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Mobile Application based Skin Disease Detection using Mobilenet Model

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***Abstract*: Skin disease is one of the fastest growing problem across the world. It is most common type of diseases where some can be painful and some can lead to death so to avoid delay in the treatment an android application is developed. CureSkin is an android application used for skin disease detection developed using MobileNet model. Model is pretrained with 6 different types of skin diseases namely Acne, Acitinc Keratosis, Eczema, Psoriasis, Seborriheic and Tinea ringworm. This model was positioned on the developed android application. When the user inputs the image of a disease its name will be displayed on the screen. This android application also detects if the selected image is normal skin or not a skin.**

***Keywords*: CureSkin, MobileNet, Skin disease.**

1. Introduction

Skin diseases are the disorders that often outwardly shown on the skin. Some might be very dangerous but many of them are commonly occurring. Many attempt to fix their skin issues by home remedies. If those remedies are not suitable for that kind of skin disease than it may cause serious impact therefore, knowing the type of skin disease is necessary. Dermatologists guaranteed that large portion of skin diseases are manageable with proper medications, if they decisively diagnosed, Thus, an automatic skin disease detection application helps to identify and treat the disease at the earlier stage.

MobileNet model is a Convolutional Neural Network (CNN) architecture model which is used for image classification and mobile vision. MobileNet reduces the total number of parameters which results in lightweight deep neural networks. There are many other CNN architectures but MobileNet uses very less computation power to run so mobileNet model was used in CureSkin application. MobileNet model was trained using 8 different classes of datasets and default pre-processing of input data. Frontend of this application was designed using dart language. Dart is a programming language which is widely used to develop mobile application. Main aim is to develop a user-friendly application that can identify skin disease by accepting an image as input and display precise output.

2. Existing System

In the existing models stored image of the skin disease and name will be displayed to the user. The user has to compare their infected area with the images provided in the application. But there no clear result regarding the user's disease. User should consult a doctor for detection of the disease. There is no such application which can take input from the user and predict the result. However very few researchers have investigated the idea of creating such application.

3. Proposed System

The proposed system application detects the skin diseases based on dataset provided. Input is taken from the user in the form of an image. Dataset contains set of images of different skin diseases. Input image will be compared with the data set using the concept of deep learning and results will be displayed.

4. Software and Hardware Requirements

- Operating System: Windows 7 or above,
- Android/iOS Tools used: Anaconda, Android Studio
- Programming Language: Python, Java, Dar
- Processor: Pentium 4 or above
- RAM: 2GB or above
- Hard Disk: 100GB or above

5. Methodology

The proposed methodology effective way to analyse the people input to predict the skin disease. The focus of the project is to divide the images of skin diseases six different classes based on type of disease. Then the images are divided into train, test and valid for further classification. Images are trained using MobileNet model in the ratio 80:20, where 80% of images are for training the model and 20% for testing the accuracy. Pre-trained MobileNet model will classify the images. Fig. 1 shows system design of CureSkin.

The user loads the image and the application will preprocess the image. Then the skin disease is detected by comparing to the dataset and obtained result is returned to the user. Fig. 2 shows the sequence diagram of CureSkin.

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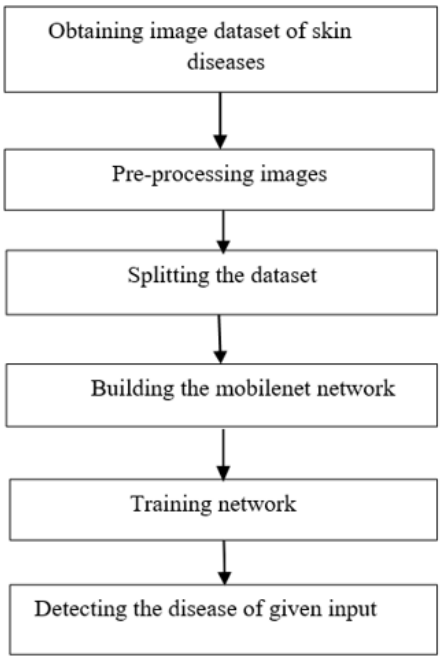


