ISSN No:-2456-2165

Proposed Healthcare System for Skin Disease Detection using Convolutional Neural Network

Prathamesh Ghan[1], Santosh Ghorpade[2], Sharon Mariam Philip[3],Charansigh Ingle[4], Dr Aniruddha S Rumale[5]
Undergraduate scholars of Bachelors of Computer Engineering, G.H.Raisoni Institute of Engineering and Technology, Pune[1,2,3,4.]
Associate Professor AI&DS, G H Raisoni College of Engineering & Management, Pune[5]

Abstract:- In global terms health issues are considered a 2nd priority compared to a lot of other issues in day-to-day life. As health issues are playing second fiddle, Skin diseases are regarded as not too important compared to other major league diseases such as Cancer, HIV, Stroke etc. As skin diseases are becoming more and more common in day-to-day life because of numerous reasons such as Poor Diet, Oily Fast Food, Pollution in the surrounding, Stressful working environment, etc. as it can also be genetic condition (hereditary) in one's nature. The aim is to understand the research that has goneinto the detection of skin diseases using modern technologies and methods to speed up the process and to achieve better accuracy of the detection and classification of various skin diseases.

Keywords:- *Identification of Skin diseases , Deep learning , Solutions, Convolution Neural Network (CNN).*

I. INTRODUCTION

In the human body, skin is the largest organ present. Skin disease is common among all age groups, hence it is a problem that everyone might face in their life regardless of their age. Today's world is so fast faced that expression like "***First impression is the last impression", "Time is money", "Time waits for no one"*** are the new reality of our world. Skin diseases are treated as small time player compared to the more terminal disease as the urgency is given preference when it comes to the ranking of health priorities.

Patient suffering from the skin diseases are highly likely also suffering mentally as well as physically. IN a society where image of a person may decide future prospect it can be very challenging for the patient affected by skin disease especially when the part of the skin is exposed to the world where the disease has affected. IN such scenario the patient is self-conscious about his or her image and can be disheartened by it.In extreme cases where the skin is affected badly and is visible it may lead to social alienation ,self-alienation, lack of confidence to face the world or the sense of lack of worth in the patient, which are a huge psychological burden on a already suffering patient.

Skin disease shouldn't be treated as a second priority or small-time player but as an important problem. Skin disease can be contagious in nature and can be menace not just for the individual but as well as the people in the locality of the patient Such disease should be diagnosed quickly and treated accordingly as swiftly as possible. As to prevent the disease from spreading further. This type is more prominent in the tropical region as the climate itself is very favorable for the skin disease to spread.

Some of the diseases may be hereditary in nature as well .So, it may have affected some past blood relatives because of the genes and passed down to the others further in the bloodline. Other skin disease are caused due to irregularities in the body hormone secretion, lack of nutrients and can be fixed easily compared to the other types. To heal from this type of skin disease one must improve his or her intake of nutrients, Develop a habit of healthy diet for long term solution .

Today, in the era of Artificial Intelligence, pattern recognition and machine learning are commonly used to create machine learning models that can swiftly and accurately recognize and find unique patterns in data.

In our project we would be processing images with the help of python language and using the Convolutional Neural Network we are going to extract the vector image and further detect disease.

Using this application, users will be able to self-diagnose the type of skin disease they are suffering from and how to treat it at the comfort of their home. The suggestion that the application will recommend will act like first aid. It will be comprised of tried and tested methods and remedies passed down the generation as well as some prominent medicine and product available in the drug market .As the user will know the disease it is suffering from they would be able to know the seriousness of the disease and urgency to get it treated, So using modern technology and techniques under Artificial Intelligence together we will be able to identify and treat the disease in question.

II. METHODOLOGY

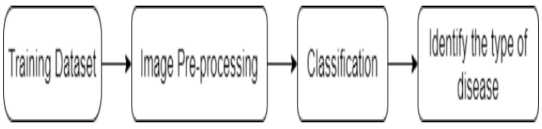

Fig. 1:workflow of the detection

A. Dataset Creation

Dataset consists of 500 images of diseases which are divided into 5 classes. We have selected a few for our research. It consists of diseases like Acne, HairLoss, Nail Fungus, Skin Allergy, Skin Cancer, and healthy skin.

- Acne disease images- we used 50 images to train the model and 26 images to test the dataset.

