AI Enabled Diagnosis Tool Using Tongue Image Capture With Automatic Prescription Generation for SDG3

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Abstract

WHO data shows that half of the people in the world suffer due to basic health care needs as there are not enough medical facilities available in many parts of the world. To diagnose a person's health using Artificial Intelligence method by capturing image of tongue and to generate prescription automatically for further investigation for places where primary medical facilities are rare. The research is based on TCM concept using machine learning. Tiny portable, low-cost, easy to use hardware.

Introduction

As per UNDP 400 million people have no basic healthcare. The UN has committed through SDG 3, to eliminate disease, strengthen treatment and healthcare, and this is possible through innovation, and research in the area of primary diagnosis. Due to better internet connectivity, higher storage capacity, powerful processor and advancement in Machine Learning now it is possible to address the issues related to medical and healthcare. It is possible to access and create dataset for various type of tongues, to train the Machine Learning model using powerful processor and availability of low-cost, small, and portable computing devices like Raspberry Pi, has made possible to address the problem of primary diagnosis simply using tongue

Availability and Ease of Development

Availability of open-source hardware and software has made it easy and economic to make such prototype which is capable of doing a doctor-like diagnosis and generate prescription/prediction automatically. To diagnose a person's health using Artificial Intelligence method by capturing image of tongue using the camera of the device and to generate prescription/prediction automatically using Python for further investigation for places where primary medical facilities are rare. The research is based on TCM concept using machine learning tiny portable, low-cost, easy to use hardware

How does it impact for ICT Development

The tongue is considered as a map according to the Chinese medicine which describes that the tip of the tongue is connected to the, the back is connected to the kidney the sides to the liver. Depending upon the different types of tongue the person's health can be predicted. If the person has red spot on the side of the tongue it might result a person suffering from cancer or HIV, red color suggests that a person might be suffering from acute fever, magenta color describes the deficiency of riboflavin, strawberry tongue represents a scarlet fever or an acute fever hence just a looking a patients tongue the doctor is able to predict what sort of disease a person is suffering from hence the same concept here is applied to train the machine in a similar way.

