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Dermatology Disorder Detection Using Convolutional Neural Network

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ABSTRACT
Dermatology diseases are found in millions of people every year and require high level computer expertise to diagnose them. To increase the accuracy of diagnosis, an image processing-based method is proposed to detect skin diseases. This method takes the digital image of disease effect skin area and uses image analysis to identify the type of disease. It is simple, fast and does not require expensive equipment, and can be used on any device with internet access.
Keywords: Dermatology diseases, computer expertise, image processing, accuracy, diagnosis, digital image, skin area, image analysis, type of disease, simple, fast, not expensive, internet access.

INTRODUCTION
Skin diseases are more common than other diseases. Skin diseases may be caused by fungal infection, bacteria, allergy, or viruses, etc. A skin disease may change texture or colour of the skin. In general, skin diseases are chronic, infectious and sometimes may develop into skin cancer. Therefore, skin diseases must be diagnosed early to reduce their development and spread. The diagnosis and treatment of a skin disease takes longer time and causes financial and physical cost to the patient. In general, most of the common people do not know the type and stage of a skin disease. Some of the skin diseases show symptoms several months later, causing the disease to develop and grow further. This is due to the lack of medical knowledge in the public. Sometimes, a dermatologist (skin specialist doctor) may also find it difficult to diagnose the skin disease and may require expensive laboratory tests to correctly identify the type and stage of the skin disease. Thus, the computer-based diagnosis of skin diseases comes into place to produce the result within a short interval of time with more accuracy than human analysis using laboratory methods.

1. REVIEW OF LITERATURE:
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

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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 five types of skin diseases with accurately 69%.

2. DESCRIPTION OF THE DATASET:

We compiled our dataset by collecting images from different websites specific to skin diseases. The database has 2205 images of every disease (Acne, Melanoma, Psoriasis, Rosacea, vitiligo). Fig 1 shows some of the sample images from our dataset.

Fig. 1. The first image is Acne, second is Melanoma, third is Psoriasis, fourth is Rosacea and the fifth is Vitiligo.

3. METHODOLOGY:

In this section, the methodology of the proposed system for Input Image, Skin Detection, Segmentation, Extraction and Prediction of skin diseases images is described. The system will help significantly in the detection of skin disease. The whole architecture can be divided into several modules comprising of input, detection, feature extraction, and prediction. The block diagram of the system is shown in Fig 2.

IMAGE PROCESSING

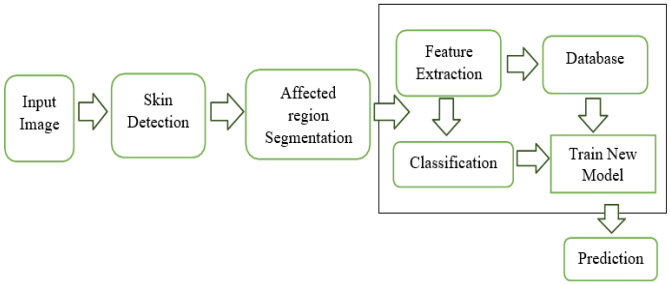

Fig. 2. The proposed system block diagram

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4. ALGORITHM:

Convolutional Neural Network also known as ConvNets, consist of multiple layers and are mainly used for image processing and object detection. Yann LeCun developed the first CNN in 1988 when it was called LeNet. It was used for recognizing characters like ZIP codes and digits. A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm that 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 pre-processing required in a ConvNet is much lower as compared to other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, ConvNets can learn these filters/characteristics.

4.1 Feature Extraction

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].