Fig. 1. System design of CureSkin

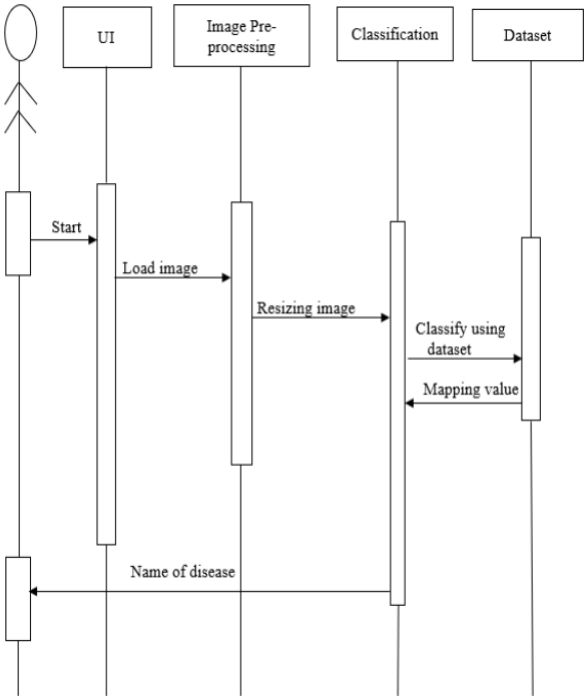


Fig. 2. Sequence diagram of cureskin

6. Implementation

A. Dataset

Thousand and twelve images for each disease were possessed from online platform. Dimensions of images obtained were different in terms of sizes but then rescaled to 244x244 dimension.

B. Pre-processing

In Pre-processing input image will be loaded to MobileNet model by converting it into array. MobileNet model predicts the output and provides the result in the form of array. Output will be the what percentage input resembles all the eight classes. Predict the output using the MobileNet model Procedure. Class with maximum percentage value will be the final output.

C. Network Layer

MobileNet model has seven different layers for pre-processing and training model which are convolution layer, pooling, Dropout, ReLu, Dense layer, Optimizer and model architecture layer.

1) Convolutional layer

Convolutional layer is initiative layer to extract feature from an input image. Layer not only applied for input data i.e. raw pixel value but also for output of other layers. Here in layer weight matrix known as filter. In project we have five layers and has different parameters. Operations takes two input i.e. image matrix and filter or kernel mathematically.

2) Pooling

Pooling is a procedure of extracting features from image output of a convolution layer. Reduces spatial size and amount of parameters in computation in the network. Building of CNN is the pooling and commonly used pooling is maxpooling i.e, when filter passed over image max value of that passed filter is considered.

3) Dropout

Dropout consists of unpredictable setting up of fraction input units to 0, or terminating of a fraction of activation function by dribble their weights to 0 during training time. Dropout very necessary when dealing with over fitting. 25% to 50% dropped out normally and which generally implemented at the final layers of the network.

4) ReLu

Rectified Linear Unit is abbreviation for ReLu. Used for start-up of nonlinearity in the network and doesn't activate all neurons at same time. ReLu activation function defined as max (x,0) with input x and its cheap to compute as not complicated math. ReLu converges faster and sparsely activated. It is quick evaluate but ReLu not used in output layer.

5) Dense layer

A Dense layer completely connected by neurons in a network and its ordinary neural network. Neurons have connection from each input present in the previous layer. Each neuron gives one output to next layer. Activation calculated by matrix multiplication and loss function used in all model is softmax loss function.

6) Optimizer

Stochastic gradient descent (SDG) with momentum is optimizer used in network. Gradient descent where updating weights only after a complete traversal of training data wherein stochastic gradient descent updating of weights after a batch of training data. So, by comparing both times required for convergence is much smaller in stochastic gradient descent than that of gradient descent. Momentum term make sure the model tries global optimum than stuck at some local minimum.

