MALARIA DETECTION REPORT

Malaria is a deadly, infectious mosquito-borne disease caused by Plasmodium parasites. These parasites are transmitted by the bites of infected female Anopheles mosquitoes. In short, nearly half the world's population is at risk from malaria and there are over 200 million malaria cases and approximately 400,000 deaths due to malaria every year.

The intent of the project is two-fold — understanding the motivation and importance of the deadly disease malaria and the effectiveness of deep learning in detecting malaria. We will be covering the following major topics in this article.

- Methods for Malaria Detection
- Deep Learning for Malaria Detection
- Convolutional Neural Networks (CNNs) trained from scratch
- Transfer Learning with Pre-trained Models

Deep Learning for Malaria Detection

With the regular manual diagnosis of blood smears, it is an intensive manual process requiring proper expertise in classifying and counting the parasitized and uninfected cells. Typically this may not scale well and might cause problems if we do not have the right expertise in specific regions around the world. Some advancements have been made in leveraging state-of-the-art (SOTA) image processing and analysis techniques to extract hand-engineered features and build machine learning-based classification models. However, these models are not scalable with more data being available for training and given the fact that hand-engineered features take a lot of time.

Deep Learning models, or to be more specific, Convolutional Neural Networks (CNNs) have proven to be really effective in a wide variety of computer vision tasks.

Convolution layers learn spatial hierarchical patterns from the data, which are also translation invariant. Thus they are able to learn different aspects of images.

Thus, CNN's help us with automated and scalable feature engineering. Also, plugging in dense layers at the end of our model enables us to perform tasks like image classification. Automated malaria detection using deep learning models like CNNs could be very effective, cheap and scalable especially with the advent of transfer learning and pre-trained models which work quite well even with constraints like fewer data.

Dataset Details

we have two folders that contain images of cells that are infected and healthy. A balanced dataset of 13779 malaria and non-malaria (uninfected) cell images.

Deep Learning Model Training Phase

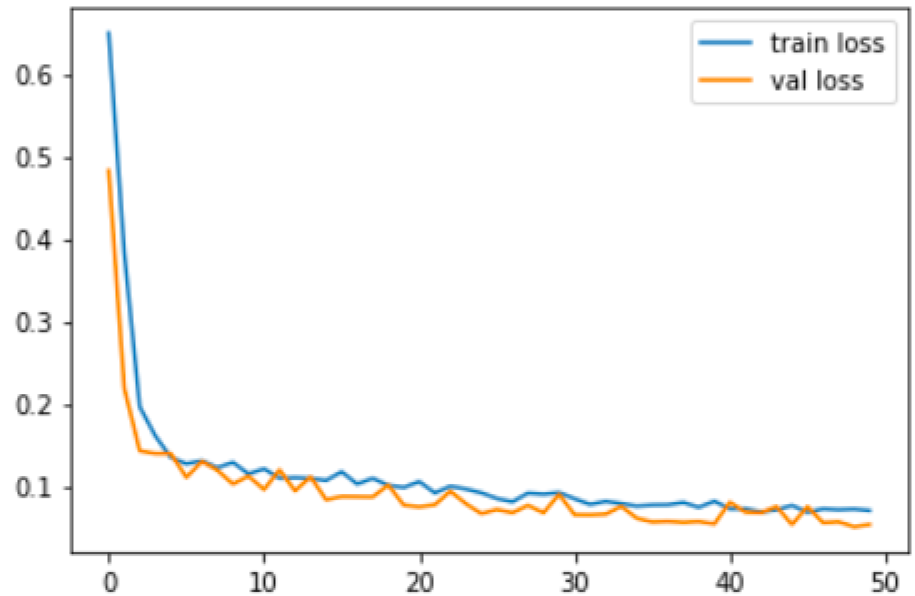
In the model training phase, we will build several deep learning models and train them on our training data and compare their performance on the validation data. We will then save these models and use them later on again in the model evaluation phase.

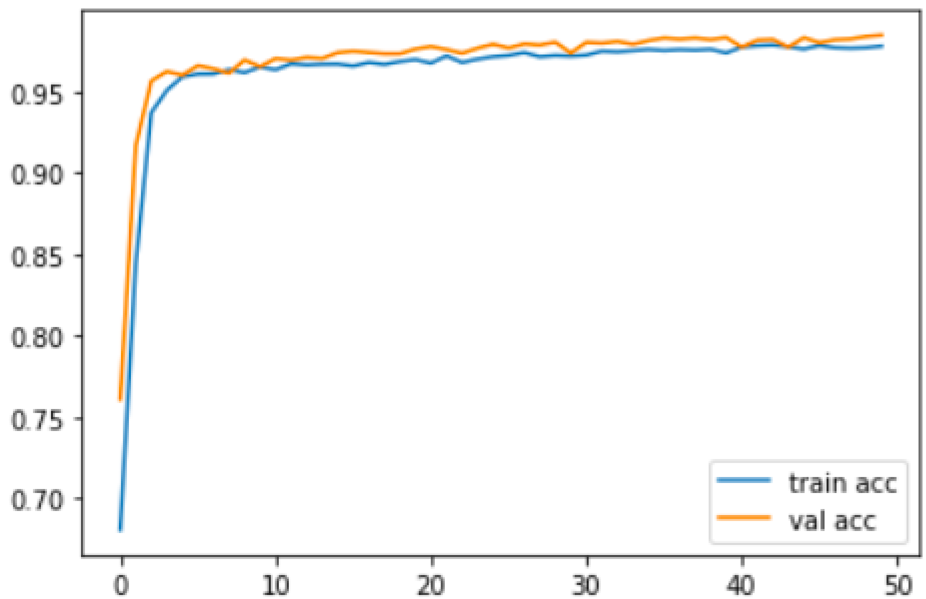
To build deep learning models we need training data but we also need to test the model's performance on unseen data. We will use a 60:10:30 split for train, validation and test datasets respectively. We will leverage the train and validation datasets during training and check the performance of the model on the test dataset.

Model 1: CNN from Scratch

Our first malaria detection model will be building and training a basic convert let's define our model architecture.

our CNN model has three convolution and pooling layers followed by two dense layers and dropout for regularization, validation accuracy of 97.6% which is pretty good, though our model looks to be overfitting slightly looking at our training accuracy which is 98.5%. We can get a clear perspective on this by plotting the training and validation accuracy and loss curves.





Conclusion

We looked at an interesting real-world medical imaging case study of malaria detection in this article. Malaria detection by itself is not an easy procedure and the availability of the right personnel across the globe is also a serious concern.