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Identification of Skin Disease Using Deep Learning

Shravani Kharat*, Pooja Shinde, Preeti Malwadkar, Prof. Dipti Chaudhari
Department of Computer Engineering, Dr. D. Y. Patil Institute of Technology, Pune, Maharashtra, India

ABSTRACT

Globally, skin diseases are among the most common health problems in all humans irrespective of age. Prevention and early detection of these diseases can improve the chance of surviving. This model illustrates the identification of skin diseases providing more objective and reliable solutions using deep learning technology and convolutional neural network approach. In this model, the system design, implementation and identification of common skin diseases such as acne, blister, eczema, warts etc. are explained. The system applies deep learning technology to train itself with various images of skin diseases from the Kaggle platform. The accuracy obtained by using deep learning is 83.23%. The main objective of this system is to achieve maximum accuracy of skin disease prediction. Moreover, if the disease is identified the system provides detailed information about the diseases along with home remedies.

Keywords : Skin disease, Deep Learning, Convolutional Neural Networks, Image Identification

I. INTRODUCTION

Skin diseases are the most widespread diseases. These diseases can vary immensely in symptoms and severity. They can be temporary or permanent, minor or even fatal. Skin diseases occur due to several factors like exposure to hereditary, environmental factors, ultraviolet radiation, alcohol etc. Moreover, these diseases can harshly affect one's lifestyle and even worse can lead to death. To improve the chance of survival early detection of the disease is one of the solutions. The other solution is that the prevention of skin diseases should be prioritized. Many kinds of research have been done to help identify and diagnose skin diseases like skin cancer. However, accurate recognition of the disease is intensely challenging.

This paper illustrates the system that aims purely to identify the accurate skin disease from the skin image. The system uses features such as image processing to acquire the image, feature enhancement to remove noise or unwanted pigments from the image, feature extraction to extract unique features from the image that will eventually help in identifying the exact skin disease. For this, a huge dataset of images needs to be well trained in advance. Deep Learning methods can effortlessly train this huge amount of data. Furthermore, the Convolutional Neural Network (CNN) approach continuously extracts the features from the images that yield accurate results. The Softmax classifier is applied at the last layer of the CNN to classify the skin images with accuracy.

II. LITERATURE SURVEY

This section reviews the different works concerned with the project. Some papers were studies and summarized as follows: [2] [3] [1] [5]

In this paper Nazia Hameed, Antesar M., M. A. Hossain pro-posed "Multi-Class Skin Diseases

Classification Using Deep Convolutional Neural Network and Support Vector Machine, An intelligent expert proposed to perform the multi-class classification of skin diseases using machine learning algorithms. The proposed expert system can classify healthy, acne, eczema, benign, and malignant skin lesions. In this research work, they investigated the features obtained by the deep convolutional neural network for the multi-class classification task. The features are extracted using the AlexNET;a pre-trained convolutional neural network model. An ECOCSVM classifier was applied on the extracted features forthe classification task. The overall accuracy achieved by the SVM classifier is 86.21%, and the generalisation error after performing 10-fold cross validation is 0.16. The proposed intelligent expert system outperforms our existing work withan increase in accuracy of 3.21%. [2]

In this paper, Jainesh Rathod, Vishal Waghmode, Aniruddh Sodha,Dr. Prasenjit Bhavathankar proposed "Diagnosis of skin diseases using Convolutional Neural Networks", It illustrates the Convolutional Neural Networks and how it is used for image classification of skin diseases and how it can be diagnosed using this technique. They used advanced computational techniques and large dataset to build their system that can match the results of a dermatologist thus improving the quality standards in the area of medicine and research.[3]

In this paper, "Evaluation of Melanoma Diagnosis using Deep Features" by Lucas Bezerra Maia, Alan Lima, Roberto Matheus Pinheiro Pereira, Geraldo Braz J´unior, Jo˜ao Dallyson Sousade Almeida, Anselmo Cardoso de Paiva .The main objective of this study was to compare the performance ofthe main models of CNNs regarding the task of skin cancer classification using PH2 dataset of dermatoscopic images. The results have shown that the VGG19 architecture, along with Logistic Regression classifier, achieved the best accuracy and precision compared to the other proposed combinations showing the ability of the model to correctly identify examples of melanoma and normal images.[1]

In this paper, Sourav Kumar Patnaik, Mansher Singh Sidhu,Yaagyanika Gehlot, Bhairvi Sharma and P Muthu proposed"Automated Skin Disease Identification using Deep Learning Algorithm", a model for prediction of skin diseases is done using deep learning algorithms. It is found that by using the ensembling features and deep learning they achieved a higher accuracy rate [5]

III. ARCHITECTURE AND METHDOLOGY

The Architecture is categorized into two major phases:

Training Phase:

Image Pre-Processing:

The images of skin diseases uploaded are clear and of high quality from Kaggle platform and from the internet. These high quality RGB images are converted into gray scale images.

