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Skin Disease Diagnosis and Classification using Deep Learning Algorithms

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Abstract:

Human health is more important than the prevention of sickness. Infections with fungi, bacteria, allergies, viruses, etc., are common triggers for skin disorders. Accurate and rapid skin disease detection is made possible by advances in laser technology and photonics-based medical technologies. This kind of diagnosis requires specialized and very costly medical equipment. Therefore, Deep learning methods aid in the early diagnosis of skin diseases. Feature extraction is crucial in skin disease categorization. Human effort in areas like feature extraction and data reconstruction for categorization is no longer necessary thanks to Deep Learning algorithms. For the purpose of Skin Disease Classification, a dataset of 938 pictures was collected. Melanoma, nevi, and seborrhea Kerasotes are only a few examples. The categorization of skin diseases is improved by 70% using CNN algorithms. Additionally, we have tested Alex Net, which achieves 80% accuracy.

INTRODUCTION

Skin is one of the largest and fastest growing tissues in the human body. Skin diseases are the common health problems in the worldwide. The burden of skin disease is viewed as a multidimensional concept that comprehends psychological, social and financial importance of the skin disease on the patients and their families and also on society. It is the infections that occurring in people among all the ages. Skin is frequently damaged because it is very sensitive part of the body. There is 3000 and more unknown skin Diseases. A cosmetically appearance spoiler disorder can have a significant impact, and can cause considerable pain and permanent injury. Most of the chronic skin conditions, such as atopic eczema, psoriasis, vitiligo and leg ulcers, are not immediately lethal, they are recognized as a considerable trouble on health status including physical, emotional and financial outcome. On the other hand, skin cancers, like malignant melanoma, are potentially lethal and their trouble is associated with the temporality that they carry. People of almost 73% are affected with skin disorder do not seek medical advice. Chronic and several other incurable skin diseases, like psoriasis and eczema, are associated with significant sickness in the form of physical discomfort and impairment of patient's life; whereas malignant diseases like malignant melanoma carry substantial

temporality. With the wide range of health status and quality-of-life measures, the effects of most skin diseases on patients lives can be measured efficiently. Along with some of the deep learning algorithms are used for detecting skin diseases in whole body. The convolutional neural network (CNN) is a category of deep learning neural networks. CNN represents a huge advance in image recognition. They are used to analyze the visual images and image classification. A convolutional neural network (CNN) is used to extract features from images. This eliminates the need of manual feature work extraction. The features from the set of images are not trained they are learned while the network trains on a set of images. It makes extreme accuracy for the deep learning models.CNN learnsthefeaturedetectionthroughtensorhundredsofthe hiddenlayers.Each layer increases the in all the Documents in the training set involvement of the learned features. A particular amount dataset will be provided to detecting the skin diseases

LITERATURE SURVEY

Many studies have applied deep learning algorithms in classification of skin diseases. Daily soft drink consumption significantly increases the risk of moderate-to-severe acne in adolescents, especially when the sugar intake from any type of soft drink exceeds 100 g per day [2]. Rosacea is one of the common chronic facial disorders that affect the patient's health. The adjusted Chinese version Rosholt was easy to complete, well received by patients, and demonstrated acceptable validity and reliability [3]. The results indicate that lepton plays a critical role in the development of autoimmune disorders and demonstrate that the transgenic lepton pigs will be act as a valuable model of SLE. Certain results argue strongly to include skin disease prevention and treatment in future global health strategies as a matter of urgency [1]. The results in ''Symptoms of systemic lupus erythematosus are diagnosed in lepton transgenic pigs,'' indicate that lepton plays a critical role in the development of autoimmune disorders and demonstrate that our transgenic lepton pigs can act as a valuable model of SLE [4]. Samples from nine normal skin analyzed by IHC in expression of ATP5B and K10 such as, six chronic dermatitis, five purring nodular is, seven kurtosis seborrhea, nine verruca vulgarism, 25 psoriasis, five keratoacanthoma, and nine SCC in "Possible involvement of F1F0- ATP syntheses and intracellular ATP in Keratinocyte differentiation in normal skin and skin lesions" [5]. Similarly several skin diseases are associated with long-term disfigurement, disability and stigma. A treatment and care activities for skin-related diseases to maximize the use of limited resources and expand the treatment coverage [6]. In order to explore the association between polymorphisms and citrating efficacy, the specialists enrolled 46 and 105 Chinese Han psoriasis vulgarism patients for discovery and validation phases [7]. This study indicates ''Frizzled-related proteins 4 (SFRP4) rs1802073G allele predicts the exalted serum lipid levels during citrating treatment in psoriatic patients from Hunan, to investigate the relation between the Frizzled-related proteins 4 (SFRP4) rs1802073 polymorphism and what are the changes of serum lipids in Chinese psoriatic patients during the treatment with citrating [8]. The illustration in the usefulness of Image Net through