Types of Tongue

Red Tongue   Geographical Tongue

Black Tongue   Fissured Tongue
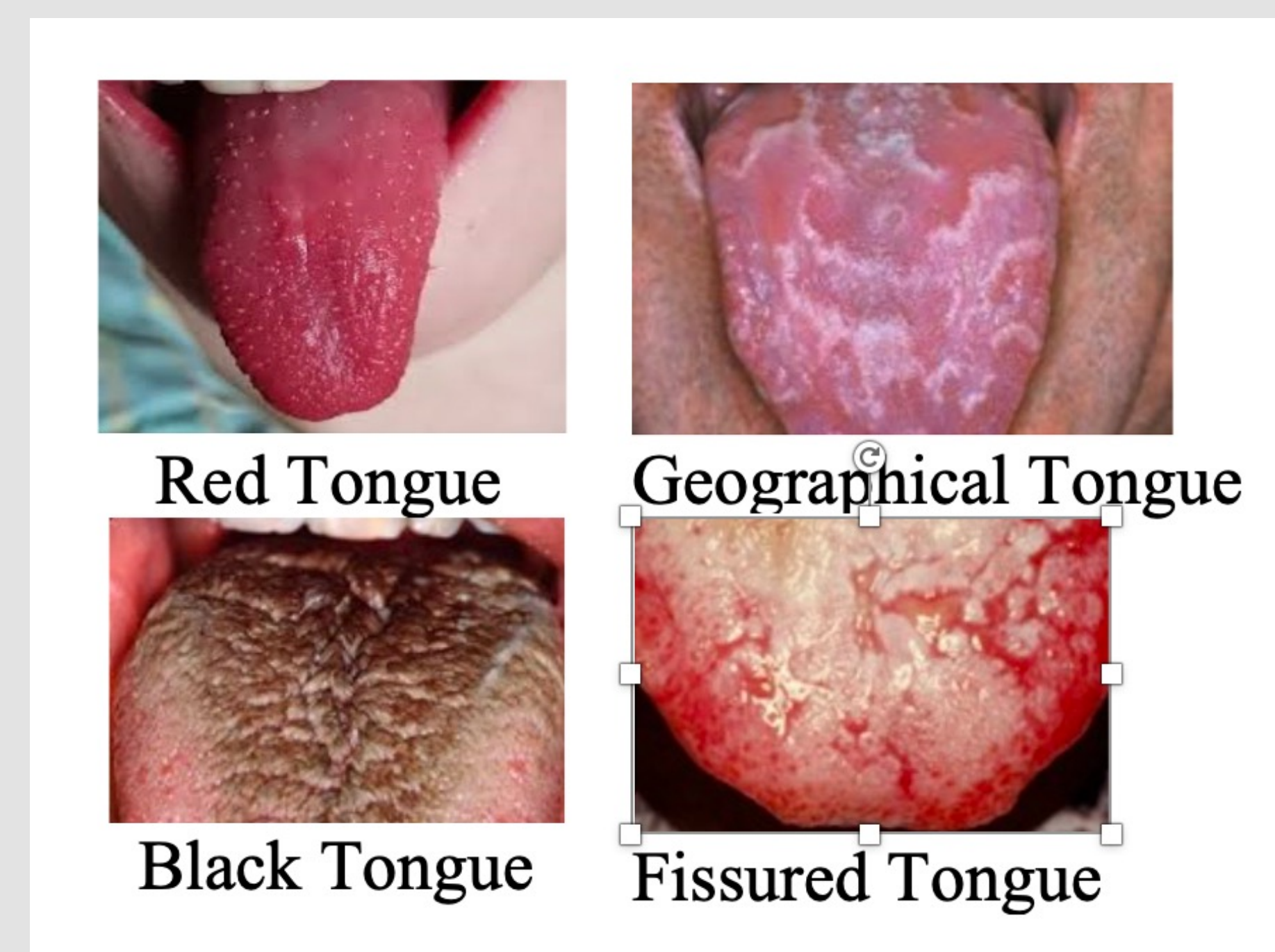
Methodology

The tongue is considered as a map according to the Chinese medicine which describes that the tip of the tongue is connected to the, the back is connected to the kidney the sides to the liver. Depending upon the different types of tongue the person's health can be predicted. If the person has red spot on the side of the tongue it might result a person suffering from cancer or HIV, red color suggests that a person might be suffering from acute fever, magenta color describes the deficiency of riboflavin, strawberry tongue represents a scarlet fever or an acute fever hence just a looking a patients tongue the doctor is able to predict what sort of disease a person is suffering from hence the same concept here is applied to train the machine in a similar way.

Training Using AI

As in for the prototype version of the system the samples of tongue have been obtained varying from color, texture, shape and size. They have been labelled as fissured tongue, hairy tongue, normal tongue, HIV etc. and sorted out the images accordingly. After classifying manually, the types of tongue were given as labels. Improper and blur images were removed. Now the images are kept in the respective folder for their purposes, which are supposed to be done through the Raspberry Pi shown in figure Now the dataset is ready for being trained by the Inception model using transfer learning, which is the pre-trained model in which the last layer of the CNN has been trained and due to that the model is trained by the concept of Transfer Learning using Raspberry Pi and deployed. Here are some of the samples of various types of tongues based on color, texture, shape and size as shown in figure

