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SKIN DISEASE PREDICTION

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Abstract – *This research describes skin disease prediction by using a neural network based on image analysis. Diagnosis and prediction of skin disease take a very long process because it requires a patient's history, physical examination, and proper laboratory diagnostic tests. The traditional system requires a large number of features clinical as well as histopathological for analysis and to provide further treatment. The disease diagnosis and prediction becomes difficult as the complexity and number of features of the disease increases. Therefore a computer-aided diagnosis and recognition system is introduced. Computer algorithm ResNet152V2 which contains few steps that involve image processing, image feature extraction, and classification of data has been implemented with the help of a classifier such as an artificial neural network (ANN). The algorithm uses feature extraction & soft-max classifier of Convolutional neural network (CNN) for the detection of skin disease. The system will give more accuracy & efficiency making it more reliable for dermatology.*

***Key Words*: Skin Disease, Neural network, Image processing, Feature Extraction, CNN, Machine Learning, Soft-max Classifier, Dermatology.**

1. INTRODUCTION

The biggest organ of human is a skin, which mass it is approximately around 4 kg to 5 kg. The skin has a surface area of about 1.2 m2 – 2.2 m2. It has many functions and especially it is one of the most essential organs for human beings. The uses and the function of the skin are protecting the body, maintaining the temperature and sense as well. The skin is separated into three different layers which are epidermis, dermis, and subcutaneous. The human skin is made up of two layers which are known as the epidermis. Where, the dermis is the thick layer of living tissues below the epidermis that forms the true skin and contains a lot of important structures such as blood capillaries, sweat glands, hair follicles, and other structures. Dermatological diseases are most prevalent diseases worldwide. The diagnosis of dermatological diseases requires extensive experience. In the current scenario, about 90 percent of diseases of the skin are managed exclusively by Primary Care. This implicatively depicts that most skin diseases can be solved if care is taken at an early stage. Skin diseases can affect the quality of life of patients and it efficiently requires early diagnosis. There have been many endeavors to implement traditional medicine across the different parts of the globe especially in countries that are not technologically advanced, but the efforts have been met with challenges such as the huge cost of medical tools and types of equipment and also lack of medical expertise. Skin disease typically originates from environmental factors along with other causes. The necessary tools required for early detection of these diseases are still not immediately available in most populations globally. The proposed paper provides an approach to predict different kinds of skin diseases. The user gives input of the skin disease image, which then the system processes, does feature extraction using ResNet152V2, and uses softmax image classifier to diagnose diseases. If there is a healthy skin image it will result in healthy skin. Thus in this paper, skin disease prediction and classification method based on Convolutional Neural network (CNN) is proposed.

1.1 Literature Survey

The first paper is Skin Disease Recognition Using Texture Analysis. In this paper, they have used the Backpropagation algorithm(BPN) to predict various kinds of skin diseases. The algorithm uses gray level co-occurrence and matrix for feature extraction. The algorithm was 50% efficient and it requires more time for pre-processing.

The Second paper name is Automating Skin Disease Diagnosis Using Image Classification. In this paper, they have used Logistic Regression to predict various kinds of skin diseases. The algorithm uses a Multilayer Perceptron classifier for feature extraction. The algorithm was 40% efficient. It was only used for cancer disease prediction.

The third paper is Image Analysis Model For Skin Disease Detection: Framework. In this paper, they have used KNN (K Means Neural Network) to predict various kinds of skin diseases. The algorithm uses a Support vector machine classifier for feature extraction. The algorithm was 90% efficient. Here image annotation must be done and the process requires much time.

The fourth paper is Diagnosis of skin diseases using Convolutional Neural Networks. In this paper, they have used CNN (Convolutional Neural Network) to predict various kinds of skin diseases. The algorithm uses Softmax Classifier for feature extraction. The algorithm was 70% efficient and a large number of datasets can increase the efficiency of the algorithm.

The fifth paper is Progressive Transfer Learning and Adversarial Domain Adaptation for Cross-Domain Skin Disease Classification. In this paper, they have used CNN (Convolutional Neural Network) to predict various kinds of skin diseases. The algorithm uses Progressive Transfer Learning for feature extraction. The algorithm was 95% efficient but it requires a large number of datasets.

1.2 Requirements

Hardware requirements
Operating system- Windows 7,8,10
Processor- dual-core 2.4 GHz (i5 or i7 series Intel processor or equivalent AMD)
RAM-8GB

Software Requirement
Jupyter Notebook
Chrome
Python
Python GUI
Flask/Django

1. METHODOLOGY

There is a total of two primary phases in the system: 1. Training phase: The system is trained by using skin disease images based on the algorithm chosen accordingly. 2. Testing phase: the system is provided with the input images and is tested for their working. The accuracy is checked. Hence, the data that is used to train the model or test it, has to be appropriate. The system is designed to detect skin disease and hence appropriate algorithms must be used to do the two different tasks. The best-suited one for the task was chosen.

