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APPLICATION TO DETECT SKIN CANCER USING CNN

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Abstract- The proposed work is an application to detect Skin Cancer, which is a software designed to identify the skin cancer in humans. In today's world many people ignore the rashes on the skin assuming that, it will be due to allergies which may lead to skin cancers and diseases. The project aims to solve these kinds of problems that human face in their day to day life. The application is designed in Python, which mainly concentrates on Machine Learning Algorithms such as Convolutional Neural Networks. A model is developed by training with sample images of different kinds of skin cancer and diseases. An Android application accepts a contaminated image as input where minimum resolution of image is 8MP. The images will be compared with the trained data set. Before comparing the image with the trained data set, a series of questions will be asked regarding skin issue symptoms and depending upon the answers given by the user the machine comes to a conclusion on type of cancer or disease based upon the training data set. Depending on the predicted result, the user will be notified with the remedies.

Keywords: Machine Learning, CNN, Image Classification, Skin Cancer

I. INTRODUCTION

In the recent happenings, machine learning is the powerful tool that is being used in various fields. And its importance in the medicine domain cannot be neglected. The main contribution in this regard is of mHealth. mHealth is short for mobile health, which is a general approach for medical care over mobile phones or wireless technology. [1]

Skin cancer is the condition where the cells in the epidermis grow abnormally, which is caused by DNA damage whichmay induce mutations and these mutations lead the skin cells to divide and multiply rapidly and furtherleads to the formation of malignant skin tumors.

The different types of skin cancer are:

- Basal cell carcinoma (BCC)
- Squamous cell carcinoma (SCC)
- Melanoma

Basal cell carcinoma (BCC): They are out of control growths that yieldsfrom the basal epidermal skin cells. They are developed on the areas that are unmasked to sun. This is developed due to the long-term exposure of skin to sun's UV rays.

Squamous cell carcinoma (SCC): They are uncontrolledgrowth of atypical cells emerging from the outmost skin layer of squamous cells. They are developed on the areas that are exposed to sun. They look like moles and sometimes may evolve from them. They are caused due to UltraViolet rays when exposed to the sun.

Melanoma: They are developed from the skin cells called melanocytes, these cells are responsible for the production of melanin pigments that give color to the skin. They are caused due torandom sun exposure that leads to sunburn.

Most of the melanomas look similar to moles, some of them emerge from moles and are with the color pigments such as black or brown and it also be found as pink, red, purple, blue or white colored skin pigments. The main objective of the proposed work is to construct an application 'Medipot' that infers the input image data to the model where data is analyzed whether the image is cancerous or not. The proposed work can be implemented based on different machine learning approaches to detect the various features and classify them correctly. [2]

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II. LITERATURE SURVEY

Existing System

Several new studies and projects have come to light in recent years to apply various Machine Learning Algorithms to Skin Cancer Detection.

Xiangfeng Dai *et al.*[3] proposed an on-device classification model, where the model was trained with the training dataset and the result is saved in a mobile.It was used to perform classification of new sample, which need not be explicitly shared. Ammara Masood *et al.* [4] proposed a method that provided an effective solution to the classification theme by subjecting the model to train with data being both labeled and unlabeled, while it made SVM to use limitedly present labelled data. Shalu*et al.* [5]proposed a methodology which mainly consisted of four major steps namely preprocessing, segmentation, feature extraction, and classification. Muhammad Qasim Khan *et al.* [6] proposed asystem to classifythe skin cancer precisely as melanoma and nevus. Catarina Barata*et al.* [7] presented a method which showed that it was better to use hierarchical networks. The approach further accounted for the color normalization, performance of learning strategies and lesion segmentation, and also the comparison of evaluation metrics. Juliana Shihadehy*et al.* [8] proposed a methodology that focused onclassifying image under consideration asMalignant or Benign. The methodology was based on AlexNet and GoogleNet, which are the predominant part of CNN. Yanhui Guo *et al.* [9]proposed a multiple CNN method that includedconnected networks where the model was trained using atraining strategy to adjust the training samples for various CNN models. The idea was to improve the model's performance by repeatedly train the model on misclassified samples, which was correspondent to the human's recognition procession. The model determined the classification results of the testing data that had the highest prediction score. Suleiman Mustafa *et al.*[10] proposed a method where an image is segmented into lesions and then 15 features were extracted by using typical image processing techniques such as GrabCut combined with mean shift segmentation algorithm, and feature extraction. Amulya P M *et al.* [11] reviewed various techniques that were available for detection of melanoma skin cancer priorly. As per the review performed based on the standard rule of ABCD considering the various ML classifiers, SVM gave highest accuracy than the k-means clustering and decision tree classification. From all the reviewed approaches it could be concluded that the classification done by the neural network method was better than the others.

III. PROPOSED SYSTEM

In the proposed method, the melanoma detection is achievedin various stages like pre-processing of the image fed into the model, image segmentation to make the image more precise to analyze by the model, image feature extraction that enables to distillate the features desired and get the region of interest (ROI), and artificial neural classification to classify the image acccordinglythat utilizespreliminary systems and software for obtaining the accurate results.