Capturing Image and sending it to Telegram bot

Using **PyPDF** python library to generate pdf file, the automatic prescription is generated from Raspberry Pi and sent to Telegram messenger application.
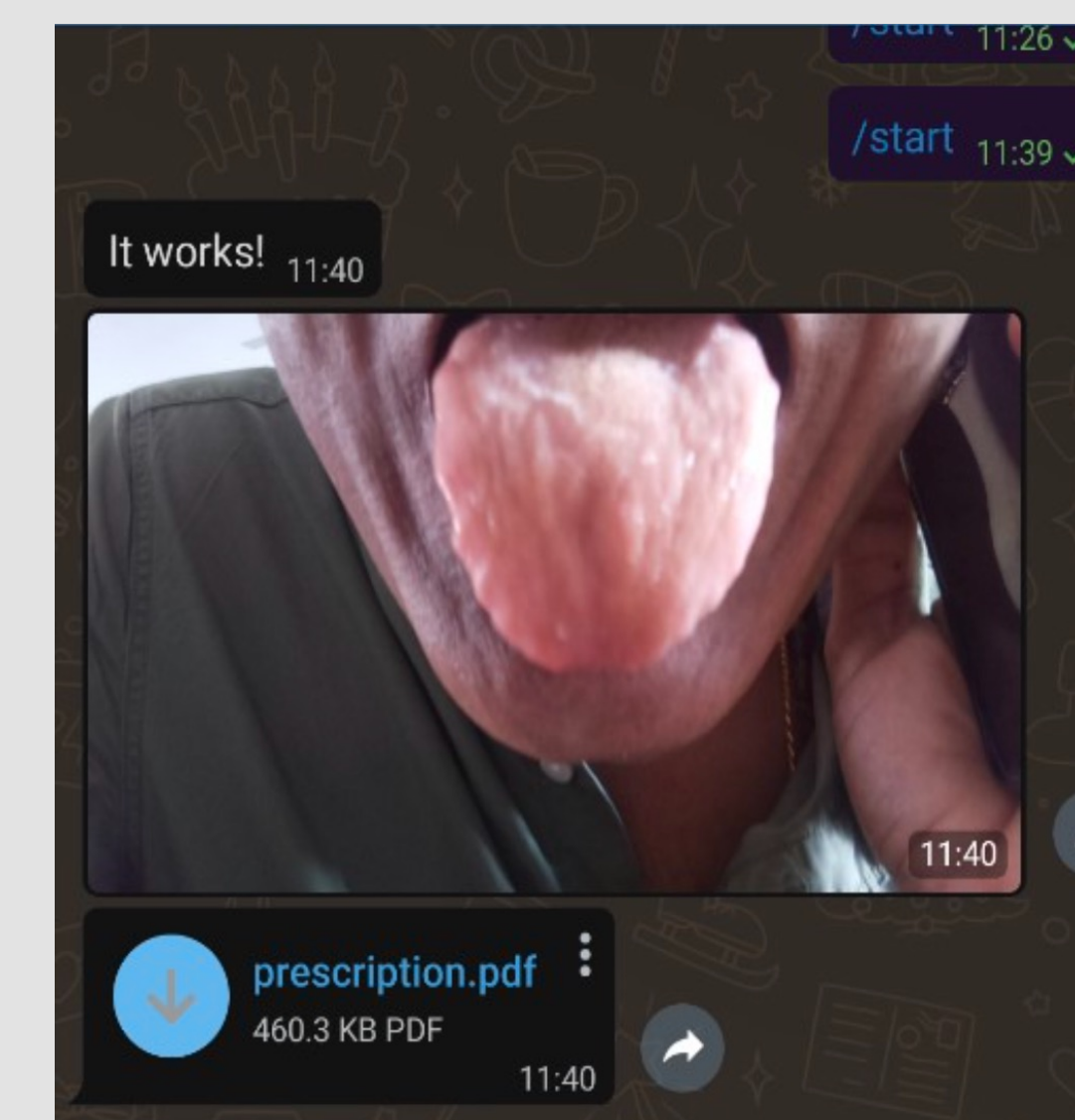
Prescription Generation

