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Dental Disease Prediction Using Convolution Neural Network and Image Processing

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Abstract: Automation in medical field is in high demand. With increased research and development in the field of artificial intelligence, machine learning and deep learning many things have been made possible in the medical field. This paper explores the method to merging deep learning and dental health care. An android application is developed to implement this idea where anyone can use this application to check the oral status. This application is developed to perform acquisition of oral image of the patient and classify the obtained image into specific disease. Mobile Nets is used to train and test the developed model in android application.

Keywords: Deep Learning, Android, MobileNet, Mobile terminal, System camera, Convolution neural network, Image processing, disease prediction, TensorFlow.

1. INTRODUCTION

The Dental disease such as plaque, gum infection, dental fluorosis etc, are becoming common increasingly. In India almost 85 to 90 percent of adults suffer from dental disease at-least once in their life time. Additionally, due to lack of awareness and information about the importance of oral hygiene and dental health in India leads to prevalence off dental health issue. Unequal distribution of oral healthcare workers is also one among the main reason for high oral disease rate in India. Regular dental appointments are solution to much dental disease, however, about 72% of population of India is living in villages, and many are unable to access proper care. In this paper we are proposing a home centric android application which helps in identifying dental related problems. This application is built in such a way that it is very easy to use and detects the disease with accuracy upto 95%. User can easily download this application and use it for regular check up, since this application can be downloaded by anybody and can be used from any part of the country, this application increases the accessibility for people living in every part of the country, mainly rural area. This application also facilitates regular check up by being available for user any time to use. User can check his or her oral every now and then without actually visiting any dental clinic.

2. RELATED WORK

The existing system which is also very traditional one is to visit dental clinic in person. This might be impossible during times like lock down and pandemic situation. This also a costly option on the basis of regular checkup. Certain population of country cannot afford such visits, so they start to ignore the problem and they only visit the clinic when the condition have worsened to a point where it is all-most very late for treatment. These clinics are not available 24 hours of the day and the patient needs to modify his or his schedule to visit clinic, so this also becomes the reason for ignorance. Other than this traditional method there are few proposed solutions which are not yet implemented, one among them is IoT based smart dental care technology, the main drawback of this technology is that it uses external camera device to capture the dental images to increase the accuracy of the disease detection, And this project is quite complex to use due to its complex functionality, and includes two side i.e client side and dentist side and user data will be collected and stored in database and same copy of data will be sent to dental clinics which makes the over all process complicated. Our project aims at decreasing complexity and enable easy use option for users.

3. METHODOLOGY USED

The main contribution of our project is building user friend application for dental disease identification using deep learning. The input to the model is taken in the form of image from the mobile memory or by capturing it through the mobile camera and then given to the model for identification. MobileNet algorithm for image classification. Once the disease is classified the results will be shown to user along with home remedies and causes and precautions for the disease identified. Along with this near dental clinics are shown to the user in map incase if the user wants to visit doctor and few verified doctors contact information will be provided for emergency.

