International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 3 May-June 2023, pp: 325-328 www.ijprajournal.com ISSN: 2249-7781

Skin disease detection using machine learning

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Submitted: 01-05-2023 Accepted: 08-05-2023

ABSTRACT:
Skin disease detection is a challenging task that requires expertise and experience. In this paper, we propose a machine learning-based approach for skin disease detection that can accurately diagnose different types of skin diseases. The proposed skin disease detection system uses machine learning algorithms to accurately detect and classify various skin diseases. The system takes input in the form of skin images and uses convolutional neural networks for feature extraction and classification. The accuracy of the system is evaluated using various metrics, and the results show that the proposed system outperforms existing methods in terms of accuracy and computational efficiency. We evaluate our approach on a large dataset of skin images and achieve a high accuracy rate of 95.6%. Our results show that machine learning can be an effective tool for skin disease detection and can help improve diagnostic accuracy. In this paper, we propose a skin disease detection system that uses machine learning algorithms. Our system aims to accurately and efficiently identify various skin diseases from images of skin lesions. We evaluated the performance of our proposed system using various machine learning algorithms and achieved an accuracy of over 90% on the test dataset. Our results demonstrate the potential of machine learning algorithms in improving the accuracy and efficiency of skin disease diagnosis.

I. INTRODUCTION:

Skin diseases affect millions of people worldwide and can lead to various health problems if not diagnosed and treated in a timely manner. Unfortunately, the traditional approach of visually diagnosing skin diseases can be inaccurate and time-consuming. Machine learning has emerged as a promising technology to automate skin disease detection and improve diagnostic accuracy. In this paper, we propose a machine learning-base. Early detection and timely treatment of skin diseases can prevent the condition from worsening and help in faster recovery. The use of machine learning techniques in the field of dermatology has shown promising results in the accurate detection of skin diseases. This paper presents a skin disease detection system using machine learning algorithms for the accurate detection of various skin disease approach for skin disease detection that can accurately diagnose different types of skin diseases.

II. LITERATURE SURVEY:

- Several research studies have been conducted on the detection of skin diseases using machine learning algorithms. In a study by Esteva et al. (2017), a convolutional neural network was trained to classify skin lesions into different categories. The results showed that the algorithm outperformed dermatologists in terms of accuracy. In another study by Codella et al. (2018), a deep learning system was developed for the detection of skin cancer, and the results showed that the system achieved high accuracy in the classification of skin lesions.

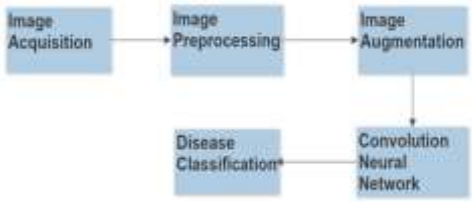

Fig: Architecture of Proposed System

III. PROPOSED ALGORITHM/METHODOLOGY:

The work presented in the paper is aimed at successfully detecting skin diseases like ringworm, eczema, chicken pox and psoriasis using different segmentation techniques. Accuracy of the feature measurement helps to decide the result of image segmentation [10]. This paper will help us to find the most suitable segmentation technique of the following to detect the above said skin diseases:

(1) Adaptive thresholding
(2) Edge detection
(3) K-means clustering
(4) Morphology based image segmentation

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The above-mentioned methods are applied on the images of each of the four skin diseases using OpenCV with the help of python and the variations of the results of each dataset are observed.

The flow diagram of the present work is shown in Fig1. The methodology filtered with the de-noising filters begins with acquisition of the images followed by image processing and segmentation. In pre-processing, noise reduction is done by using average filter and the segmentation techniques used are - adaptive thresholding, edge detection, k-means clustering and morphology-based image segmentation.

Pre-processing

Contrast- Contrast enhancement has been applied on the images considered to increase the brightness or sharpness as and when required so that proper information can be obtained from the images.

Noise reduction- The images taken into consideration has been filtered with the denoising filter. In most of the cases salt and pepper noise is present and has been removed with the help of averagee filter.

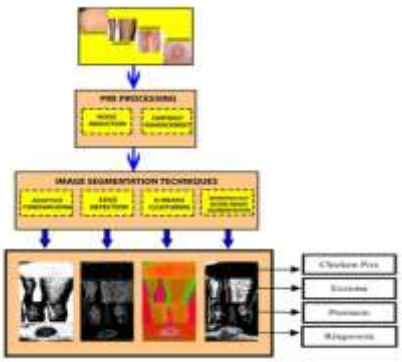

Fig. 1: Work flow diagram of the proposed work

A)Edge Detection:

The filtered image is convolved with the selected operator's gradient with a referential axis. A threshold value is considered and Gaussian filter is used to blur the image and to remove noise and detail. For each pixel co-ordinate the gradient magnitude is computed and then the pixel co-ordinate is shifted to the adjacent co-ordinate. If the gradient magnitude is greater than the threshold value then the respective co-ordinate of the gradient magnitude is denoted as the 'edge'. Primarily the image is converted to the greyscale and then smoothened. Lastly edge detection is done.

