Infyma Hackathon Report
Diabetic Retinopathy Classification

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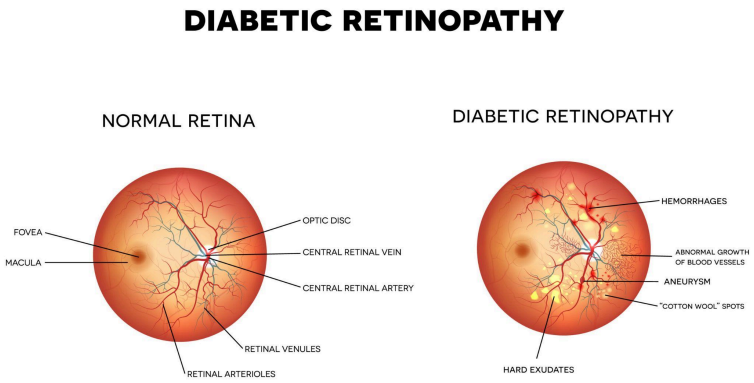
Dataset:

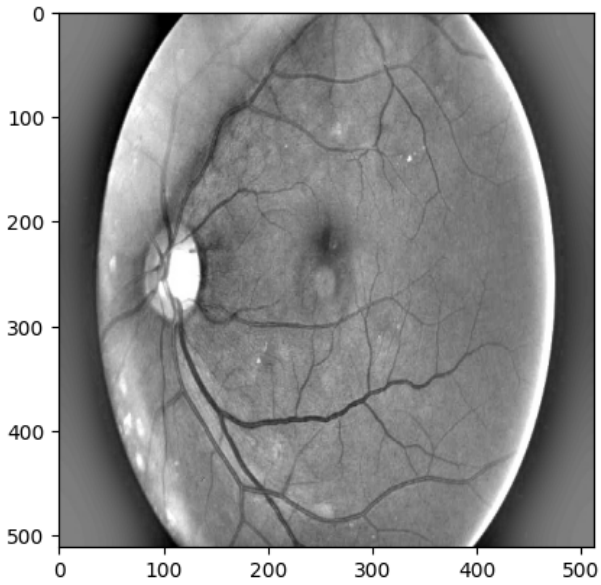
There are a total of 5 classes with labels: No Dr, mild DR, severe DR and Proliferative DR. After doing some research, we figured out that the features of Diabetic Retinopathy were clear so our goal was to segment those indicators from the rest of the image. The features were:

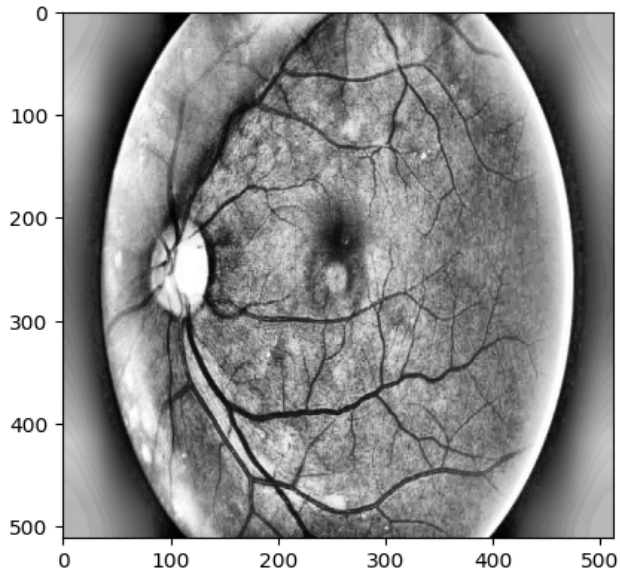
1. Hemorrhage
2. Abnormal Blood Vessels
3. Aneurysms
4. Cotton Wool spots