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three simple applications in object recognition, image classification and automatic object clustering is done in “Image Net: A large-scale hierarchical image database” [9]. For example, the task of classifying skin tumors using the Inception-v3 network has reached the classification level of professional dermatologists. For certain nine classes of tumors, a computer achieved an accuracy rate of 55.4%, and two dermatologists achieved accuracies of 53.3% and 55.0% [10]. With the same network structure, [11] it has been achieved an accuracy of 87.25, 2.24% on the dermoscopic images for four most common skin diseases, such as SK, BCC, psoriasis and melanocytic nevus. These studies show that current deep learning algorithms have the potential to be applied to skin related diseases. At the same time, deep learning application to face- related diseases is also promising. Reference [13] designed a deep learning algorithm called Deep Gestalt and it trained the model on more than 17,000 facial images of genetic syndromes, and this model identified more than 200genetic syndromes using skin images with very high precision. Reference [14] used CNNs for classification of acne into different severity grades ranging from clear to severe, and their results show that the accuracy obtained by their method outperformed expert physicians. Initially, investigation of the proportion of skin images in the most commonly used public datasets for skin disease, which include AtlasDerm [15], DermlS [16], the ISIC Archive[17], Derm101 [18] and Dement [19]. Most of these datasets [15]–[18] did not provide information about body parts. In [19], which provides body parts information, there were only 195 facial images

IMAGE DATASET:

Skin Disease classification Dataset contains 938 images of Three Classes of Skin diseases. Dataset consists of three categories, which includes training, test and validation. Each category contains images of three diseases such as Melanoma, Nevus and Seborrhea kurtosis. In the Dataset, Melanoma contains 439 Images. Nevus contains 551 Images. Seborrhea Kurtosis contains 413 Images. Training data is used for training the system and finally the images are detected and classified into above mentioned three categories. Fig 1, Fig 2, Fig 3 represent melanoma, Nevus and Seborrhea kurtosis respectively.

Fig 1 Melanoma

Fig. 2 Nevus

Fig.3 Sebborheic keratosis

CNN and Alex Net FOR SKIN DISEASEDETECTION

Neural networks and deep learning are currently providing the best solutions for many problems in image recognition, speech recognition, and natural language processing. A neural network is a type of machine learning algorithm allows the computer to learn by incorporating new data. CNNs are very useful in image recognition in order to analyze visual imagery and are frequently used in classifying the images. It takes the given three classes of skin disease images as input and it gives the output of a probability that the input belongs to a particular class.CNN is now the go-to model on every image related problem. The main advantage of CNN compared to its predecessors is that it automatically detects the important features without any human superintendence. For example, given many pictures of cats and dogs it learns distinctive features for each class by itself. CNN is also computationally efficient. A CNN has Convolutional layers, Rely layers, Pooling layers and fully connected layer. Here it takes input as the skin disease dataset. Convolutional layers apply a convolution operation to the input. It uses different filters to create a feature map and passes the information to the next layer. It uses convolution and pooling operations and performs parameter sharing. This enables CNN models to run on any device, making them universally attractive. The main building block of CNN is the convolutional layer. Convolution of an image with different filters can perform operations such as edge detection, blur and sharpen by applying different filters. Rely function is used to increase the non-linearity that is; it is an element wise operation and replaces all negative pixel values in the feature map by zero. Since, the real world data would want our Convent to learn non-negative linear values. There are other non linear functions such as tan and sigmoid that can also be used instead of using Rely layer. Rely is used since performance wise Rely is better than the other two layers. Pooling layer is used for combining the outputs of clusters of neurons into a single neuron in the next layer. Spatial pooling which reduces the dimensionality of each map but retains important information. It is of three different types such as Max Pooling, Average Pooling and Sum Pooling. Max pooling takes the largest element from the feature map. Average pooling takes the average for the feature. Sum of all elements in the feature map is called as sum pooling. With the fully connected layers, combining the features together to create a model. Flattening layer flattens the pooled images

Into one long vector and inputs the vector into a fully connected artificial neural network .The final fully connected layer provides the “voting” for the three classes of dataset that we’re after. Forward propagation and backpropagation are also used to train and it repeats until we have a well-defined neural network with trained weights and feature detectors.

