Classification of Different Types of Psoriasis Using Machine Learning.

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***Abstract*— In this paper, the authors present an approach of classification of different types of psoriasis using machine learning.The main objective of the work is to classify the given psoriasis image into one of the classes of inverse psoriasis, nail psoriasis, plaque psoriasis, erethrodermic psoriasis, guttate psoriasis and pustular psoriasis. Convolution neural networks are used in the classification. The approach consumes less memory and can be deployed easily on hand held devices where processing capability is a constraint. In the initial stage, pre traind weights are used for the classification where the results were not promising. As the neural network is trained on input data images, the performance of the neural network is improved to 89%.**

***Index Terms*— Convolution neural networks, Psoriasis, Accuracy, Keras.**

I. INTRODUCTION

Skin is the largest organ in our body. Its weight lies between six and nine pounds and surface area is about two square meters [1]. The inner part of body is separated by skin from the outer environment and protects the body from infection, heat, injury, fungal infection, bacteria, allergy and viruses which are caused by ultraviolet (UV) radiation and controls temperature of body [2]. There are situations where the individual gets frustrated due to the change in the texture of the skin or damage of the skin which can result in symptoms like swelling, burning, redness and itching. Allergies, irritants, genetic structure and immune system related problems can also result in various skin problems [3]. The spot on the skin which is different from rest of the body is called a lesion area. Skin lesions are the first clinical signs of any skin disease such as chickenpox, melanoma etc [4]. A skin that has inadequate melanin is exposed to the risk of sunburns as well as skin cancer due to harmful ultra-violet rays from the sun. Researchers claim that the skin disease requires early intervention in order to effectively identify exact symptoms that will make it easy for the dermatologists to treat and prevent it. Psoriasis disorder has been proven to be unpredictable. It is characterized by the development of lesions in the skin that vary in shape, size, color and texture [5]. So protection and treatment of the skin from diseases is the significant and complicated work of the dermatologists [1]. Nowadays, medical field and dermatologists largely depends on computer-aided diagnosis [4] which is objective rather than subjective.

Dermatology is one of the most unpredictable and difficult terrains to diagnose due to its complexity. In most developing countries, it is expensive for a large number of people to consult a dermatologist. The ubiquitous use of smart phones in a developing country has opened up new avenues for inexpensive diagnosis of the diseases [6]. Dermoscopy is a specialized method of high-resolution imaging of the skin that reduces skin surface reflectance, allowing clinicians to visualize deeper underlying structures [7] based on the user of incident light and oil immersion to make possible the visual examination of sub surface structures of the skin. Though the detection of skin lesions using dermoscopy is higher than unaided observation-based detection. In addition to that, some lesions have irregular boundaries and in some cases there is a smooth transition between the lesion and the skin [8]. Its diagnostic accuracy depends on the training of dermatologist. The computer aided diagnostics is helpful to increase the diagnosis accuracy as well as the speed [9].

Image processing is used to detect the disease by using various methods like segmentation, filtering, feature extraction and classification etc [2]. In automated diagnosis of skin lesions, feature design is based on the ABCD rule of dermatoscopy. ABCD represent the asymmetry, border structure, variegated color, and dermatoscopical structures and define the basis for a diagnosis by dermatologist [8]. Different techniques for segmentation, classification and feature extraction methods related to the diagnosis of cutaneous malignancies are present recently. Numerous features have been extracted from skin images, including shape, color, texture and border properties.

Classification methods range from discriminate analysis to neural networks and support vector machines [10]. To accomplish the classification or regression tasks in order to classify normal skin and psoriasis affected skin, deep neural networks could be a scientific model that minimizes biological neural network structures and enables an automatic data processing framework. The basic operating principle of deep neural network can be summarized as each successive layer uses the output from the previous hidden layer as input. The thought of this rule is to use a high variety of hidden layers to strengthen the classification or regression capability [17].

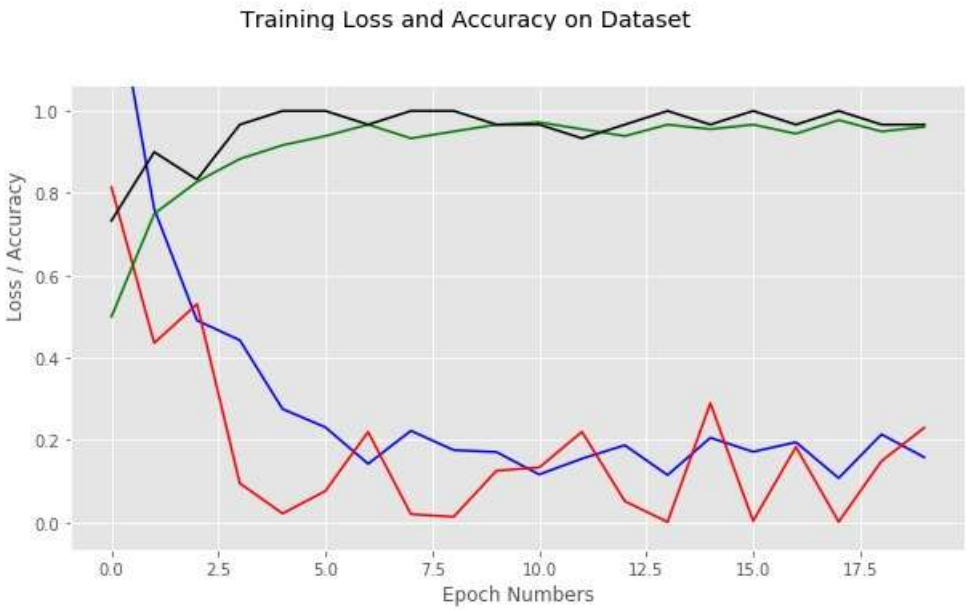
II. METHODOLOGY

Convolution neural networks have proven to be better performers in classification of different skin disorders. In any skin disorder, the identification of the diseases at the early stage plays a vital role in the treatment. Computer aided devices have become an important medical aid in the early detection of skin disorder which provide very high quality of images to the dermatologists who in turn can start treatment at an early stage of skin disorder which has proven as an effective treatment of skin disorder, which is one of the motivating factors for our work. The skin images captured using computer aided devices or hand held devices provide clear distinction among various types of skin disease. The feature obtained from such images acts as input to the neural network. Various machine learning models can be used in assisting the dermatologists in providing insights about the disease based on the texture of the skin. The architecture of convolution neural network used is as shown below in Figure1.

Input Layer
Zero Padding
Convolution
Batch Normalization
ReLU
Depthwise Convolution Block - 1
ZeroPadding
Depthwise Convolution Block - 2
Depthwise Convolution Block - 3
ZeroPadding
Depthwise Convolution Block - 4
Depthwise Convolution Block - 5
ZeroPadding
Depthwise Convolution Block - 6
Depthwise Convolution Block – 13
Global Average Pooling
Reshape
Dropout
Convolution Preds
Reshape
Activation
Output Layer

Figure 1. Architecture used.

III. RESULTS



At the initial stages of the experiments, from the graph it is evident that the performance of the model was not good as the validation loss and training losses were very high. The main reason for the model to attain high validation loss and training losses was the pre determined weights used in the experiments which were from the imagenet. As gradually, the model got trained on psoriasis images, then the validation loss and training losses started to decline and validation accuracy and training accuracy started to improve. In the last phase of the experiments around 89% of classification of inverse psoriasis, nail psoriasis, plaque psoriasis, erethrodermic psoriasis, guttate psoriasis and pustular psoriasis is attained.

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