The pdf file contains the photo of the tongue under diagnosis and symptoms are added as labels in the file. The screenshot of the telegram is shown in the figure
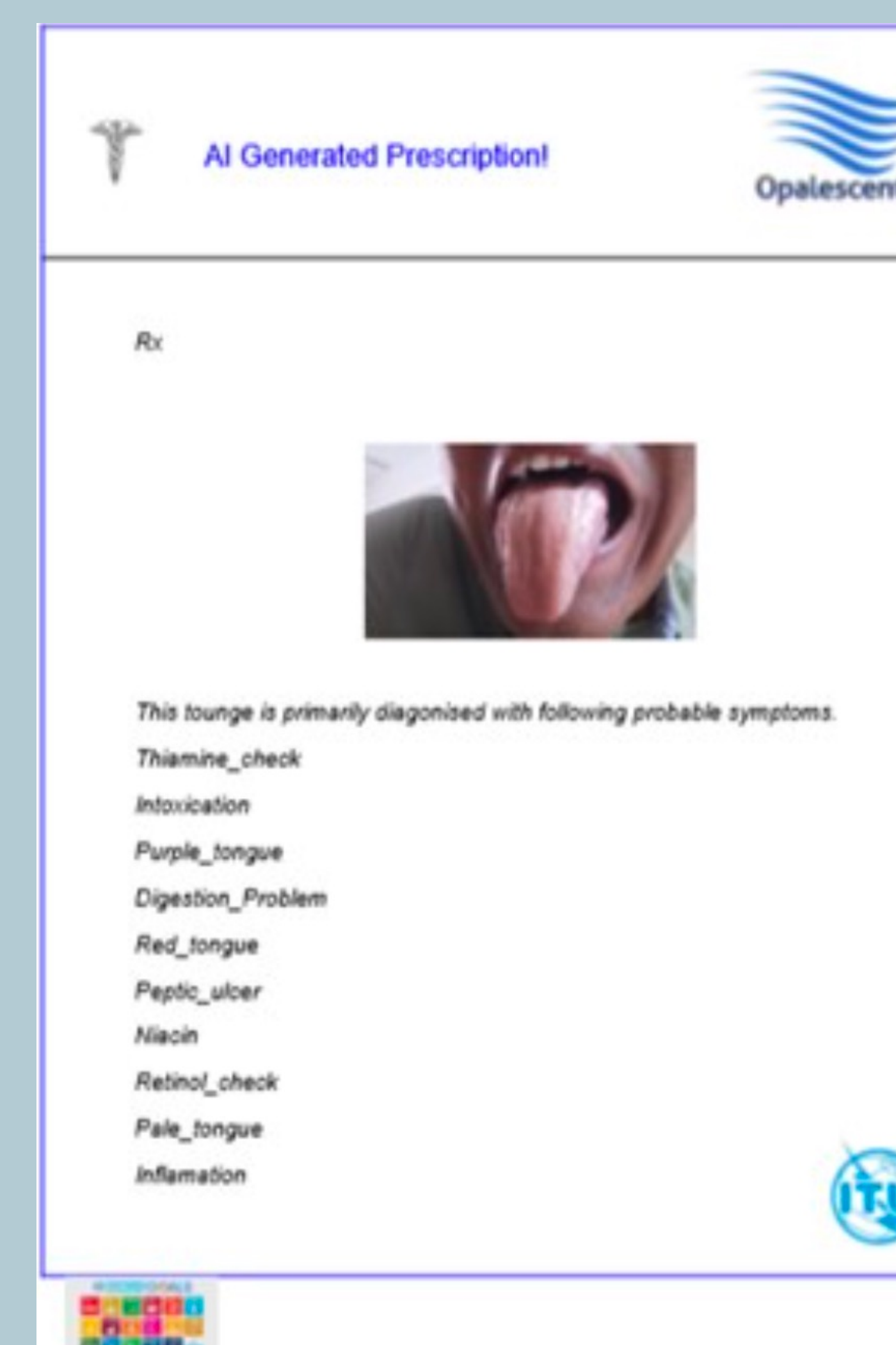
Functional Prototype

Application

This system can be useful for the people that do not have enough facilities especially in underdeveloped countries where are there no doctors available for the primary diagnosis using this app the patient will be able to predict what disease he might be suffering from and as the app does not require any internet connectivity hence it will be helpful. Technology Aided healthcare device might be a boon for both the doctors and the people who do not have enough facility for basic health treatment and AI might be helpful in saving lots of lives.

YouTube Video and Contact Information

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