Feature Engineering:

The unique features are extracted from these images such that it becomes convenient for classification.

Classification:

To identify the type of skin disease, Softmax classifier is used in the last layer as it yields the actual probability of the object.

Testing phase:

The images can be acquired either through camera or browsed through the Testing dataset or from the local device.

Image Pre-Processing :

It is very essential that the input image must be clear and precise and of good quality.

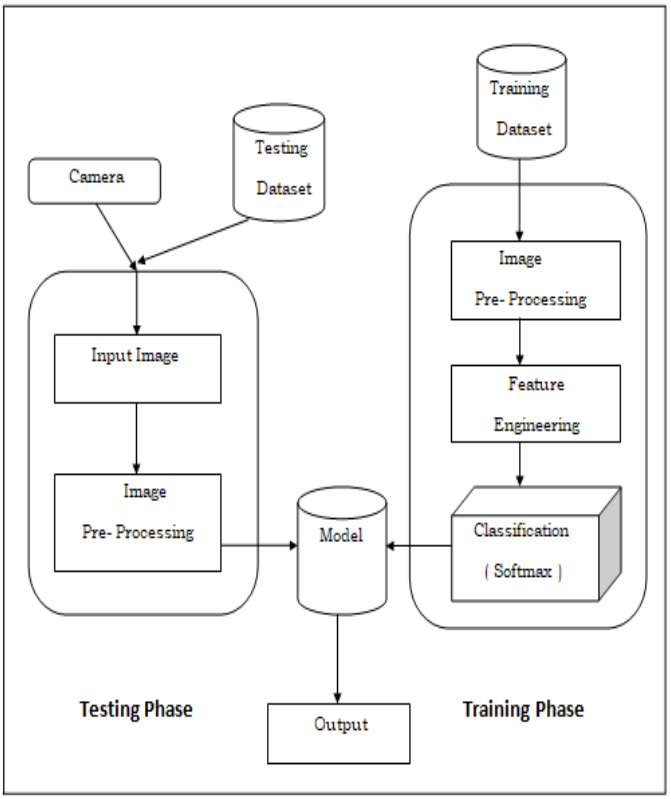


Figure1. System Architecture

Deep Learning:

Deep learning is a subset of machine learning based on artificial neural networks along with representation learning. The word "deep" in "deep learning" refers to the number of layers in the network through which the data is transformed. It derives meaning out of data by using hierarchy in multiple layers that imitates the neural networks of the human brain.

Convolutional Neural Network:

In deep learning, a Convolutional Neural Network commonly known as CNN, or ConvNet is a class of deep neural networks. CNN inspired by the visual cortex of animal, it continuously divide images in order to extract features from them. CNN consists of input layer, output layer, and hidden layers.

The hidden layers consist of :

Convolutional layer: It is the core building block of CNN. It convolves the input and passes its result to the next layer. In CNN, a convolution is a linear mathematical operation that involves multiplication of input image matrix and a filter or kernel.

- An image matrix of dimension (h * w * d)
- The filter ($f_h * f_w * d$)
- Output is a matrix of dimension

$$(h - f_h + 1) * (w - f_w + 1) * 1$$

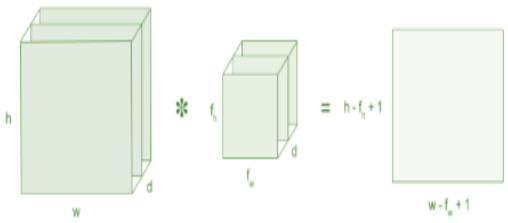


Figure2: Convolution

Rectified Linear Unit Layer (ReLU): Its purpose is to introduce non-linearity in CNN.The output is $f(x) = \max(0,x)$, where x is the input to a neuron.

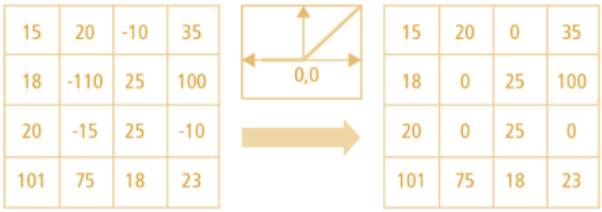


Figure 3: ReLu Operation.

