CLASSIFICATION OF MALARIA CELL IMAGES WITH DEEP LEARNING :
Build an explainable deep learning model to classify malaria-infected cells and deploy the model in a simple dashboard.

DATA COLLECTION -
1.For this work, we collected data that is already available on the internet. The dataset is collected from NIH (National Institute of Health) which contains 27,588 images of parasitized and uninfected cells. The number of images per class is equally distributed with 13,794 images per class. The difference between malaria-infected and uninfected cells from the dataset, chosen randomly
2.After data collection, the next step was data preprocessing. In the preprocessing step, we convert all the images into 64*64 dimensions which is the standard input image size of most pre-trained CNN models for faster model convergence. Then the next step is data labelling. We represent the parasitized images as 1 and uninfected images as 0 for the data in this step.
3.The next step was data splitting. In this step, data is divided into two different parts which are known as data training and data validation. In this process, the data set's splitting ratio is (75, 25), i.e. 75% of data used for training and the remaining 25% of data used for validation.

DEEP LEARNING -
Deep learning techniques are now generally used for image classification and medical image analysis. It has been a proven method which increases the performance in any field. A convolutional neural network (CNN), a type of deep neural networks, is essentially considered for research in the computer vision field. The deep architecture of CNN is its main power. The convolutional layer in the CNN works as an automatic feature extract-tor that extracts hidden and important features. Extracted features are passed to a fully connected neural network which performs classification images by maximizing the probability scores
1.After data is splitting into training and validation then the CNN algorithm was chosen for classifying the data. We give the train data to the CNN algorithm by making use of the fit function and train the algorithm to detect the malaria disease. For the training process, we use the 20669 images of the taken data.
2. After training the next process is validation. In this process, we have to test the given data to whether the algorithm classifies the given data correctly or not and shows the predicted class label for the dataset.

ANALYSIS AND DISCUSSION -
Deep learning methods achieve impressive performance (even surpassing human-level performance) in several tasks over a wide spectrum of domains. However, in many domains like healthcare, reasoning the predictions of a model is vital. They are useful in evaluating the reliability and fairness of a model, and in effective data-driven decision making.
While being a generally black box approach, with modern techniques, deep learning methods can provide some explanations to their predictions. In the context of image classification, heat-maps on the image highlighting areas that highly influence the classification of the target can be generated (see examples below).

RESULTS -

We have adopted the following approach to assessing the proposed CNN model's performance for the classification of uninfected and parasitized cell images. The results based on the test plan that has been done. At the first trial, the results were nearly negative that the Accuracy of malaria detection was 96.0% and Loss was1.6. After the second test plan has been done, the results were positive: The Accuracy was 98.0%, and Loss was 0.9. the Accuracy was calculated by rule, as shown below:

ACCURACY = (TP+TN/TP+FP+FN+TN)

This network's approach is instead of layers to learn the underlying mapping; we allow the network to provide the residual mapping. So, instead of say H(x), initial mapping, let the network fit, F(x): = H(x) − x which gives H(x): = F(x) + x.

RECOMMENDATION -

THIS model achieved 98.0% of Accuracy and 0.9 of Loss.It was recommended to develop our model by: deploying our best improved model to a mobile application to facilitate a simple and fast detection of malaria parasite in blood cell images.