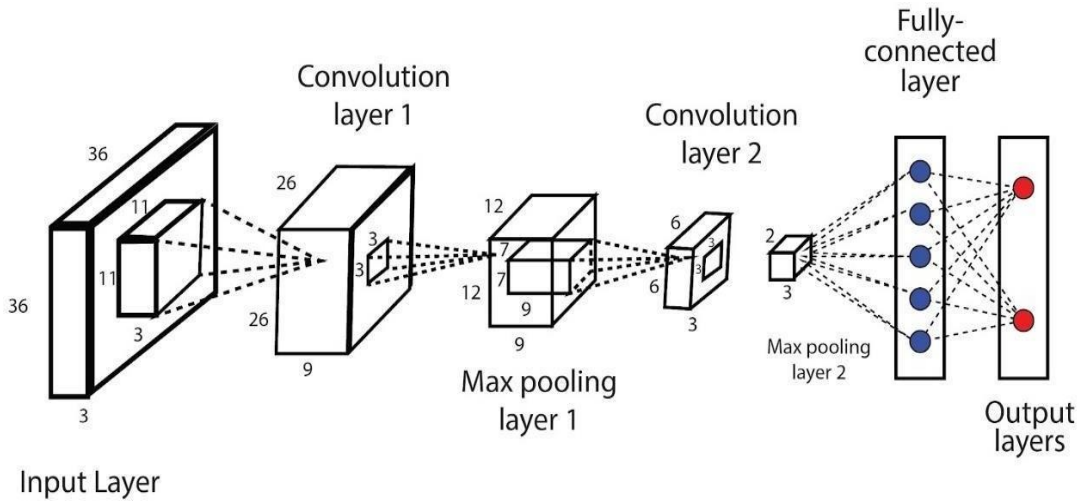

Fig. 3. The Architecture of Convolutional Neural Network

Input layers are connected with convolutional layers that perform many tasks such as padding, striding, the functioning of kernels, and so many performances of this layer, this layer is considered as a building block of convolutional neural networks.

4.2 Classification

Classification is a computer vision method. After extracting features, the role of classificationis to classy the image via Convolutional Neural Network (CNN).Its built-in convolutional layerreduces the high dimensionality of images without losing its information.

5. RESULT:

We used a platform of Intel Core i3 processor 2.10 GHz with 2GB RAM. The Implementation results are shown in Figure 6. Initially, the input images are pre-processed, then features are extracted using pretrained CNN. Finally, classification is performed using CNN classifier.

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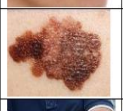
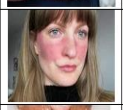
Disease Name	Sample Image	Total Image	Disease Detected	Detection rate %
Acne		200	183	91%
Melanoma		200	180	90%
Psoriasis		200	179	88%
Rosacea		200	186	93%
Vitiligo		200	160	80%

Table 1: Accuracy Detection Rate

In this study, 2205 skin images were used by several dermatological disease patients, also were taken from the Internet. The proposed system can successfully detect 5 different skin diseases with an accuracy of 80%-89%.

The detection rate of system is 69%. In the table 1 we can see different detection rate for 5 different diseases. The detection rate of diseases is very high 80%-89%.

6. FUTURE WORK:

In future, system can be improved and can be made highly advanced to detect and classify more diseases as well as their severity and can suggest their cure under the view of skin specialists. We can add more data sets in training data so that we can predict more than 5 diseases. This system can be used by dermatologists to give a better diagnosis and treatment to the patients. In future, this system can also be added with some more features that may connect people with a skin specialist virtually.

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.

8. REFERENCES:

[1] Arifin, S., Kibria, G., Firoze, A., Amini, A., & Yan, H. (2012) "Dermatological Disease Diagnosis Using Color-Skin Images." Xian: International Conference on Machine Learning and Cybernetics.

[2] Yasir, R., Rahman, A., & Ahmed, N. (2014) "Dermatological Disease Detection using Image Processing and Artificial Neural Network." Dhaka: International Conference on Electrical and Computer Engineering.

[3] Santy, A., & Joseph, R. (2015) "Segmentation Methods for Computer Aided Melanoma Detection." Global Conference on Communication Technologies.

[4] Zeljkovic, V., Druzgalski, C., Bojic-Minic, S., Tameze, C., & Mayorga, P. (2015) "Supplemental Melanoma Diagnosis for Darker Skin Complexion Gradients." Pan American Health Care Exchanges

DOI:10.46647/ijetms.2023.v07si01.050 ISSN: 2581-4621
[5] Suganya R. (2016) "An Automated Computer Aided Diagnosis of Skin Lesions Detection and Classification for Dermoscopy Images." International Conference on Recent Trends in Information Technology.
[6] Alam, N., Munia, T., Tavakolian, K., Vasefi, V., MacKinnon, N., & Fazel-Rezai, R. (2016) "Automatic Detection and Severity Measurement of Eczema Using Image Processing." IEEE.
[7] Kumar, V., Kumar, S., & Saboo, V. (2016) "Dermatological Disease Detection Using Image Processing and Machine Learning." IEEE.
[8] Krizhevsky, A., ILYA, S., & Geoffrey, E. (2012) "ImageNet Classification with Deep Convolutional Neural Networks."
Advances in Neural Information Processing Systems.
[9] Cristianini, N., Shawe, J., "Support Vector Machines", 2000.
[10] SOMMERVILLE, I., "Software Engineering". 9th .2011.