An on-device inference application is developed where user inputs a skin image.

The application is designed in such a way that the image could be fed either by capturing a new one or by selecting the image stored in the gallery.

The android application is developed with the help of Android Studio application, which provides the best platform for developing android mobile applications with better quality user interface.

On the other hand, the model predicts the result whether the image of the skin under consideration is cancerous or not. The model makes use of convolution neural network as shown in Fig 1. The CNN are the special version of the multilayer perceptrons, which mean the network is to be fully connected. In a fully connected CNN, every neuron in the considered layer is connected to every singleneurons present in the upcoming layer. [12]

The model is designed in Python and is trained with the help of various images in the considered dataset. To be precise, the model makes the extensive use of TensorFlow.

IV. IMPLEMENTATION

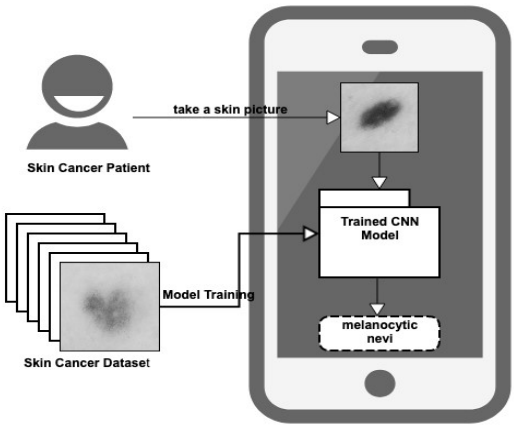

Fig-1:On-device Inference App for Skin Cancer Detection [1]

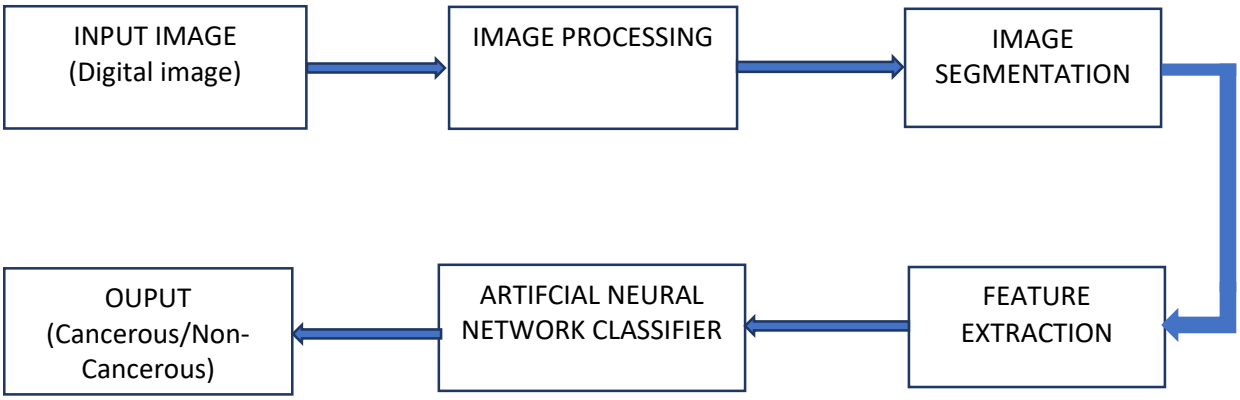

Fig-2:Sequence of data flow [2]

The input image is subjected to various image processing techniques and is subjected to segmentation where the noisefrom image such as hair, impurities areremoved. The skin lesion features are extracted and the data is fed to the neuralnetwork that classifies the image based on its training experience whether the imageinput to the application is cancerous or not as shown in Fig 2

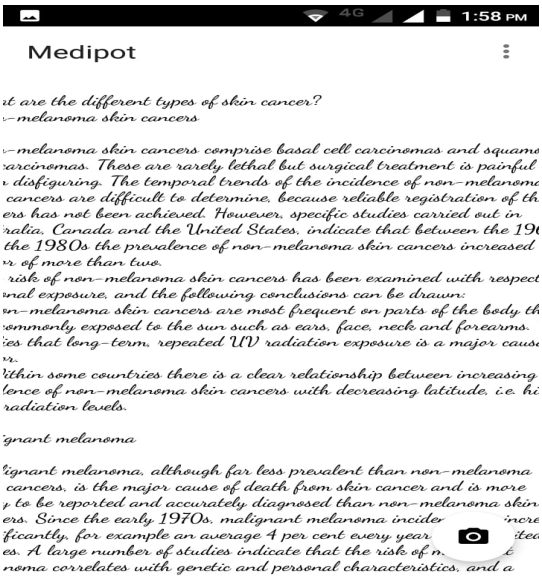

Fig-3: Home Page

Fig 3 shows the home page of the application where the user can click on the camera icon to open the camera. In the background the motivation for the development of the project can be observed.