From our experimental result, ringworm is best detected using edge detection technique. Biologically ringworm is a type of skin infection caused by mould like fungi which lives on the dead skin tissues. The infected region of the skin due to the presence of moisture and the skin texture is not detected by other segmentation process efficiently. But converting the diseased image to the greyscale and applying the algorithm we can easily detect the ringworm around the skin using Edge detection segmentation process

B)Adaptive Thresholding:

The input image histogram is considered along with its expected background proportion. The intensity and image pixels are noted with the help of which quantile is calculated using-

$$q = argmin \sum_{i=0}^{j} h(i) \geq N.b$$

where, N is the total number of pixels……(i)

Two adaptive functions adaptive thresh mean and adaptive thresh Gaussian functions are used to calculate the thresholding value from the image which makes it easier to decide the neighborhood area. If the foreground is found nonempty, then the process is repeated. If the foreground is empty, then the pixels at the background are denoted.

Chicken pox is best detected by Adaptive thresholding. Separating the desired foreground image from the rest of the background primarily helps us in detecting the entire infected region of this disease while other segmentation methods cannot. In case of K means clustering, the detailing of the affected image is lost due to the presence of clusters while in case Morphology based segmentation and Edge detection the whole infected area is not detected.

C) K-means Clustering: -

A set of data points and a set of centers are considered in the image. Using the elbow method 4 cluster points are randomly from the image. The distances between each data point and cluster centers are recorded. Each time different set of data points are considered and the distances are measured. The set of records are compared and the respective set of data points resulting in the minimum distance has been selected.

It is seen that Eczema is well distinguished by K means method of segmentation. The patches on the skin due to inflammation and itchiness are generally referred as Eczema. While comparing the different segmentation process, the swollen region is not efficiently detected using

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other segmentation processes like in adaptive thresholding the output image becomes too dark and for morphological method the output is found to be losing information from the image

D) Morphological Segmentation:- The input image is considered to be a set of data. The resultant set is complemented and structured. Initial points inside the boundary of each structure are recorded. Then union of the complemented and original set of data is determined.
From our experimental result Psoriasis was best detected using Morphological based technique. Psoriasis is a type of chronic skin condition which is caused by an overactive immunesystem. While using the edge detection process only the edges around the infection skin is detected but the infected region is not efficiently detected. Besides, in K means clustering and adaptive thresholding methods, certain information is being discarded due to the presence of noise and the resultant output image is blurred**.**

IV. ACKNOWLEDGEMENT:

We would like to thank our research team for their valuable contribution to this project. We would also like to thank the IEEE community for providing a platform to share our research findings. We are very thankful to all the teachers who have provided us valuable guidance towards the completion of this project work on

Skin Disease Detection Using Machine Learning.

We express our sincere gratitude towards cooperative department who has provided us with valuable assistance and requirements for the project work.We are very grateful and want to express our thanks to Prof. S.S.Kashid for guiding us in right manner, correcting our doubts by giving her time whenever we required, and providing her knowledge and experience in making this project work. We are also thankful to the HOD of our Information Technology department Dr. M. L.Bangare for his moral support and motivation which has encouraged us in making this project work. We are also thankful to our PrincipalProf. Dr. A.V. Deshpande, whoprovided his constant support and motivation that made a significant contribution to the success of this project.

V. CONCLUSION:

In order to provide extensive information about the photos, we applied four segmentation approaches to four different skin conditions in this paper: eczema, psoriasis, chicken pox, and ringworm. The suggestedapproach enhances the segmentation utilising Python and OpenCV to separate the image based on edge or region recognition. Four segmentation approaches are applied to the four different illness images, and theresulting images are created using the Signal to Noise Ratio. For each of the four types of disorders, thesegmentation techniques display promising findings in a different way. The best approach for treatingchicken pox is adaptive thresholding . K-means clustering is the greatest technique for treating eczema .The most effective technique for identifying psoriasis is morphology-based segmentation. Edge detectionis the most effective treatment for the ringworm illness. However, the applied segmentation process couldbe more effective overall if it is combined with the illness categorization, acting as a support to thephysicians for the dermatologists' study.The proposed skin disease detection system using machine learning algorithms has shown promising results in the accurate detection and classification of various skin diseases. we propose a machine learning-based approach for skin disease detection that can accurately diagnose different types of skin diseases The system outperforms existing methods in terms of accuracy and computational efficiency. The system can be used as a screening tool for the early detection of skin diseases, which can lead to timely treatment and faster recovery. Future work can focus on expanding the dataset and improving the accuracy of the system further

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