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Skin Disease Detection Using Deep Learning and IoT

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Abstract—

Dermatological disorders are one of the most widespread diseases in the world. Despite being common its diagnosis is extremely difficult because of its complexities of skin tone, color, presence of hair. This paper provides an approach to use various computer vision-based techniques (deep learning) to automatically predict the various kinds of skin diseases. The system consists of three phases- The feature extraction phase, the training phase and the testing / validation phase. The system makes use of deep learning technology to train itself with the various skin images. The main objective of this system is to achieve maximum accuracy of skin disease prediction. This work focuses on skin disease prediction using deep learning techniques. For the implementation, the dataset used for the skin disease prediction is the ISIC dataset with 8 category of skin diseases. For the classification, the deep learning algorithm used is ResNeT50. Restnet50 is a pretrained network, which can be used for the detection of skin disease detection using the concept of transfer learning. For that the neural network extracts image features from the skin images. The extracted features are used for disease detection for 8 classes of skin diseases.

Keywords— Skin Disease Detection, Deep Learning, ResNet50, Convolutional Neural Network (CNN), Transfer Learning, Image Processing, Dermoscopic Images, ISIC Dataset.

I. INTRODUCTION

Skin is one in every of the most important and quickest developing tissues of the human body. It is a contamination that takes place in humans of all ages. Skin is regularly broken due to the fact it's far a touchy a part of the body. There are more than 3000 skin diseases. A cosmetically look spoiler disease will have a big effect and might reason extensive ache and everlasting injury. Most of the chronic skin conditions aren't right now deadly, they may be diagnosed as an

extensive problem on fitness popularity which include physical, emotional and economic outcome. On the other hand, skin cancers are potentially lethal and their trouble is associated with the temporality that they carry. Now day's skin diseases become more common problem in human life. Most of these diseases are dangerous and harmful, particularly if not treated at an initial stage. People do not treat skin diseases seriously. Hence it is very important to control it at earlier stage to prevent it from spreading in people. It has become an important thing to treat these skin diseases properly at the earlier stages itself to prevent serious damage to skin. This system would help to solve this problem to a great extent. Since it system would allow users to determine the skin diseases to provide treatments or advice to patient by making use of images of skin infected with the disease and by obtaining information from the patient. Skin diseases are quite difficult to identify and unpredictable. The use of smart phones and camera technology and utilize of image processing technology of the devices for skin diagnosis. Impro-vising machine learning based analytical tools are testing in improving and those are necessary to pick the right element and AI method to increase the accuracy. So, it is necessary to pick the right element and AI method to get more accuracy value. Machine-learning and image-processing dependent study and are applied in various areas such as fingerprint identification, face identifica-tion, tumour area recognition and for segmentation of effected area of skin disease. Deeplearning algorithms are gaining prominence in skin disease classification.

II. LITERATURE REVIEW

In [1], Noel C. F. Codella, David Gutman, M. Emre Celebi, Brian Helba, Michael A. Marchetti, Stephen W. Dusza, Aadi Kalloo, Konstantinos Liopyris, Nabin Mishra, Harald Kittler, Allan Halpern proposed an image processing-based skin disease detection technique. They used the RGB image of the skin diseases area as input. Then resize the images and extract the features using a pre-trained convolution neural network model. They apply multi support vector machine for classification. They show that this method is simple, easy and the accuracy is 100%.

In [2], Philipp Tschandl, Cliff Rosendahl, Harald Kittler shows several studies of skin diseases in their review paper. All the studies are related to the classification of several skin diseases using the machine learning processes. They show a detailed review of the applied mechanisms, algorithms, and accuracies of those processes.

In [3], R. Bhardwaj and S. Vatta review different deep learning approaches for skin diseases detection. They briefly described different publicly available datasets, their image acquisitions process, and proposedalgorithms.

In [4], Neetu Chikyal, K. Veera Swamy used five different machine learn-ing algorithms to detect skin diseases. They used random forest, kernel SVM, Na¨ıve Bayes, Logis-tic Regression, and Convolution Neural Network algorithms. Finally from the confusion matrix, they discovered that the convolution neural network model gave the best result for this disease detection process.

In [5], A. Santy and R. Joseph proposed an artificial intelligence system based on a neural network. This system has two parts first feature extraction, that was done by the image acquisition process. Second part was classification, which was done by the feed-forward neuralnetwork.

In [6], V. B. Kumar, S. S. Kumar and V. Saboo proposed in their study six different data mining algorithms for classifying the different skin disease classes. The select 15 most salient features for predict the disease classes. Except for these six algorithms, the authors also create an ensem- ble method using Bagging, AdaBoost, and Gradient Boosting classifier techniques for prediction. Finally, they conclude the ensemble method provides a more accurate and effective prediction for skin disease detection.

In [7], R. Bhardwaj and S. Vatta proposed an artificial intelligence system for skin cancer detection. They used image processing and a deep neural network

for skin cancer detection. First, they segmented the affected area and extracted the features from the area using the image processing method, and for prediction, they used a convolution neural network. They achieved 93.7% for training accuracy and 89.5% for test accuracy.