- Hair loss we have used 50 images to train the model and 31 images for testing the dataset.
- Nail fungus -we used 50 images to train the model and 32 images to test the dataset.
- Skin allergy - We used 50 images to train the model and 33 images to test the dataset.
- Skin cancer - We used 50 images to train the model and 40 images to test the dataset.
- Normal- we used 50 images to train the model and 26 images to test the dataset.
- Not identified - We used 50 images to train the model and 26 images to test the dataset.

Dataset was downloaded from Kaggle.

B. Image Pre-processing

Image preprocessing are the steps taken to format the images. It helps to reducesses model training time and increases model execution speed. Fully connected layers of CNN model requires all the images in the same standard format. The system is using the "Keras" library of python for image pre-processing. The image pre-processing consists of resizing , rescaling , removing noise, shearing, rotating, zooming and flipping . The images are resized to 150x150 resolution for processing. To enrich our dataset we have rescaled, flip, sheared and zoomed the image.

For classification of diseases we have used deep convolutional neural networks . CNN model consists of 3main layers they are as follows :

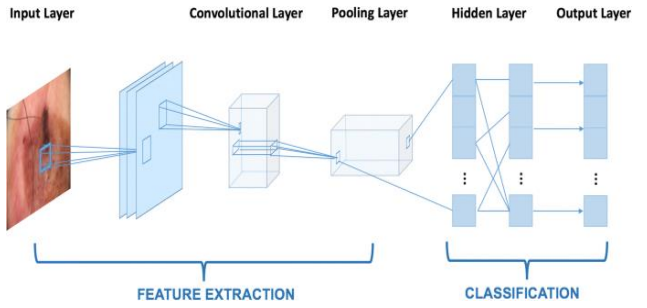

Fig. 2: Layers of CNN.

C. Convolution Layer

The convolution layer multiplies the input image matrix with the feature detector matrix to get the reduced size feature map matrix. In the convolution layer we move stride by stride through the input image matrix. This reduced feature map matrix helps for faster computation.

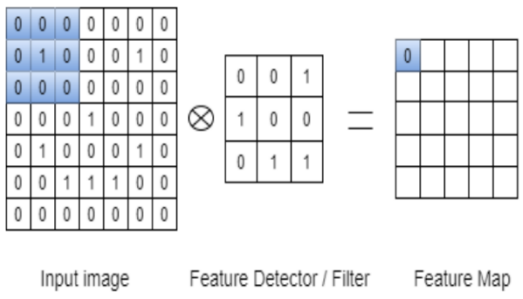

Fig. 3: Convolutional layer working

Fig. 3 exhibits the operation for 7x7 input matrix which is multiplied by 3x3 feature detector matrix and the result is 5x5 feature map matrix of reduced size.

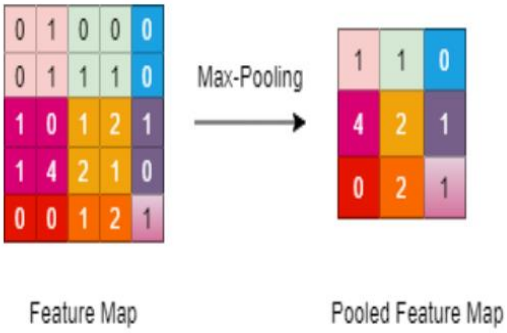

Fig. 4: Pooling layer

D. Flattening

The numbers from the pooled feature map are taken row by row to form a huge vector because later we want to input this vector into the Artificial Neural Network (ANN) for further processing.

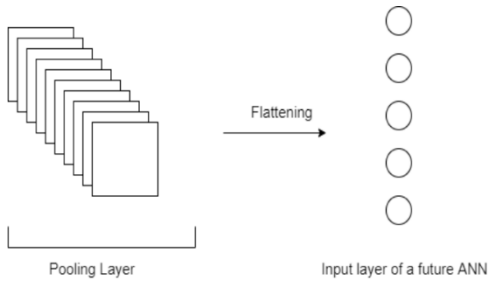

Fig. 5: Flattening layer

E. Fully Connected Layer

The Fully Connected Layer consists of input layer, fully connected hidden layers and output layer. The output vector that we got after flattening is the input layer. The features are combined to form attributes which will help us to predict the class. The output layer consists of all the classes.

