MALARIA IDENTIFICATION USING NEURAL NETWORK

D.Lakshmi Pooja, BTech, Department of CSE, devarapupooja999@gmail.com

ABSTRACT: A parasite that frequently infects a particular species of mosquito that feeds on humans can cause malaria, a dangerous and occasionally fatal disease. Malaria often causes severe disease in its victims, including high body temperatures, body shakes, and cold symptoms. People are likely to get this disease mainly because of four kinds of malaria causing insects, four of which can cause fatal illnesses if not treated right away. Malaria can be lethal, however most infections and deaths from malaria can be avoided. In this research, convolutional neural networks (CNN) models, which are a subset of deep learning models, are proposed. The accuracy of malaria disease classification based on CNN's is higher than other algorithms, according to a comparison of the suggested and existing algorithms. If the CNN method is backed by additional feature extraction techniques and correctly classifies malaria disease on the image, it is projected that the success of the results will grow.

Keywords: *Convolutional Neural Networks*

1. INTRODUCTION

Malaria is a fatal illness brought on by parasites that are spread to humans through mosquito bites. The World Health Organization estimates that there were 216 million malaria cases in 91 countries in 2016, an increase of 5 million cases from 2015. In 2016, there were 445000 more malaria-related deaths than there were in 2015 (446000). Children from Sub-Saharan Africa make up the majority of those who pass away. This is due to the favourable natural circumstances for mosquitoes as well as the challenging socioeconomic situations that limit access to resources for disease prevention and health care. While there are many ways to test malaria, manual testing with micrscope is well known as "the gold standard." Even with unskilled hands, this diagnostic procedure is time-consuming (resulting in a delayed diagnosis) and susceptible to human error (resulting in an incorrect diagnosis) due to the amount of steps required in manual examination. As previously indicated, this manual method of diagnosis takes time and may produce inconsistent results, largely relying on the skill level of laboratory professionals. This calls for knowledgeable technicians or pathologists. In our study, we employ a deep learning model to identify malaria images using a convolutional neural network technique in order to compare CNN designs and potentially classify the findings with the highest degree of accuracy.

2. LITERATURE REVIEW

2.1 Detection of Malaria Parasite Infection Based on Convolutional Neural Networks Using Blood Swab Samples with a Thin Microscope.

Malaria can be both preventive and curative, but worldwide Is a major public health issue.The disease is basically examined and tested by well skilled micro scientist who examines blood smears under a microscope.This disease can be normally deducted only in case of early identification and treatment is

given on time . Computer-aided diagnosis is becoming increasingly popular these days because we can immediately get done with primary identification test without the help of an expert. A technique called deep learning extracted from AI guides the machines to copy the actions of the brain of human . The main aim of this research paper is to construct the deep neural networks that usually estimates whether malaria is caused or not in patient by mosquito from blood microscopic image.. The center for biomedical communications in Lister Hill of America keeps the track of malaria in National Library of Medicine. The complicated neural networks model is solved in overfitting problem and resulting 94% of F1 score.

2.2 Huge range of malaria affected patients information gathered for Machine Learning: Hadhramout Yemen case study

There is a lack of research on the collection of health and medical data mainly on a common illness this research focused on creating and publishing data benchmarks and making them available to researchers malaria is consistently problem causing and pandemic in various nations such illnesses require close attention to diagnosis prediction and management by staff and experts .The initial thing to do is data preprocessing and pace the collection of data by using some data processing methods to build estimation models of 1000 cases of malaria with definitive diagnosis that are collected under expert and that are helpful for next work and recorded data on 40 features and listed 27 clues for finding malaria patient that was obtained using statistical scores using common statistical metrics and data mining will also be provided later in this white paper this study uses a statistical package for social science tools for statistical analysis and a waikato environment for knowledge analysis as a tool for data mining

2.3 Non-Invasive System for Detecting Malaria Parasites

Diagnosis of malaria in Sudan and around the world remains largely dependent on invasive methods, including taking blood samples from patients. However, these methods require a lot of experienced and skilled techies to properly diagnose the malaria, and tested result can be affected due to human errors. A few Sudanese technicians reduce attempts to minimize the disease. Therefore, this study is other non-invasive malaria with no blood smear picture with the help of light to detect hemozoin creatures in the sample below the influence 0.6 Tesla validated magnetic field. This project is initiated with basical testing of 17 malaria affected patients and the results proved that the method implemented was accurate (93.75%). This study shows a more convenient malaria test that is less painful, less time consuming, and prevents the spread of the infection.