Pooling layer: This layer down-samples the volume spatially, independently in each depth slice of the input volume using max operation. It also helps control over-fitting.

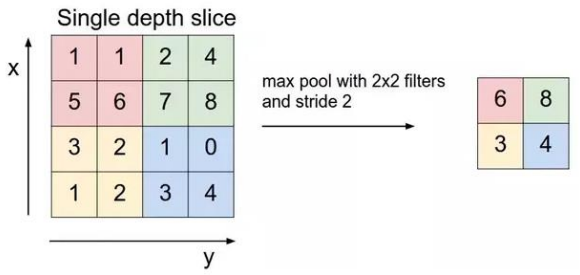


Figure4: Max pooling.

Fully connected layer: It connects every neuron in one layer to every neuron in another layer. The flattened matrix goes through a fully connected layer to classify the images.

Softmax :

In mathematics, softmax function assigns decimal probabilities to each class in a multi-classification problem. These decimal probabilities must add up to 1.0. This helps trains the object more quickly and provides maximum accuracy in prediction. Softmax is often used in convolutional neural networks as an activation function like ReLU applied to the output of the last layer.

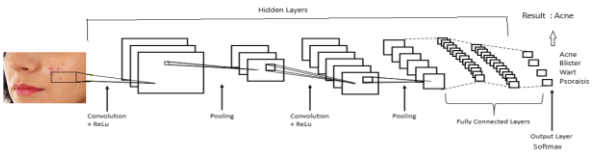


Figure5. Convolutional neural networks.

Accuracy:

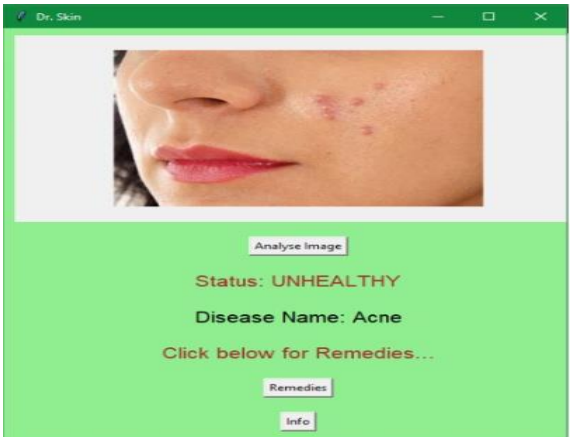
$$\text{Accuracy} = \frac{\text{Number of correct predictions}}{\text{Total number of predictions mode}}$$

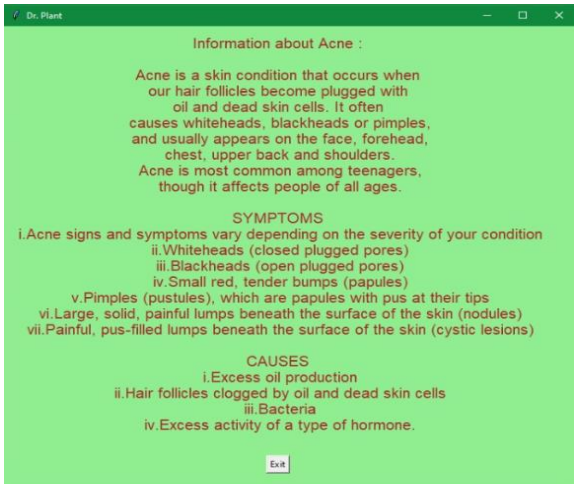
The accuracy is calculated by using the above formula.

IV. DATASET

To develop the skin disease identification model, a dataset of various skin diseases images were used. Some of the images are collected by the author and the rest part is collected from the Kaggle are free to use.

V. IMPLEMENTATION





VI. CONCLUSION

Skin diseases are the most widespread diseases that affect millions of people worldwide every year. Early

detection of the disease can help reduce the chance of worsening the disease. This model is a genuine attempt to identify accurate skin disease. The deep learning and convolution neural network approaches are applied to this system. The accuracy of skin disease prediction which was obtained from the use of deep learning is 83.23%. Moreover, if the disease is identified the system provides detailed information about the diseases along with home remedies.

VII. FUTURE WORK

In the future, the model can be extended by focusing on more severe diseases. A Mobile-based application can also be created. The system can be used as an assistant to the actual doctors when the patients/ users need not have to visit the doctor in person and can have a virtual conversation

VIII. REFERENCES

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