**TASK: MALARIA CELL DETECTION MODEL**

**Abstract:**

**Infectious disease malaria is a devastating infectious disease that claims the lives of more than 500,000 people worldwide every year. Most of these deaths occur as a result of a delayed or incorrect diagnosis. At the moment, the manual microscope is considered to be the most effective equipment for diagnosing malaria. It is, on the other hand, time-consuming and prone to human error. Because it is such a serious global health issue, it is important that the evaluation process be automated. The objective of this article is to advocate for the automation of the diagnosis process in order to eliminate the need for human intervention in the process. Convolutional neural networks (CNNs) and other deep-learning technologies, such as image processing, are being utilized to evaluate parasitemia in microscopic blood slides in order to enhance diagnostic accuracy. The approach is based on the intensity characteristics of Plasmodium parasites and erythrocytes, which are both known to be variable. Images of infected and noninfected erythrocytes are gathered and fed into the CNN model and Mobilenet pretrained model, which are all trained on the same dataset. The techniques of transfer learning and fine-tuning are employed, and the outcomes are contrasted. The Mobilenet model obtained the best overall performance given the parameters and dataset that were evaluated.**

**process flow and algorithm:**

* **Generation of information necessary for training model**
* **Data pre-processing**
* **Dataset**
* **Initiation of convolution neural network**
* **Feature extraction**
* **CNN model training**
* **Transfer Learning**
* **Fine tuning and unfreezing**
* **Malarial parasitic identification**
* **Computation performance metrics**

**Data Preprocessing:**

A model's behaviour and performance are completely dependent on the data that it receives when learning is performed through supervised learning. Experiments would be impossible to conduct without the use of data pre-processing. Data Augmentation is used to resize or normalize images before they are fed into the “Learner” class, which collects all of the information required to train a model based on the data. Data generator performs Data Augmentation to resize or normalize the input images before feeding them into the “Learner” class.

##### Convolutional Neural Network (CNN):

##### The convolutional neural network (CNN) is one of the deep neural networks that are most extensively utilized today (CNN). As a result of the convolution process, it is named after the linear mathematical action between matrices that is used to create it [29]. The architecture of CNN is comprised of four layers: a convolutional layer, a nonlinearity layer, a pooling layer, and a fully connected layer. For the nonlinearity and pooling layers, there are no settings available; however, there are options for the convolutional and fully connected layers. When compared to standard neural networks, CNNs are capable of preserving the spatial correlations of the input while extracting feature information. Weights and biases can be taught for each neuron in a layer by experimenting with them. Data can be fed into the network, and the loss function at the top layer can be minimized to achieve the optimal model. A variety of CNN designs have been proposed, each with its own advantages and disadvantages. In this work, the MOBILENET, this pretrained model gave good results.

##### CNN Model Training:

##### The dataset contains both training and validation sets, which are complementary. Approximately 80 percent of the training set is used for real training, with the remaining 20 percent being used for back-propagation validation

##### Transfer Learning:

##### Transfer learning is a machine learning research subject that relies on retaining acquired knowledge while solving one issue and applying it to another but similar problem. Starting with a pretrained model, we change it to predict the two categories of blood smeared photographs using our dataset instead of predicting thousands of categories of ImageNet using the ImageNet dataset

##### Performance Metrics:

##### there are three different combinations of anticipated and actual data to consider. For the sake of comparison, the matrix of confusion is displayed in relation to the validation dataset.

##### Precision = TP/(TP+FP)

##### Recall = TP/(TP+FN)

##### F1 score = 2(Precision\*Recall)/(Precision + Recall)

##### Conclusion:

##### To increase the performance of malaria diagnosis categorization in this study, we applied end-to-end deep-learning neural networks from start to finish. I conclude that the pretrained convolutional neural network model MOBILE NET performs significantly better than all CNN pretrained model for the classification of blood smears . *I have tried CNN model and Mobile net pretrained Model while comparing results Mobile net model giving good accuracy than CNN model. and I have deployed in Fast API.* I employed transfer learning and fine-tuning to increase the performance of these pretrained models, and the results were promising.