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MALARIA PARASITE DETECTION WITH THE HELP OF IMAGE PROCESSING AND MACHINE LEARNING

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Abstract: Malaria is caused by "female Anopheles" mosquito. Mosquito transmits the Plasmodium Parasite to the blood which causes Malaria. The conventional method to diagnosis malaria is to examination of blood cell of patient in the microscope. The blood cell to be tested is kept in a slide then, observe the infected RBC under the microscope. This process consumes more time and expensive. Here we construct the image processing system detection and later we develop a machine learning code to detect the infected cells. We find out the accuracy using Keras-Sequential Model. In our project we will get the fast and accurate result. We try the keras model using SVM classifier. SVM have a positive rate of 99.8% in the detection of the plasmodium infected. Below average people living in village areas who lack of access to health care are at the greater risk for the disease. World Health Organization estimates that the India has a 15 million cases of the malaria with 19,500-20,000 deaths annually**.**

Keywords: Plasmodium, Machine Learning, Female Anopheles, Parasite

I.INTRODUCTION

The history of malaria involves cyclical infection of humans and female Anopheles mosquitoes. In humans, the parasites grow and multiply first in the liver cells and then in the red cells of the blood. In the blood, successive broods of parasites grow inside the red cells and destroy them, releasing daughter parasites ("merozoites") that continue the cycle by invading other red cells. Malaria is the one of the health challenges because, it requires a fast diagnosis to control the malaria disease. Poor people living the remote areas are at high risk due to lack of health care. According to the research of (World Health Organization) WHO in India has 15 million cases of malaria every year. 19,500-20,000 deaths annually. In 2015, world-wide 215 million cases of malaria cases were reported. In that nearly 438000 deaths were reported. According to the research 3.2 billion people are at high risk because, of malaria. If anyone infected then, they feel like night sweats, chills, fever, nausea, fast heart rate, headache. If it is untreated then, it will lead to death.

Mainly there are three types of plasmodium species which transmits parasite and cause disease. They are,
1.Plasmodium Falciparum
2.Plasmodium malaria

Compare to all three Plasmodium species, the Plasmodium Falciparum is most dangerous. Most of the deaths from malaria parasite is because of Plasmodium Falciparum. Plasmodium Parasite is most common in Africa. Symptoms like chill, vomiting, fever will appear after 10-15 days of female infected mosquito bite. WHO (World Health Organization) estimate the some methods to tackle the detection of malaria. Main method is to detect the malaria as soon as possible using machine learning model which is popularly known as Convolutional neural network (CNN) in our model. Because earlier detection of malaria can decrease the death rate from malaria. The commonly used is gold standard technique for diagnosis the malaria is the light microscope. Using this method, it encompasses the investigating of the thick and a thin blood smears for the presence of the plasmodium parasite. We can easily detect the infection cell using machine learning and image processing.

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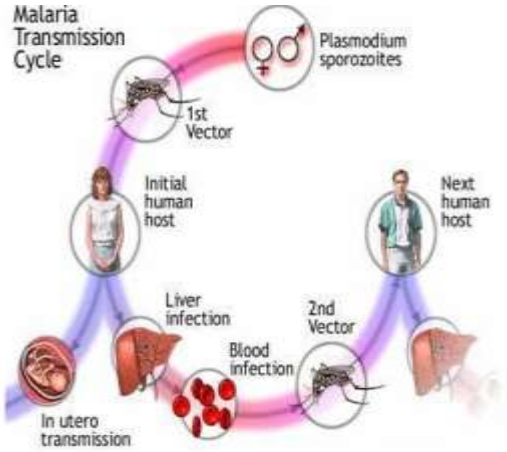

Figure 1: Malaria Transmission Cycle

II.RELATED WORK

The ordinary ECG signals are made out of P wave, QRS complex followed by T wave as displayed in Figure 1. Diagnosing of the heartbeat is relies upon researching the shape, the connection between these waves and the length of each wave. In any case, investigation of the heart state or ordinary ECG waves is certifiably not a simple assignment. Truth be told, the ECG signal is nonstationary and consequently, side effects of an infection, assuming any, may not happen routinely. In this manner, doctors need to record and screen the heartbeat for quite a while to arrange the mood into typical or strange sort. For ECG signal investigation, the size of the created information can be gigantic which requires a great deal of time and exertion, hence need for a programmed characterization framework. Machine learn Traditional method of detecting malaria disease is using microscope which is the time consuming and is difficult, which needs the considerable expertise of laboratory technician. People who are bit by female anopheles mosquito infected with falciparum are most at risk of dying from the malaria. Most of research has found that the person with little or no immunity to malaria such as young children, pregnant women, or travelers coming from areas with no malaria is most likely to become sick. Poor people living in rural areas who lack access to health care are at greater risk for the disease.

Mainly there are two methods to detecting malaria disease:
(i) images acquired under well controlled conditions
(ii) the need of proper microscope equipment.

Both criteria are different to accomplish in endemic area of malaria, where this type of equipment is scare or non-existent in health care facilities. So, L. Rosadoa and his team proposed different methodology approach for image processing of malaria-infected thick blood smears by using images exclusively acquired with low cost and accessible tools such as Smartphone. The methodology was divided into three main block Optical Circle Detection, WBC Detection and Trophozoites Detection. It used two different Smart phones, HTC One S and LG Nexus 5, with image resolution ranging from 1456 × 2592 to 1944 × 2592 pixels. L. Rosadoa and his team proposed the method that only represents a component of mobile-based framework for malaria parasite detection. They do not identify and count all possible species- stages combinations of MP that potentially infect humans.