2.4 Malaria Parasite Concentration Determination Using Digital Image Processing:

Malaria is a dangerous disease which is resulted due to anopheles mosquito.On careful analysis of 2016 World Health Organisation it is seen that a total of 216 million cases were reported with an increase of 5 million cases compared to 2015.The total number of deaths were equal to 2015 report accounting to

445000 deaths.More than 90% of malaria cases and deaths are from african and sub saharan regions.The caategories with most cases were women and children.Even though malaria is easily identified and preventable many cases are reported."Gold standard " conventional method is the standard methodology which is used to identify the malaria parasites in the blood stream.It includes experts manually checking every slide to detect the parasite.A total of 5 types of malaria parasites are accountable for malaria cases around the globe.This paper shows that manual recognition of malaria parasites may lead to human error.even more the time stipulated for this method is more.So, a malaria lab expert can handle only a few cases with accuracy.Therefore A new technique is proposed which detects the malaria parasites wih the help of image processing,image segmentation and filtering classification.

3. IMPLEMENTATION

The methods employed in the current system largely took the hand-crafted features into consideration while making decisions. For instance, used SVM and Principal Component Analysis (PCA) for classification and depended on morphological factors for feature extraction. These models do have some accuracy, but that's not too much.

Disadvantages:

1. It hasn't concentrated on naming CNN as the classifier.

2. The system's accuracy is pretty poor.

3. The model cannot be suggested for inexpensive phones.

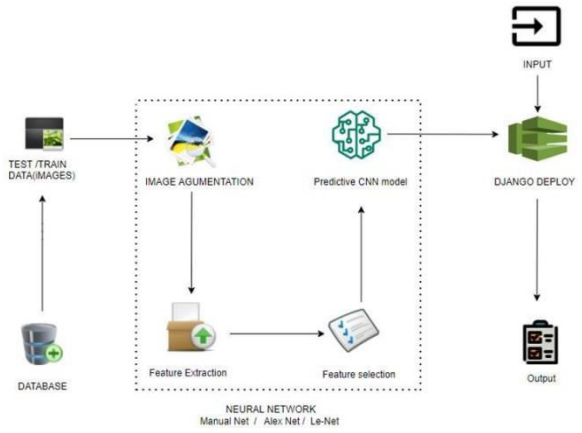

Fig.1: System architecture

In order to give the types of cells in blood samples under typical microscopic examination either infectious or uninfectious, the offers a new and reliable machine learning model based on a convolutional neural network (CNN). The suggested algorithms accurately detect malaria in various scenarios and can automatically extract complicated images of the condition. We used full photos as input, therefore no pre-processing or malaria was required. Samples of more photographs were obtained that included various classes of data. For each class that was assigned to the input photographs, a distinct number of images are gathered. To combat malaria, we suggested a deep learning (dl) based strategy for identifying the disease. LeNet convolutional neural network is the deep learning technique utilised in the study (CNN). If more feature extraction techniques are added to support the CNN method and successfully classify malaria sickness, it is projected that the success of the results would grow. We'll display the prediction result in the local-host web application for deployment.

Advantages:

1. Using an artificial neural network to recognise the malarial illness

2. To quickly identify malaria, it is the best model for deep learning approaches.

MODULES:

➢ Taking the input and loading it

• Taking and processing the dataset

• Get the necessary libraries needed

➢ The taken data must be cleaned

• Change the shape

➢ Giving a definition to the models

•By sequence or function

• Give the quantity of layers ,nodes and metrics to be used for models.

➢ Model is to be executed

•Tell the optimizers,weight and functions loss

➢ Ready the models

• Information is to be tested and batch size to be given

The objective is to create a convolutional neural network algorithm-based deep learning model for the classification of malarial images in order to compare CNN designs and potentially classify the findings with the highest degree of accuracy. Four different strains of malaria, including parasitized and uninfected, are present in this experiment. We practise in order to instruct the machine to acquire accuracy and obtain the best result.

Overview of the system:

➢ Define a problem

➢ Gathering image data set

➢ Evaluating algorithms

➢ Detecting results

The steps involved in Building the data model is depicted below.

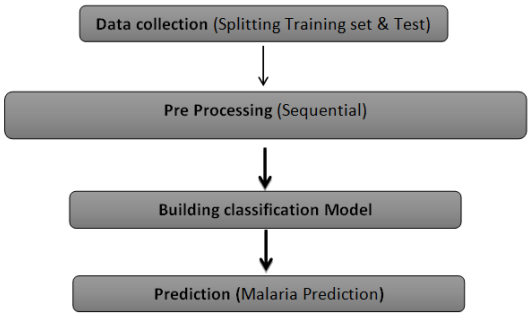

Fig.2: data flow diagram for CNN model

4. ALGORITHMS

CNN:

The dataset is preprocessed by shrinking, reshaping, and converting it to an array form. This procedure is known as preprocessing. The test image likewise goes through similar processing. The model (CNN) is trained using the training dataset so that it can recognise the test image and the disease it possesses. Convolution2D, MaxPooling2D, Dropout, Activation, Flatten, and Dense layers are some of the layers that CNN has. The software can recognise the Emotion Classification image in the dataset once the model has been successfully trained.