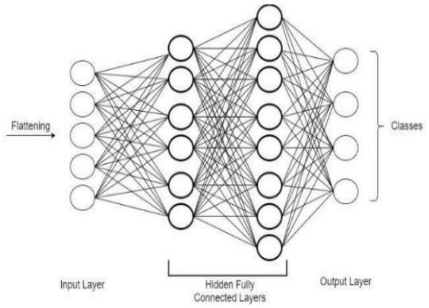

Fig. 6: Fully connected layer

ISSN No:-2456-2165

III. ACTIVATION FUNCTION

Activation functions are mathematical equations to determine the output of a neural network. In a network, the function is attached to each neuron. Based on whether each neuron's input is relevant for the model's prediction it determines whether it should be activated("fired") or not. In the proposed model ReLU and SoftMax activation functions are used. The rectified linear activation function or ReLU, Linear function that will generate output zero if the input value is zero or negative otherwise it will generate output positive value as it is. SoftMax : It is used in the output layer and when we need to classify into multiple categories. It normalizes the output for each class between 0 and 1 and then divides by their sum, to find the probability of input data in a specific class.

IV. EXISTING APPLICATION

- SkinVision – App only detects moles and evaluates risk for skin cancer but has no means to detect other skin conditions. Not available for children.
- iDoc24 – App mainly designed for detecting skin lesions and moles and can't detect other several skin diseases. Not available for children
- First Derm – Apps can't self-detect any disease but instead act as a medium between doctor and patient through online communication or telephone communication.
- Cureskin – App specializes in six types of diseases but isn't functional for other than these six specific diseases.
- Dermatology Atlas – App was designed for rare skin diseases for their proper detection and to suggest cure for the same. App contains pre-cases of diseases but can't self-evaluate any other diseases, those that are not mentioned.

V. SUMMARY

Detection of skin disease through an application limits the data to the android users, hence our application in future would be including data analysis which would help collect data of the effect of skin diseases prevailing in our country and this statistic can help introduce different ways to reach out to all and curb its adverse effect on humankind

VI. RESULT AND DISCUSSION

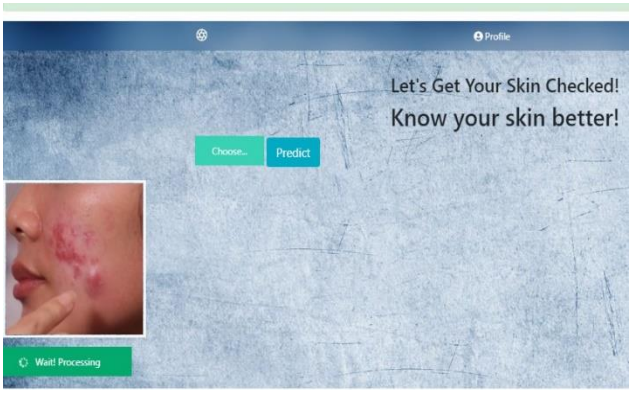

Fig. 8:Window to select the image of the affected area of the skin.

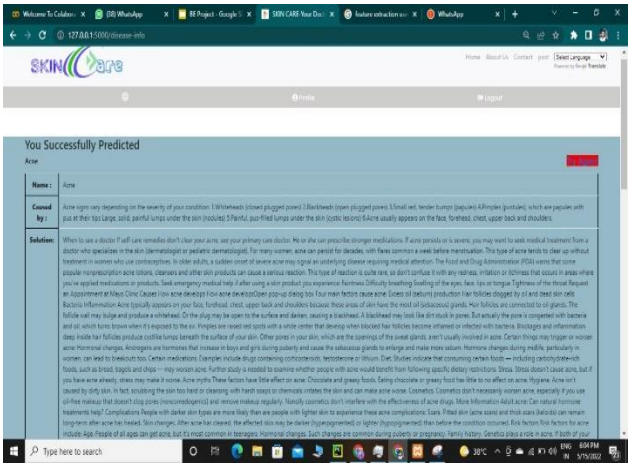

Fig. 9: Result of the above selected image, possible cause of the disease and a few suggestions to treat the disease.