7) Model architecture

L2 regularization rate of 0.01 network model constructed. CNN has input, output and hidden layers and model constructed

with no pretrained weights. Because of the external memory limitation model trained using 12 size for batches.

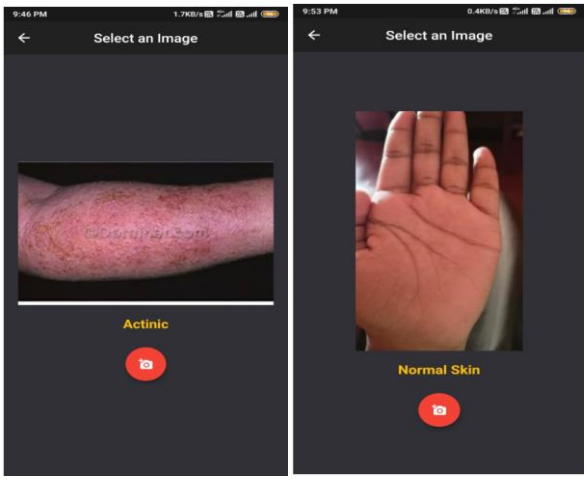
7. Guidelines

A. Testing

Table 1 shows the test case result of the final application.

Table 1
Test cases of cureskin

Sl. No	Test Procedure	Pre-Condition	Expected Result	Passed/ failed
1	Click sign-up with valid details	---	User account will get created	Passed
2	Click sign-up with invalid details	---	Invalid Sign-up	Passed
3	Click login with valid details	User account should exist	Successful login	Passed
4	Click login with invalid details	User account should exist	Invalid Login	Passed
5	Click on Choose file	Login through the created account	System Location will be opened	Passed
6	Click on Camera icon select capture	Image should be captured	The name of the Skin disease will be displayed	Passed
7	Click on Gallery icon	Skin Image is selected	The name of the Skin disease will be displayed	Passed
8	Select a normal skin image	Image should open	Normal skin result will be displayed	Passed
9	Select any other Object image other than Skin	Image should open	Not a Skin result will be displayed	Passed



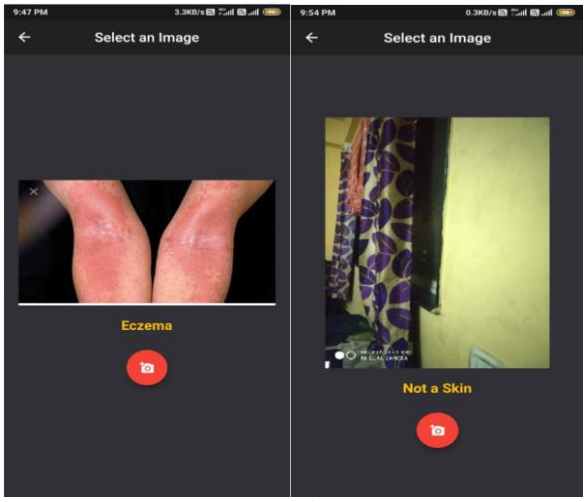


Fig. 3. Result of application

B. Mobile Application

The proposed system was developed using very minimum software and hardware requirements. Anaconda navigator and android studio were the IDEs used for development. Application has very simple interface for user convenience.

Fig. 3 shows the interface and results displayed by the application.

8. Conclusion and Future Work

Detection of skin diseases is one of the major problems for medical field. The proposed system is able to detect the skin disease with good accuracy using machine learning technique. Application is build using TensorFlow hence, it can be used in machine with low system specification. It also has simple user interface for user convenience. Since this method is mobile based it even accessible in remote areas.

In future application can be included with details and location of nearby doctors. At present application detect six diseases. In future model can be trained for more diseases.

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