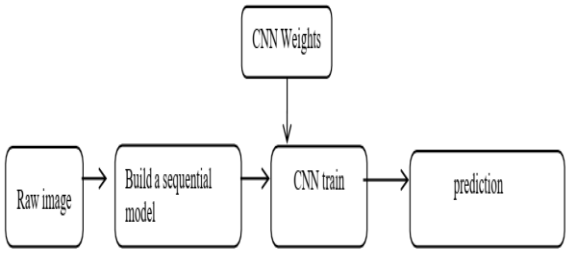

Fig.3: Logistic regression model

CNN Model steps:

Conv2d:

At its core, 2D convolution is a relatively straightforward process: you begin with a kernel, which is just a small matrix of weights. This kernel summarises the results into a single output pixel after conducting an elementwise multiplication with the portion of the input it is currently on.

•Every region the kernel slides over is subjected to this process again, resulting in the creation of a second 2D feature matrix. The input features are effectively positioned roughly in the same location as the output pixel on the input layer, and the output features are the weighted sums of those features, where the weights are the values of the kernel itself.

•This is all in stark assessment to a layer this is definitely integrated. five x five = 25 enter capabilities and three x 3 = nine output capabilities are found in the instance above. The result is obtained by total addition of all input data having the matrix of weight as 225=259 parameters. Instead of "looking" at each enter function, convolutions allow us to to carry out this alteration with best nine parameters, with every output function best getting to "look" at enter capabilities that come from kind of the identical position. Do preserve this in thoughts as it can be essential for our verbal exchange later.

MaxPooling2D layer:

• By calculating the maximum value for each input channel over an input window (whose size is determined by pool size), the input is downsampled along its spatial dimensions (height and width). Steps are taken along each dimension to move the window.

• Whenever the valid choice is opted the result get the spatial shape as (number of rows or columns): output shape = math.floor((input shape - pool size) / strides) + 1 (when input shape >= pool size)

•Whenever the same choice is opted the result produced: output shape = math.floor((input shape - 1) / strides) + 1

ARTIFICIAL NEURAL NETWORK:

Multi-layer, fully linked neural nets are what artificial neural networks (ANN) are made of. A

given data layer, hidden layers count, and result layer make them up. Every node in a layer is linked to every node in the layer above it. By adding more hidden layers, we make the network deeper. The development of Artificial Neural Network (ANN) algorithms, which may be applied to model complicated patterns and solve prediction issues, is based on how the brain processes information. Network design consists of the given data layer and hidden layer and result layer . because of many layers it is also called as multilayer perceptron. The hidden layer can be thought of as a "distillation layer" that grabs few of important input designs and sends to the immediate layer for observation. By selecting only the crucial data from the inputs and excluding the

superfluous data, it accelerates and optimises the network.