2.1 Objective

To develop an effective and efficient model which detects and predicts skin disease based on the user input. To achieve good accuracy. To develop a User Interface(UI) that is user-friendly and takes input from the user and predicts the skin disease.

2. PROPOSED SYSTEM

As shown in the below figure, the process starts by collecting the dataset. The next step is to do Data Preprocessing which includes Data cleaning, Data reduction, Data Transformation. Then, using the Convolutional Neural Network (CNN) algorithm we will predict the skin disease. The algothm used is ResNet152V2. After using the algorithm the model will predict the skin disease according to users' input. Users can give input through the website for skin disease prediction using machine learning.

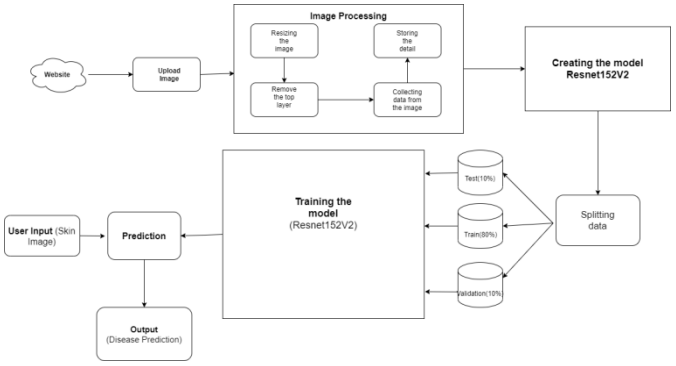
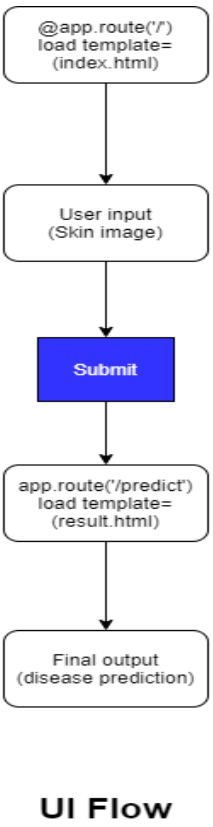


Fig 3.1: Proposed System Flowchart

3.1 The objectives of the proposed system are:

1)To develop an algorithm for efficient extraction and classification of Pigmented human Skin.
2)To ease diagnosis and treatment of skin patient (using automation) and provide for a cost-effective way of skin disease treatment.
3) To improve the speed of diagnosing various kinds of skin diseases.



UI Flow

Fig 3.2: UI Flow

3.2 ResNet Architecture

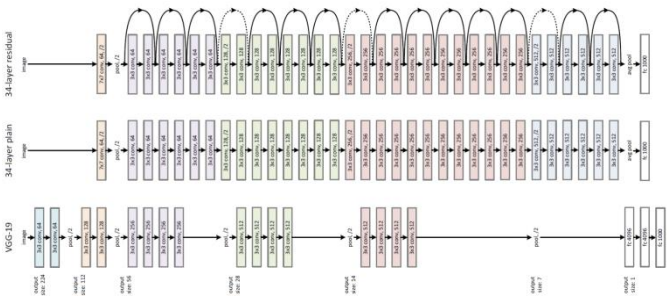


Fig – 3.3: ResNet Architecture

[Source: https://towardsdatascience.com/an-overview-of-resnet-and-its-variants-5281e2f56035]

The above figure shows the ResNet architecture.
The VGG-19 [2] (bottom) is a state-of-the-art approch. 34-layer plain network (middle) is considered as the deeper network of VGG-19, i.e. more convolution layers. 34-layer residual network (ResNet) (top) is the plain network one with addition of skip or shortcut connection.
For ResNet, there are mainly 3 types of skip / shortcut connections when the input dimensions are smaller than the output dimensions.
(A) Shortcut performs identity mapping, with extra zero padding for increase in dimensions. Thus, no extra parameters added or required.
(B) The projection shortcut is used for increasing dimensions only, and the other shortcuts are identity. Extra parameters are also needed.
(C) All shortcuts are projections. Extra parameters are more than that of the (B).

3.3 ResNet152V2

The first thing we notice in the algorithm to be different is that there is a direct connection that skips some layers(may vary in different models) in between. This connection is the core of residual blocks and it is known as 'skip connection'. Now due to this skip connection, the output of the layer is not the same. Without the use of this skip connection, the input 'X gets multiplied by the weights of the layer followed by adding a bias term.

