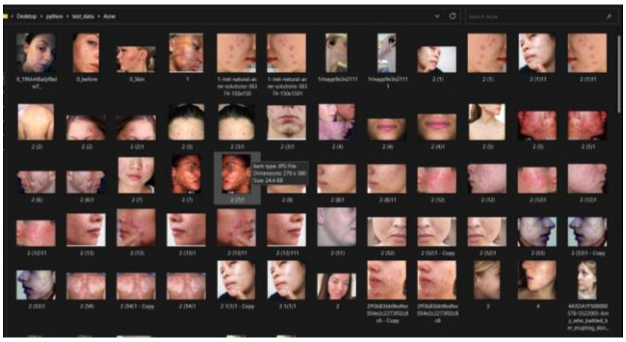
E. ***Classification***: Classifying items into various specified categories or classes comes after they have been localized. This entails giving each object a label or class. Different techniques, including convolutional neural networks (CNNs), decision trees, and support vector machines (SVMs), can be used for classification.

F. ***Post-processing:*** After classification, post-processing steps can be applied to refine the detected objects. This may involve removing duplicate detections, filtering out false positives using confidence scores or probability thresholds, or applying additional constraints to improve the accuracy of the detected objects.

G. ***Object Tracking (optional)***: In some cases, object detection is extended to object tracking, which involves following the identified objects across multiple frames in a video sequence. Object tracking algorithms can be applied to maintain the identity and trajectory of objects over time.

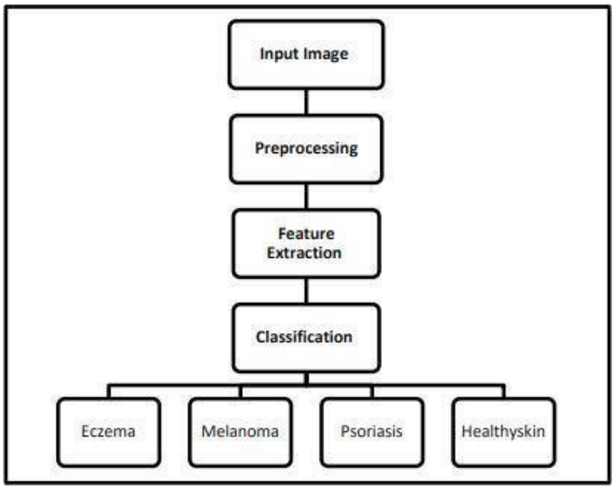
Dataset Management

dataset by gathering pictures from many websites dedicated to skin conditions. Each disease is represented by 80 photos in the database (20 normal, 20 melanoma, 20 eczema, and 20 psoriasis). Fig. 1 displays a few examples of the photos from our dataset.



IV. Methodology

The proposed system's methodology for image detection, extraction, and categorization of skin disorders is detailed. Melanoma, Eczema, and Psoriasis will all be substantially easier to identify thanks to the method. Preprocessing, extraction of features, and classification are some of the components that make up the entire architecture.



A. ***Pre Processing*** *:* High performance skin illness detection techniques need to overcome several significant obstacles. Establishing a database of data and standardizing image dimensions are two examples. The method for image resizing is described in the following section

B. ***Image Resizing*** *:* The image that is input is either made larger or smaller to address the issue of varying dimensions of images in the database. The same amount of features will be obtained from all photographs by standardizing the image size. Additionally, shrinking the image speeds up the system by reducing processing time. Figure 3 depicts the original image, which is 260 by 325 pixels. The image has been reduced in size to 227 by 227 pixels, as seen in Fig. 4

C. ***Feature Extraction :*** A collection of stacked layers with both nonlinear and linear operations makes up a convolutional neural network (CNN). These levels are collectively taught. Convolutional layer, pool layer, linear units with rectification (ReLU) layer by layer coupled to a typical multilayer neural network, which is also dubbed the complete layer, and an impairment layer near the heart of the network are the essential components of every CNN model. CNN is renowned for its impressive performance in areas like natural language processing and visual tasks.

*D.**Classification:*** A technique for computer vision is classification. After features have been extracted, classification involves using Support Vector Machines (SVM) to categorize the image. Using the training set's extracted features, an SVM may train a classifier.

V. MACHINE LEARNING MODELS

1.AlexNet:AlexNet, a powerful convolutional neural network (CNN), is credited with helping deep learning become widely used for image categorization. By winning the 2012 ImageNet large-scale visual recognition competition (ILSVRC), it proved how well CNNs perform on complex picture classification problems.

2.VGGNet/VGG16: The VGGNet architecture consists of a series of convolutional layers with small 3x3 filters followed by max-pooling layers. It achieved excellent performance on the ImageNet challenge in 2014, showing the importance of deeper networks for image classification.

3.GoogLeNet (Inception v1): GoogLeNet introduced the concept of the inception module, which enables the network to capture information at different scales by using multiple filter sizes in parallel. It won the ImageNet challenge in 2014 with a highly efficient architecture.

4. ResNet (Residual Network) ResNet introduced residual connections, allowing the network to efficiently learn from extremely deep architectures. ResNet won the ImageNet challenge in 2015 and has become a widely adopted architecture due to its effectiveness in training very deep networks.

5.Inception v2, v3, v4:These are improved versions of the GoogLeNet architecture, incorporating various enhancements such as factorized convolutions, improved inception modules, and aggressive pooling strategies. Inception v3 won the ImageNet challenge in 2015.

6.DenseNet:DenseNet connects each layer to every other layer in a feed-forward fashion, resulting in densely connected blocks. It encourages feature reuse and alleviates the vanishing gradient problem. DenseNet achieved competitive performance on ImageNet and showed good parameter efficiency.

7.MobileNet : MobileNet is designed for efficient inference on mobile and embedded devices. It uses depth-wise separable convolutions to reduce computational complexity while maintaining reasonable accuracy. Variants like MobileNetV2 and MobileNetV3 further improved the architecture's performance.

8.EfficientNet:EfficientNet is a family of models that use a compound scaling method to balance model depth, width, and resolution. It achieves state-of-the-art accuracy while being computationally efficient. EfficientNet-B7 is the largest variant in the series.

9.SqueezeNet:SqueezeNet is a lightweight architecture that significantly reduces the number of parameters without sacrificing much accuracy. It achieves this by replacing 3x3 filters with 1x1 filters and using a "fire module" to combine different filter sizes.

10.ResNeXt:ResNeXt extends ResNet by replacing the standard residual blocks with "cardinality" blocks, which introduce a new dimension called "cardinality" that allows the network to capture more diverse feature representations.
. The choice of model depends on factors such as the available
computational resources, the desired trade-off between accuracy and efficiency, and the specific requirements of the application

VI. CONCLUSION

A crucial first step in lowering mortality rates, illness transmission, and skin disease progression is the diagnosis of skin diseases. Skin disease diagnosis requires expensive and time-consuming clinical procedures. In the early stages of developing an automated dermatology screening system, image processing techniques are helpful. The classification of skin diseases relies heavily on the extraction of features.

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In this research the method of detection was designed by using pretrained convolutional neural **VGG16** and **TENSORFLOW** KERAS. In conclusion, we must not forget that this research might have an effective role in the detection of skin diseases in Saudi Arabia because it has very hot weather for the presence of deserts; this indicates that skin diseases are widespread.

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