RESULTS AND DISCUSSION

First of all, the CNN algorithm is used for training and classifying all kind of clinical images. We have taken three types of skin diseases. They are Melanoma (439 Images)**,** Nevus (551 Images) Seborrhea kurtosis (413 Images).We train the system using the set of data and use the parameters from the pre-trained set as the initial parameters for the new

input, which is also called as transfer learning. The performance of sets retrained using the images are generally superior to the sets that were trained using the next set of inputs. According to us, there were so many differences between the images in different parts of the body. However, for most of the diseases, the difference in symptoms on different body parts is not same. Therefore, while training the model for skin diseases, a better strategy could be used to train the model with datasets of the skin diseases in different parts of the body and then retrain model on images of particular body parts. Then, the particular model can be used to diagnose the disease at any specific body part. We obtain the overall accuracy 71%. The results shows that, generally, the predictions were made by CNN by using features and characteristics learned from lesion areas with abnormalities, rather than from the textures or other features of normal skin. The training set is used for training the model, while the validation set is only used for evaluating it. For example, if the model has an accuracy of 86% on the training set and 84% accuracy on the validation set, then it means that model can perform with 84% accuracy on new data. Percentages of the results which are relevant are referred as precision. Percentage of total relevant results correctly classified by the algorithm is referred as recall. Fig 4 represents the training and validation accuracy obtained by using CNN algorithm in skin disease classification. Fig 5 represents the training and validation loss. Table 1 represents Precision and Recall obtained for CNN network.

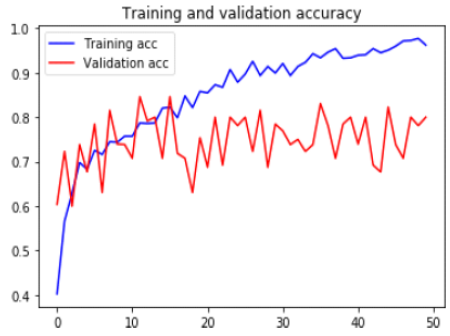

Fig. 4 Training and validation accuracy

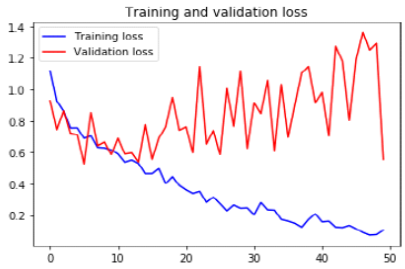

Fig. 5 Training and validation loss

Table. 1 Precision and Recall

DISEASE	PRECISION	RECALL
Melanoma	0.29	0.29
Nevus	0.37	0.38
Sebborheic Keratosis	0.15	0.14

Apart from CNN, we have also tried with Alex Net. The classification accuracy of Alex Net is found to Be better than CNN. The results are shown in Table 2.

Table.2Accuracy for CNN and Alex Net

ARCHITECTURE	ACCURACY		
	10 Epochs	20 Epochs	30 Epochs
CNN	67.1%	69.2%	71.5%
Alexnet	69.8%	72.1%	76.1%

CONCLUSION AND FUTURE SCOPE

Experiments were conducted in this paper employing a convolutional neural network (CNN) structure for the identification of three prevalent skin illnesses using photographs of the affected skin. The findings prove that CNNs can identify and categorize skin disorders. Additionally, our research shows that an acceptable network topology may enhance the model's performance. Though it has been put to use for illness categorization with the existing network architecture, it still has room to grow in terms of its overall performance. Therefore, specialized changes should be made if individuals wish to truly utilize this method to assess their skin health in their everyday lives. We predict that the performance of CNN-based skin disease diagnostic algorithms will continue to improve as more and better picture data of different skin disorders becomes available and as the network structure is continuously improved. Classification accuracy may be enhanced by using architectures other than convolutional neural networks.

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