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Modeling and Analysis

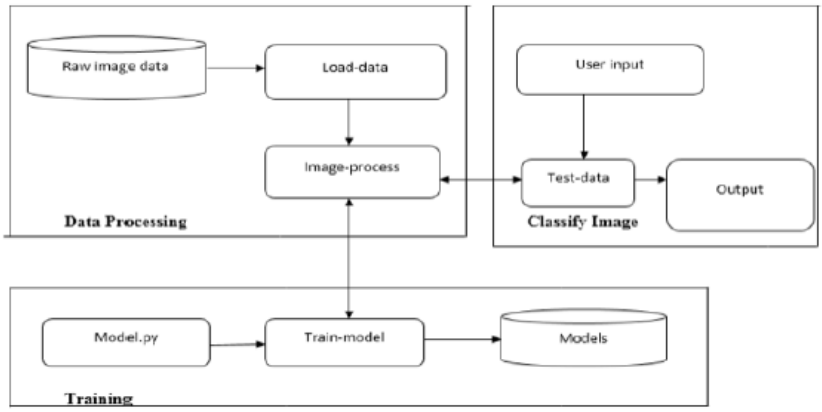

Fig -1: Model of the project

MobileNet is open source image classification model, specially designed for mobile applications by Google. It is a class on Convolution neural network (CNN). It uses depth wise separable convolutions which significantly reduces the number of parameter when compared to regular CNN classes, so this is well suitable for mobile applications because of its light weight deep neural networks. MobileNet is very small and very fast, the speed and power consumption of the network is proportional to the number of MACs (Multiply-Accumulates) which is a measure of the number of fused Multiplication and Addition operations.

Model of our project is formed using MobileNet by training it through the data set. This model takes the input and classifies it according to disease. Before providing the image to the model image resizing is done to fit into model. Once the classification is done then the output will be shown to the user. Based on the obtained output the precaution and causes will be displayed to user which will be fetched from memory.

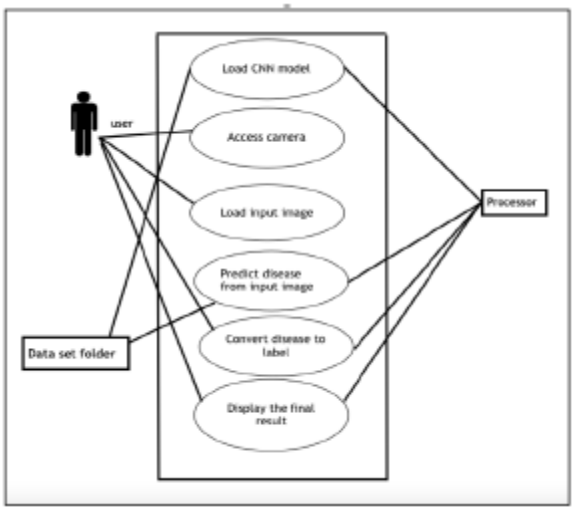

Fig -2: Interaction among different functions of the project

Different functions interact with each other to smoothly carry out the project.

4. ALGORITHM

Step 1: Import trained models
Step 2: Get input from user
Step 3: Resize image
Step4: Load the pre-processed image to model
Step 5: Obtain the output from the model's classification
Step 6: Display the output to user

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5. ANDROID APPLICATION

The application is built MIT and cable of running in also 98% of android devices. MIT is app inventor developed by Massachusetts Institute of Technology and google. Input image can be either selected in gallery or can be captured by user using phone camera. The predicated disease will be displayed on the same screen (Figure 4).

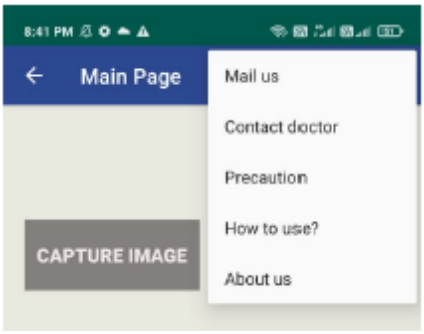

Fig 3: Android application

Other options like "mail us"(Figure 5) is provided for user to send us any application related issue. Doctor details can be viewed by clicking "Contact doctor" button, doctor details like name phone number and mailing address will be provided in there. "Precaution" button gives all the details that is related to disease identified, like cause for the disease, home remedies and precaution to avoid disease. "How to use?" Will guide user on how to use application and "About us" will give information related to application and its version and other application related things.

6. CONCLUSIONS

This application is based on deep learning and android application, aiming to regulate as well as optimise the accessibility of dental treatment and provide home-based dental health care service more efficiently. The trained model was used to realise the detection and classification of dental diseases, and application software on mobile device was developed for users. This application can be expanded to dentist side terminal for immediate on-spot communication.

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