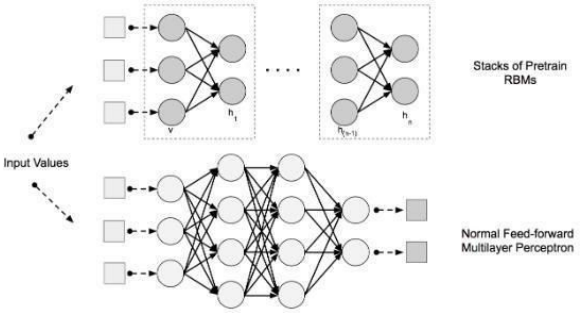

Fig.4: ANN model

5. EXPERIMENTAL RESULTS

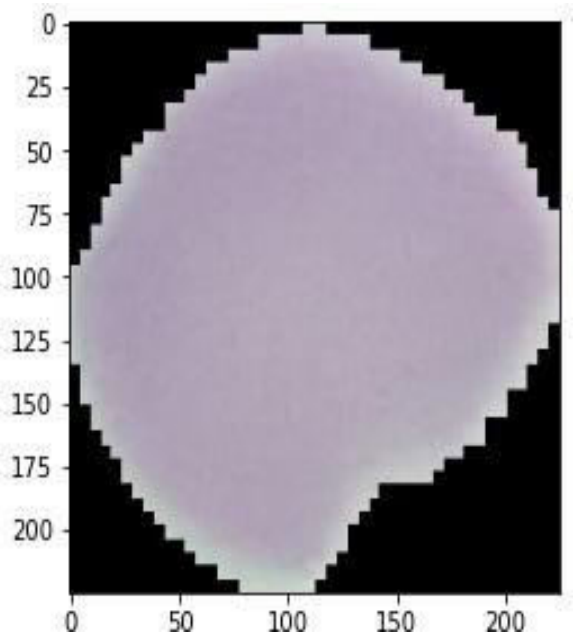

Fig.6: Model prediction for uninfected sample

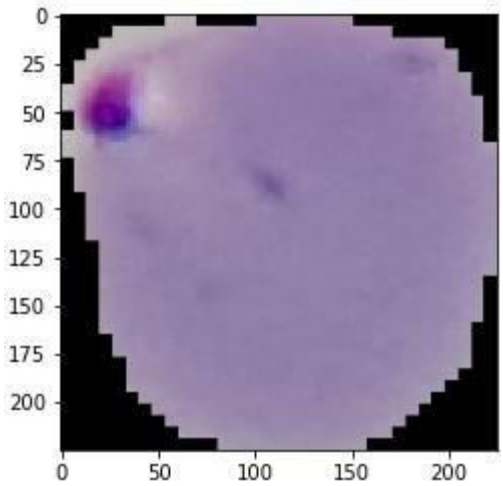

Fig. 7 Model prediction for parasitized sample

6. CONCLUSION

The following techniques can be used to further enhance the network's generalisation and accuracy: • The first technique is to use the entire dataset when performing the optimization. Larger datasets are more suited for batch optimization. One such method is to individually assess each malaria detection. This makes it possible to identify the harder-to-classify objects. Finally, it appears useful to use a larger dataset for training. It's possible that such a dataset doesn't exist today. Using many datasets could be a solution, but normalising them requires careful consideration. The use of a larger dataset, pre-training on individual photos, and using the entire dataset for training all appear to have the potential to enhance the network's performance. Future study on this subject should therefore address them.

7. FUTURE SCOPE

This project involved the development of a research study to categorise things across static various object

photos using deep learning techniques. • This is a challenging issue that has been tackled multiple times using various methods. Although feature engineering has produced successful outcomes, this study concentrated on feature learning, one of Deep Learning's promises. • Image pre-processing improves classification accuracy even while feature engineering is not required. As a result, the input data's noise is reduced. These days, feature engineering is used in malaria classifications. • Due to a significant constraint, a solution entirely based on feature learning does not appear to be close yet. As a result, deep learning techniques could be used to classify malaria.

REFERENCES

[1] Zhenyu Yu, Shiyu Dai, Yuxiang Xing. “Adaptive Salience Preserving Pooling for Deep Convolutional Neural Networks”. IEEE International Conference on Multimedia & Expo Workshops, July 2019.

[2] Lina M.Q. A, Mohammed A.K. M, Yee-Ling Lau Mun-Yik Fong R , Abdul-Ghani R, Mahmud” Molecular markers associated with resistance to commonly used antimalarial drugs among Plasmodium falciparum isolates from a malaria-endemic area in Taiz governorate, Yemen during the transmission season “,2016.

[3] A. Bashir, Z. A. Mustafa, I. Abdelhameid, and R. Ibrahem, "Detection of malaria parasites using digital image processing," in Communication, Control, Computing and Electronics Engineering (ICCCCEE), 2017 International Conference on, 2017, pp. 1-5.

[4] A. Basir; Z. A. Mustafa; I. Abdlhameid; R. Ibrahem,“Detection of malaria parasite using digital image processing”,2017 International Conference on Communication ,Control and Electronics Engineering (ICCCCEE).

[5] Kaushik Chakraborty, Arnab Chattopadhyay (2015), “A Combined Algorithm for Malaria Detection from Thick Smear Blood Slides”, Journal of Health & Medical Informatics, Vol. 6, pp. 179-185.

[6] Pragati Sharma (2017), “Disease Detection using Blood Smear Analysis”, International Journal of Computer Applications (IJCA), Vol. 179 – No.7, pp. 79-87.

[7] A. Anand, V.K. Chhaniwal, N.R. Patel,and B. Javidi, “Automatic identification of malaria- infected RBC with digital holographic microscopy using correlation algorithms,” IEEE Photonic J., Vol. 4, no.5,pp. 1456-1464, 2012.

[8] Manoharan, S. “Image Detection, Classification And Recognition For Leak Detection In Automobiles”. Journal of Innovative Image Processing (JIIP), Vol 1(02): 61-70, 2019.

[9] H. S. Bretschneider T.R,Yikun Li,Preiser P.R., “Estimating malaria parasitaemia from blood smear images”, proceedings of the 9th international conference on control, automation, robotics and vision, PP.1- 6,Dec.2006.

[10] N.R. Shet and N.Sampathila, “An Image Processing Approach for Screening of Malaria”, Canar. Eng. Coll. Mangalore, pp. 395-399, 2015.