ResNet network uses 34-layer plain network architecture inspired by VGG-19 in which shortcut connection is added.

3.4 Skip / Shortcut Connection in Residual Network (ResNet):

To solve the problem of vanishing/exploding gradients, a skip / shortcut connection is added to add the input *x* to the output after few weight layers as below:

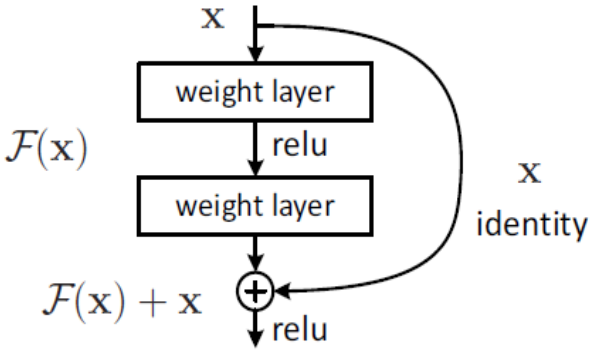


Fig 3.4 Skip layer Diagram

[Source: https://towardsdatascience.com/an-overview-of-resnet-and-its-variants-5281e2f56035]

Hence, the output **H(x)= F(x) + x**. The weight layers actually is to learn a kind of residual mapping: **F(x)=H(x)-x**.
Even if there is vanishing gradient for the weight layers, we always still have the identity **x** to transfer back to earlier layers.

3. FUTURE SCOPE

In future, this machine learning model may bind with a various website which can provide real-time data for skin disease prediction. Also, we may add large historical data on skin disease which can help to improve the accuracy of the machine learning model. We can build an android app as a user interface for interacting with the user. For better performance, we plan to judiciously design deep learning network structures, use adaptive learning rates, and train it on clusters of data ratherthan the whole dataset.

4. Result and Disscusion

The datasets used in the proposed system are standard datasets from Kaggle [Source: https://www.kaggle.com/].
The algorithm used in the proposed system is ResNet152v2 which provides better accuracy than some other algorithms as shown in the following graph. The Graph is plotted on the basis of actual result as previous paper analysis.

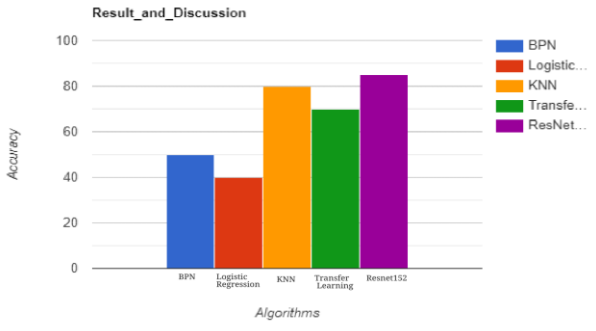


Fig 5.1 Graphical Analysis

5. CONCLUSION

This method we can use as an effective, low-cost solution for skin disease detection by a computer-aided system is proposed to resolve difficulties that are created from challenges faced by the dermatologist to recognize the different skin diseases easily. Firstly applied enhancements to remove the noise, two noise reduction technologies were investigated. Gaussian filter and median filter were compared in the noise reduction and compared four color spaces (RGB, YUV, HSV, and YCbCr) for skin lesion extraction and feature extraction and to improve the computation efficiency. This model is a built-in mobile application with user-friendly interfaces and clear steps.

6. REFERENCES

[1] Z. Ma and J. M. R. S. Tavares," A Novel Approach to Segment Skin Lesions in Dermoscopic Images Based on a Deformable Model," IEEE Journal of Biomedical and Health Informatics , vol. 20, no. 2, pp. 615-623, March 2016.

[2] Sudha J, Aramudhan M and Kannan S, "Development of a mathematical model for skin disease prediction using response surface methodology," Biomedical Research 2017; Special Issue: S355-S359.

[3] Igor Kononenko," Machine learning for medical diagnosis: history, state of the art and perspective,"Artificial Intelligence in Medicine , v.23 n.1, p.89-109, August 2001.

[4] V. B. Kumar, S. S. Kumar, and V. Saboo, "Dermatological disease detection using image processing and machine learning," 2016 Third International Conference on Artificial Intelligence and Pattern Recognition (AIPR) Lodz, 2016 , pp.1-6.

[5] Damilola A. Okuboyejo, Oludayo O. Olugbara, and Solomon A. Odunaike, "Automating Skin Disease Diagnosis Using Image Classification," Proceedings of the World Congress on Engineering and Computer Science 2013 Vol II WCECS 2013 , 23-25 October 2013, San Francisco, USA .

[6] "Expert System for Diagnosis of Skin Diseases", International Journal of Science and Technology , vol. 4, no. 1, 2015.