In [8], Arifin, S., Kibria, G., Firoze, A., Amini, A., Yan, H proposed another skin diseases de-tection model based on an adaptive federated machine learning process. This approach consists of intelligent local edges (dermoscopy) and a global point (server). This architecture can able to diagnosis the skin type, skin diseases type and also improve the accuracy constantly.

In [9], N. Hameed, A. M. Shabut and M. A. Hossain the skin disease is detected by using color images without any supervision of dermatologist. This structure contains two stages, In the first stage the effected portion of skin is detected by using color image processing techniques, and active counter segmentation is used for segmentation to classify skin disease type and the second stage is to classify skin disease type by using different machine learning algorithms like artificial neural network, support machine vector, decision tree algorithms and so on. In artificial neural networks, the system was tested for five skin diseases type with accuracy of first phase 95.98% and the second phase has 94.02%.

In [10], P. R. Hegde, M. M. Shenoy and B. H. Shekar the input images obtained from the user is processed to predict skin disease presence or absence from a new input image. The input image of a user would be obtained using android application. In this system, the application would ask the user with many questions and disease type is predicted using the end user answers. At last the proposed system, suggests medicinal descriptions, surgery and medicinal drug based on the skin disease trained model. Skin diseases like Eczema, Fungal infection and Urticaria are been analyzed in this project. This question and answer based application doesn't provide promising results every time.

In [11], Zeljkovic, V., Druzgalski, C., Bojic-Minic, S., Tameze, C., Mayorga, P, Skin disease are mostly ignored and provided less importance at the early stages. Some ignorance among people might lead to skin cancer. In existing approach, the increased skin dis-ease are identified at the later stage using biopsy only. The inspection is performed manually by considering many histopathological features. Thus this process is performed manually which can lead to human errors and takes 1-2 days for providing the biopsy results. Also the physician find it difficult to identify the type of skin disease and the stage of disease at the analysis stage. Thus making the medicine prescription difficult. This concern can be addressed by usage of machine learning and deep learning techniques by analyzing the microscope image. This proposed machine learning based approach can be an effective tool to identify the clinical data and provide the results in a short period of time. This approach can provide a promising results by combining computer vision and machine learning techniques.

In [12], This research paper, M. K. Rao, K. Veera Swamy and K. A. Sheela predicts different types of skin diseases in which user can take the skin photo images and provide into the system which could process and provide variety of skin disease absence or presence. This proposed system used matlab tool for identifying different type if skin diseases like normal, melanoma, psoriasis or dermo case based on the extracted image features. This system would provide an alert to the nearby medical team if any abnormality is detected. This methodology suffers from the issues with segmentation issue thus making classification model less accuracy .

In [13], M T. Islam et al proposed a deep convolutional neural network for skin disease detection to provide feasible and efficient system and due to the emergence of smart phones, image pro-cessing based disease analysis is more demandful as this could provide promising results in less time. Utilization of camera technique, the people can provide the input and integration of image processing and machine learning techniques the respective skin disease is identified and diagno-sis is recommended. The input analysis are

performed using two staged approach to address this problem. The first approach is the image processing technique and second approach is the machine learning technique to train the model. This trained model is kept on training to predict different types of skin diseases. As the characteristics and features of different skin disease are different, the machine algorithm needs to be trained for efficient prediction.

In [14], R. Yasir, M. A. Rahman and N. Ahmed proposed a model to use medical imaging to detect skin lesion in input skin images. They used methodology to create a prototype system to detect skin disease. The objective of this project is to identify skin lesion based on the input skin images texture analysis based on thresholding and neural network to detect and diagnose skin disease.

In [15], The work of Cristianini, N., Shawe, J proposed the development of a Melanoma diagno-sis tool for dark skin using specialized algorithm databases including images from a variety of Melanoma resources. Similarly, discussed classification of skin diseases such as Melanoma, Basal cell carcinoma (BCC), Nevus and Seborrheic keratosis (SK) by using the technique support vec-tor 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).

III. CONCLUSION

In this work, deep learning algorithms are used to detect various skin diseases. Skin Disease de-tection is important to reduce death rate. Dermatological process to detect skin disease type is very costly compare to deep learning. No need of manual feature extraction from input image, since, deep learning networks extracts features automatically. Also, no need of image processing techniques. Here, ResNet50 is used, which is a transfer learning algorithm. To improve the per-formance of the system, data augmentation is employed. The augmented training image is fed into the ResNet50 network for training. After training completed the network is capable of detecting 8 types of skin diseases from input skin images.

The potential benefits of deep learning solutions for skin disease are tremendous and there is an unparalleled advantage in reducing the repetitive work of dermatologists and pressure on medical resources. Accurate detection is a tedious task that inevitably increases the demand for a reli- able automated detection process that can be adopted routinely in the diagnostic process by expert and non-expert clinicians. Deep learning is a comprehensive subject that requires a wide range of knowledge in engineering, information, computer science, and medicine. With the continuous development of the above fields, deep learning is undergoing rapid development and has attracted the attention of numerous countries. This can be further improved with large database and better features.

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