III.LITERATURE SURVEY

➢ In [1] “Detection of malaria using the digital image processing”, The method used for the intensity features of Plasmodium parasites. Images of the infected and non-infected parasite were pre-processed, relevant features extracted from them and the eventually diagnosis was made on the bases of the features extracted from the images.

➢ In [2] “Detection of malaria parasite in Giemsa blood sample using the image processing”, The proposed system model is implemented by using two segmentation that are HSV segmentation and watershed segmentation. The result of both the segmentations are mapped so that all malarial parasites can be counted. It is done for the propose of improve accuracy

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➢ In [3] "Detection of the malaria parasite in blood using the Image Processing", The design takes form of a standard pattern recognition and classification of the system. The system architecture of malarial parasite detection includes the grey scale image conversion, thresholding, thinning labelling algorithm.

➢ In [4] "Colour image segmentation approach is applied for detection of malarial parasite using various colour models and k-means clustering", This paper shows that detection of malarial parasite can be also done through the colour image segmentation which can be further applied on the malaria images of P.vivax species.

➢ In [5] "Automatic diagnosis of the malarial based on complete circle of ellipse fitting search algorithm", Thin blood smears are used in this study and it is mainly based on the curve fitting to detect the infected cells in the blood smear.

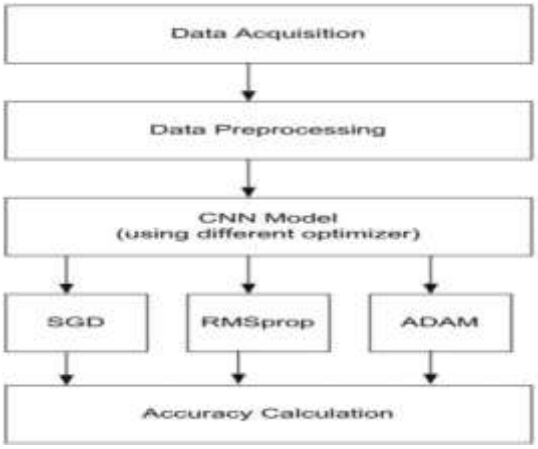
➢ In [6] "Computer automation for the malarial parasite detection using the Linear Programming", Mathematical modeling is used by means of LP as it is an efficient tool to solve the problems related to malarial parasites problems related to the malaria diagnosis through microscopy imaging problems.

Two applications are approached:

1. Formulation of LP model based on the given data.
2. Solving and the displaying the result using the graphical method approach for detecting the infected cells.

IV.METHODOLOGY

Figure 2: Flow chart of propose model



The paper focuses on the Malaria parasite detection using machine learning and image processing step by step. In the first step need to implement data acquisition which is image acquisition, it means the particular RBC smear image which is taken should be preprocessed to remove noise if that image has. The image data that has been used in the development of system which is taken from official website of national library of medicine (NLM) which contains 27,550 images of cells which are divided into infected and uninfected cells. While coming to next step Data preprocessing, it means preprocessing is the process of making transformations on the raw data before applying machine learning algorithm on it. Preprocessing of the data it is a very much essential stage in machine learning because the functional information and standard of data can be extracted from it so that it can affect the quality and accuracy of our model, therefore data preprocessing step in our model is utmost important. If we train convolutional neural network on raw images then it might give us poor result. So that preprocessing phase it will helps to accelerate the whole model. The convolutional neural network is one of the most effective neural networks to the work with images and make classification. In our model we have used keras to create the CNN model. We have evaluated our model with different optimizer and obtain the different accuracy. First, we have used malaria detection using SGD optimizer. SGD which means stochastic gradient descent optimizer. Here, Stochastic tells us about the system or task that is connected with different possibility. In this process, rather than using whole data set, we will use few samples randomly from data set. SGD computes the parameters gradient using only single or a little bit of training examples. We implement SGD optimizer in our model, it gave us the result of accuracy 95.54% on test set and 95.33% on train set. Next, we use second optimizer that is RMSprop optimizer. known as root mean square prop optimizer it is alike the gradient descent algorithm with momentum which will limits the oscillations in the upright direction. So that it will help us to increase our learning rate. When we applied RMSprop optimizer in our model, it will give us result of accuracy95.54% on test set and 95.32% on train set. The last optimizer which is used in our model is ADAM optimizer. We can use ADAM, it is an optimization algorithm, which is substitute

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of classical stochastic gradient descent system to update network weights in training data. This ADAM is one of the best optimizers to present. In our model, ADAM optimizer gave us the accuracy of 96.88% on train set and 96.62% on test set. On Test and Train set we can say that ADAM optimizer worked very well with our data set and gave us result of highest and good accuracy.

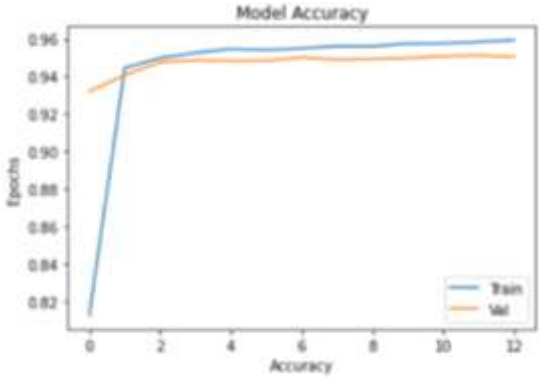

Figure 3: Accuracy

V.CONCLUSIONS AND FUTURE WORKS

The main goal of the proposed method is to improve the quality of detection of malaria which help microscopists to detect the malaria in a easy way, accurately and further who is infected by malaria parasite can undergo proper medication as soon as possible. The future work is mainly towards improving the performance and enhancing the algorithm and removing the noise in the images of blood cell for better detection of malaria. Another direction of future work is by implementing our model into a single application which can be operated on any smartphone to detect malaria easily.

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