Malaria Detection using Convolution Neural Network

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Abstract: Malaria is one of the dangerous disease caused by Mosquito. Generally malaria will be detected by diagnosing blood samples. By observing the blood sample under the microscope the lab technicians will justify whether the person was infected or not. And this can be only possible if the technicians can diagnose the malaria if not the patient may die. So the efficiency of diagnosing malaria is low if the technician is not having good knowledge. For that we are using deep learning model which can predict malaria if the person was infected. By using latest technology like deep learning in medical field helps the doctors to diagnose the disease easily and treat the patient. So that the efficiency of predicting will also increase.

Keywords: CNN, tensorflow, CV, optimizers in deep learning like adam, multiple layers in cnn, accuracy etc.

I. Introduction

Malaria was a disease caused by plasmodium falcipuram virus which can effect both humans and animals. This virus pass from one person to another by mosquito as a medium to spreads the virus. For classification of these disease we have taken a real-time dataset of blood samples having both infected and uninfected samples. The dataset contains total of 27560 sample. In that 13780 are infected samples and 13780 are uninfected samples. Deep Learning is the subset of artificial intelligence. It works as an human with high accuracy based on our training. Deep learning is mostly used for classification and predictions. Here we are using deep learning for predicting whether sample was infected or not. The model we are using in deep learning are Convolution Neural Network. And also in CNN we have taken CNN with single layer, CNN with two layers and CNN with three layers. We got different accuracies for different layers. This can be mostly used for hospital industry to easily diagnose the malaria with high efficiency.

II. Literature Review

In paper[1] they propose a model which can classify and predict the infected cells present in the blood smears under the microscope using three different models in CNN. They are Basic CNN, VGG19 Frozen CNN, VGG19 Fine Tuned CNN. And also they compared and the accuracy of the models and suggested the best model. For Basic CNN they got accuracy of 94%, for Frozen CNN they got accuracy of 92% and for Fine Tuned CNN they got accuracy of 96%. They concluded that Fine Tuned CNN given the highest accuracy when compared to other CNN models.

In paper[2] they have used transfer learning model. For implementation they have taken VGG and SVM models. For getting better accuracy they have designed a combined model of both VGG and SVM as VGG-SVM. In CNN some layers are of VGG and some are SVM. They taken a dataset of

blood samples of infected person and train the model and got the accuracy of 93.1%.

In paper[3] they have used different deep learning models to predict the malaria. They aimed to find which deep learning model will give high accuracy in less time. So they used Densenet121,VGG16, Alexnet, Resnet50, FastAI, Resnet101. And they got accuracies are 97.27%, 95.44%, 95.62%, 97.55%, 97.38%, 97.00%. They concluded that Resnet50 gives the high accuracy when compared to other models.

III. Dataset

The dataset we have taken is an image dataset contains 27560 blood samples. In that 13780 was infected and 13780 was uninfected sample. By using these attributes we have trained our model. The sample image of dataset is

Figure1. Infected blood Sample

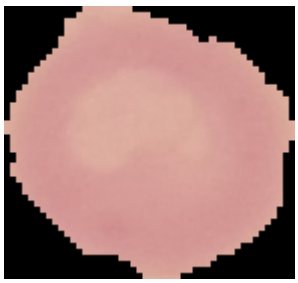

Figure2. Uninfected blood sample

IV. Methodology

A. Convolution Neural Network

CNN is an Deep Learning algorithm used for classification and prediction. For image segmentation, object detection etc CNN is used. CNN is very good at required feature selection from the given image. CNN is a multi-layered feed forward neural network which contains many hidden layers. Convolution layers plays a crucial for feature extraction so obviously when the number of layers increases the predicting capacity and accuracy also increases. The CNN architecture is

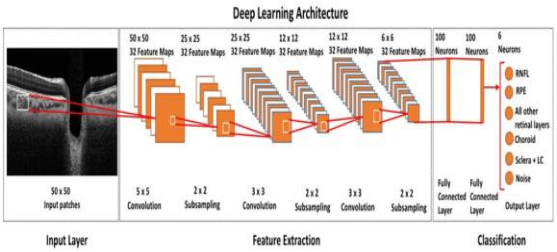

Figure3. Architecture of CNN model

In this paper we have taken CNN with 1 layer, CNN with 2 layer and CNN with 3 layer and Find the accuracies of the model.