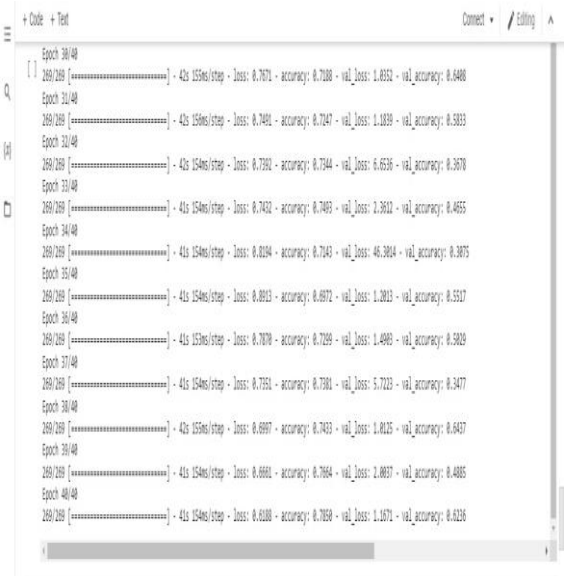

Fig. 10: Image showing the accuracy of the algorithm

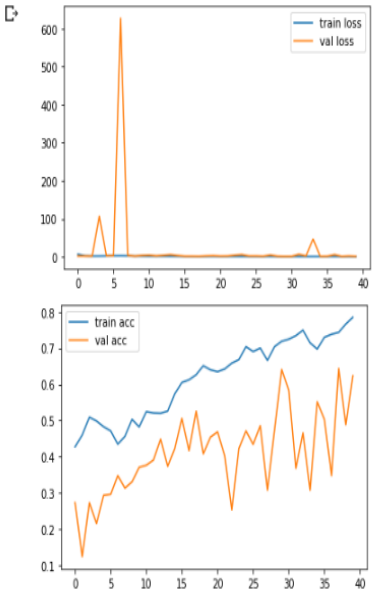

Fig. 11: Images of algorithm reacting to the training and testing phase.

REFERENCES

[1.] Fusing Metadata and Dermoscopy Images for Skin Disease Diagnosis https://ieeexplore.ieee.org/document/9098645/authors#authors
[2.] A Method of Skin Disease Detection Using Image Processing and Machine Learning https://www.researchgate.net/publication/338759556_A_Method_Of_Skin_DiseaseDetection_Using_Image_Processing_And_Machine_Learning
[3.] Skin Disease detection based on different Segmentation Techniques https://ieeexplore.ieee.org/document/8862403
[4.] Diagnosis of skin diseases using Convolutional Neural Networks https://ieeexplore.ieee.org/document/8474593
[5.] Digital dermatology: Skin disease detection model using image processing https://ieeexplore.ieee.org/abstract/document/8250703
[6.] An Enhanced Model for Skin Disease Detection Using Dragonfly Optimization Based Deep Neural Network. https://ieeexplore.ieee.org/document/9032458
[7.] Analysis and classification of human skin diseases. https://ieeexplore.ieee.org/document/7877750
[8.] Melanoma Disease Detection Using Convolutional Neural Networks. https://ieeexplore.ieee.org/document/9121075
[9.] Digital Diagnosis of Hand, Foot, and Mouth Disease Using Hybrid Deep Neural Networks. https://ieeexplore.ieee.org/document/9570380
[10.] Deep Convolutional Neural Network for Melanoma Image Classification. https://ieeexplore.ieee.org/document/9231676
[11.] Deep Learning Approach for Dermatosis Identification https://ieeexplore.ieee.org/document/9293898
[12.] Convolutional Neural Network Algorithm with Parameterized Activation Function for Melanoma Classification. https://ieeexplore.ieee.org/document/8539451
[13.] Classification of Skin Lesions Using an Ensemble of Deep Neural Networks. https://ieeexplore.ieee.org/document/8512800
[14.] Deep convolution neural network based automatic multi-class classification of skin cancer from dermoscopic images. https://ieeexplore.ieee.org/document/9432160
[15.] Mobile-based Intelligent Skin Diseases Diagnosis System. https://ieeexplore.ieee.org/document/9035129
[16.] Advanced Skin Diseases Diagnosis Leveraging Image Processing. https://ieeexplore.ieee.org/document/9155914
[17.] Computer-Aided Clinical Skin Disease Diagnosis Using CNN and Object Detection Models. https://ieeexplore.ieee.org/document/9006528
[18.] Texture features neural classifier of some skin diseases https://ieeexplore.ieee.org/document/1562298
[19.] Color Segmentation for Skin Lesions Classification. https://ieeexplore.ieee.org/document/4786059
[20.] 20. Skin Lesion Classification Using Densely Connected Convolutional Network.
[21.] https://ieeexplore.ieee.org/document/9231041