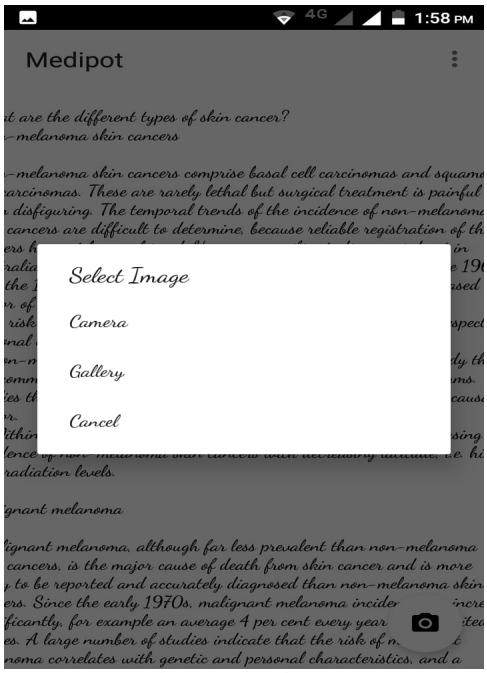

Fig-4: Image Selection

The image selection of the application where the user can select the image either from the mobile camera or could select from the gallery where the image is already available, else chose to cancel the operation.

V. TECHNOLOGIES USED

5.1 Convolution Neural Network

CNN comprises of one or more convolutional layers.It is proceeded by one or more neural network connected layers. These are inspired by animal visual cortex.

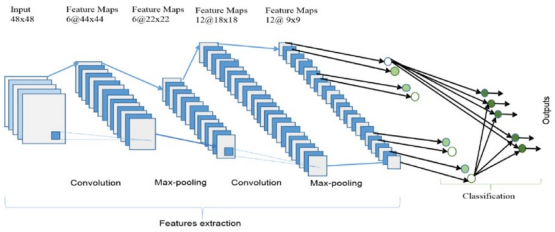

Fig-5: CNN Architecture

CNN Architecture shown in the Fig 5, uses convolutional layers, which is otherwise called land pooling. Pooling is a method of arbitraryexperimenting and it is commonly used while adding pooling layers tolower the parameters and to eliminate unnecessary features during the training in a pursuance to avoid overfitting in the network.
After the convolutional layers, the multiple proportionalarraysare flattened into a twodimensionalarray in fully connected network. The ultimate output layer is calculated as the probability of each skin type to ensure the most proper classification of the image, that is done using the SoftMax activation function. [13]

5.2 Tensorflow
Tensorflow is a license free software for dataflow graphs to build models. It allows neural networks to go hand in hand with multi layers and is predominantly used for prediction and classification of the sample data fed into the model or the network. [14]Tensorflow provides excellent functionalities and services and enables the high level complex parallel computation for building advanced neural networks.

Keras
It is also another python library majorly used in neural networks.It is more user friendly, modular and enables faster experimentation with neural networks. It is can be made to run on top of Tensorflow. It contains a great number of neural network building blocks such as activation functions, optimizers, and tools compatible with working of text and image data. [15]

Mobilenet
MobileNet is an architecture, more suitable for mobile and embedded based applications where computational power is deficient. This architecture uses separable convolutions which reduces the number of parameters significantly. This results in light weight deep neural networks.[16][17]
Among the available features in the architecture, it majorly consists of 28 layers of neurons. Out of 28, the first 22 layers of perceptrons are extensively used, and the last 6 layers are neglected.

VI. RESULTS

The application is developed by considering significant number of images for training the model. After which, the model is capable of classifying the image in a maverick fashion. The model is trained with HAM10000.
HAM10000 is anagglomeration of skin images extensively used for skin cancer purpose. It is a csv file where in it consists of 7 columns related skin in which, eachimage is given an id to identify it uniquely. It also consists of many other information fields as whether is localized or not, age ofthe person when the image was captured, etc.,[18]
Subsequent to training, the model is subjected to the testing phase. Here the prediction and classification of the image takes place.

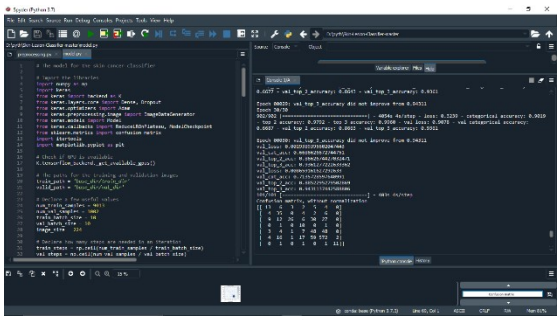

Fig-6: Console output

The Fig 6 depict the various accuracies and can be observed that the upon testing with the images, the categorical accuracy prevailed is found to be 0.6687 or 66.87 %.

VII. CONCLUSION

In today's world many people ignore the rashes on the skin thinking it is due to some allergies.The proposed work can be implemented based on different machine learning approaches to detect the various features and classify them correctly. Since the application is developed in the mobile device, it enables the users to do self-analysis of their health whenever there arises a doubt of mole or cancer at their convenient.

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