B. Convolution Neural Network model with 1 layer

CNN is a model which has multiple neural networks. CNN with 1 layer means the architecture of CNN is having only one convolution layer. And that convolution layer will be used for feature extraction and trains the model. Here we have taken CNN with 1 layer and trained with the dataset of blood samples we got accuracy of 91.11%. The graph for CNN with 1 layer is

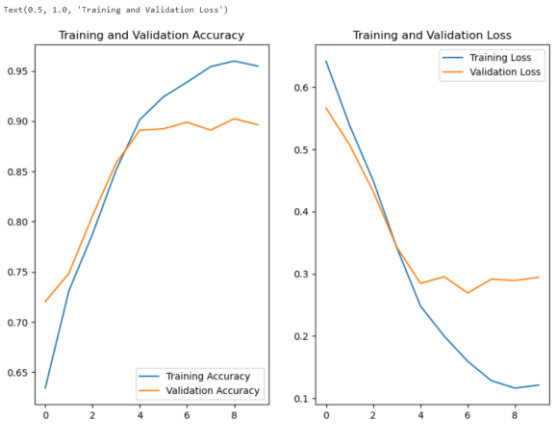

Figure4. Training and validation accuracy and training and validation loss for CNN with 1 layer

C. Convolution Neural Network model with 2 layer

Here we are adding one more layer to CNN model then it becomes CNN with 2 layer. CNN with 2 layers will have two convolution layers. The accuracy of the CNN with 2 layer is 95.39%. The graph for CNN with 2 layer is

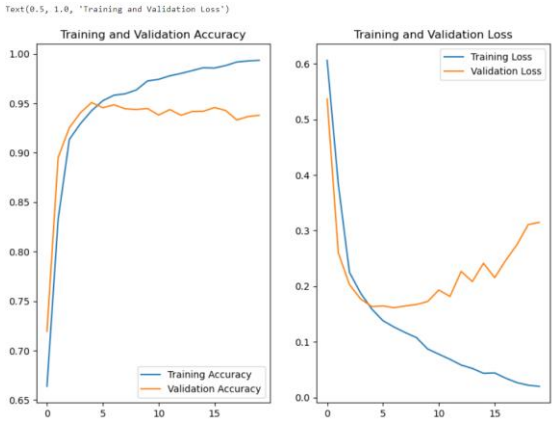

Figure5. Training and validation accuracy and training and validation loss for CNN with 2 layer

D. Convolution Neural Network model with 3 layer

As mentioned above the number of layers increases the accuracy also increases. Now we have taken CNN with 3 layers that means one more convolution layer will be added so that feature selection also increases. The accuracy of CNN with 3 layer is 96.19%. The graph for CNN with 3 layer is

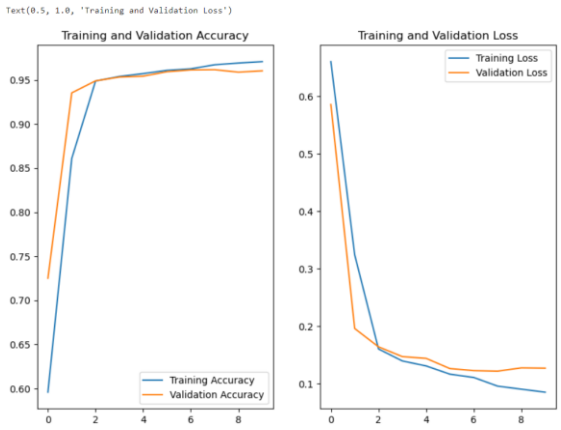

Figure6. Training and validation accuracy and training and validation loss for CNN with 3 layer

V. Conclusion

Malaria is one most dangerous disease caused by a virus. Every year many people are dying due to these disease because of unable to diagnose the disease correctly. Malaria will have symptoms like fever, body pains etc. So by using latest technologies like CNN we can diagnose the malaria easily. For that we have taken CNN with different layers and we got high accuracy for CNN with 3 layer. The accuracy is 96.19%. So we conclude that by using latest technologies in medical sector we can help doctors to diagnose the disease easily. And also we conclude one other statement that is In CNN the number of convolution layers increases the predicting and classification capability of the model also increases.

VI. References

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