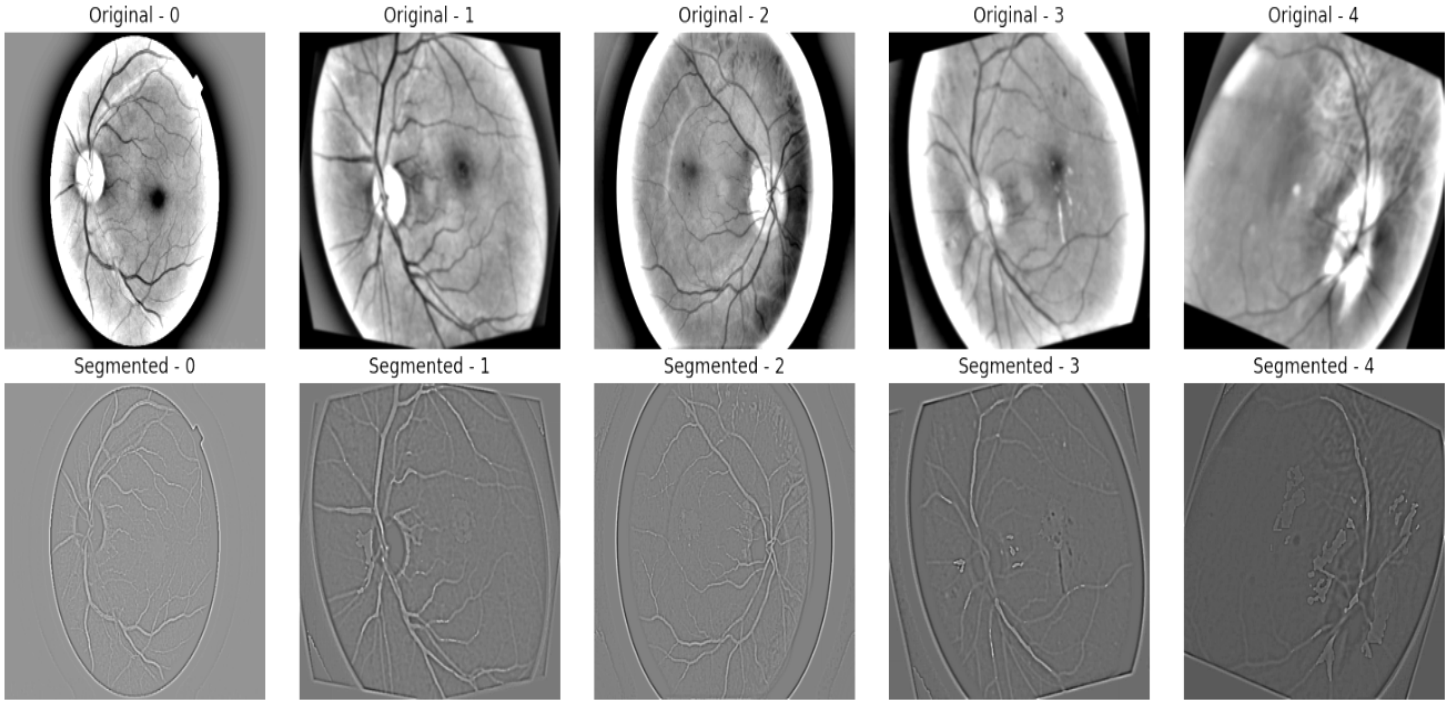
Preprocessing:

Segmentation of the features mentioned above was quite tricky. The vessels were extremely thin so to enhance them, we used **CLAHE Filter.** I masked the entire images except the vessels. To create the mask, we experimented with different pixel values until I found those pixels that correspond to those which contained the ones of the vessels. But unfortunately, it didn't perfectly mask so some pixels from the background also got included. Here are the before (left) and after (right) images of the retina.





The difference is clear as the vessels are now clearly defined. Next, we had to segment the small bulges and vessels from the background. So for that, I used Laplacian Filter. I chose a **laplacian filter** as the edges were present either on the vessels or on the spots (Hemorrhage,Aneurysms,Cotton Wool spots). These were the results after applying CLAHE and Laplacian filters:



You can clearly see the difference between the stages. In the last stage, there are more bulges and spots while the first image is clear. We have added more images in the notebook for you to see.

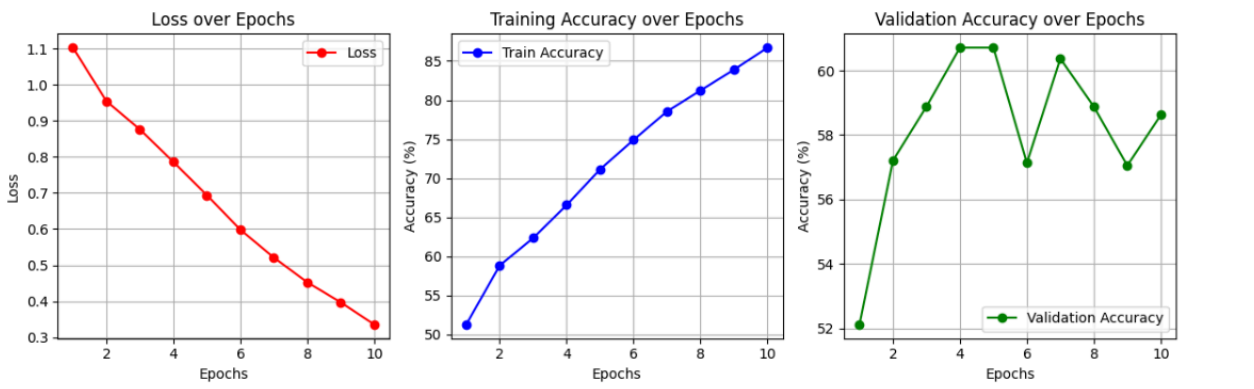
Now that my images were ready, the next step was to create and train the model.
After doing some research, we decided to go with Resnet50 as it's a large model so accuracy would be better. We changed its input layer so that it takes grayscale images as input and the output layer.

Model Hyperparameters:

Learning Rate: 3e-4
Weight Decay: 1e-4
Betas: (0.8,0.98)

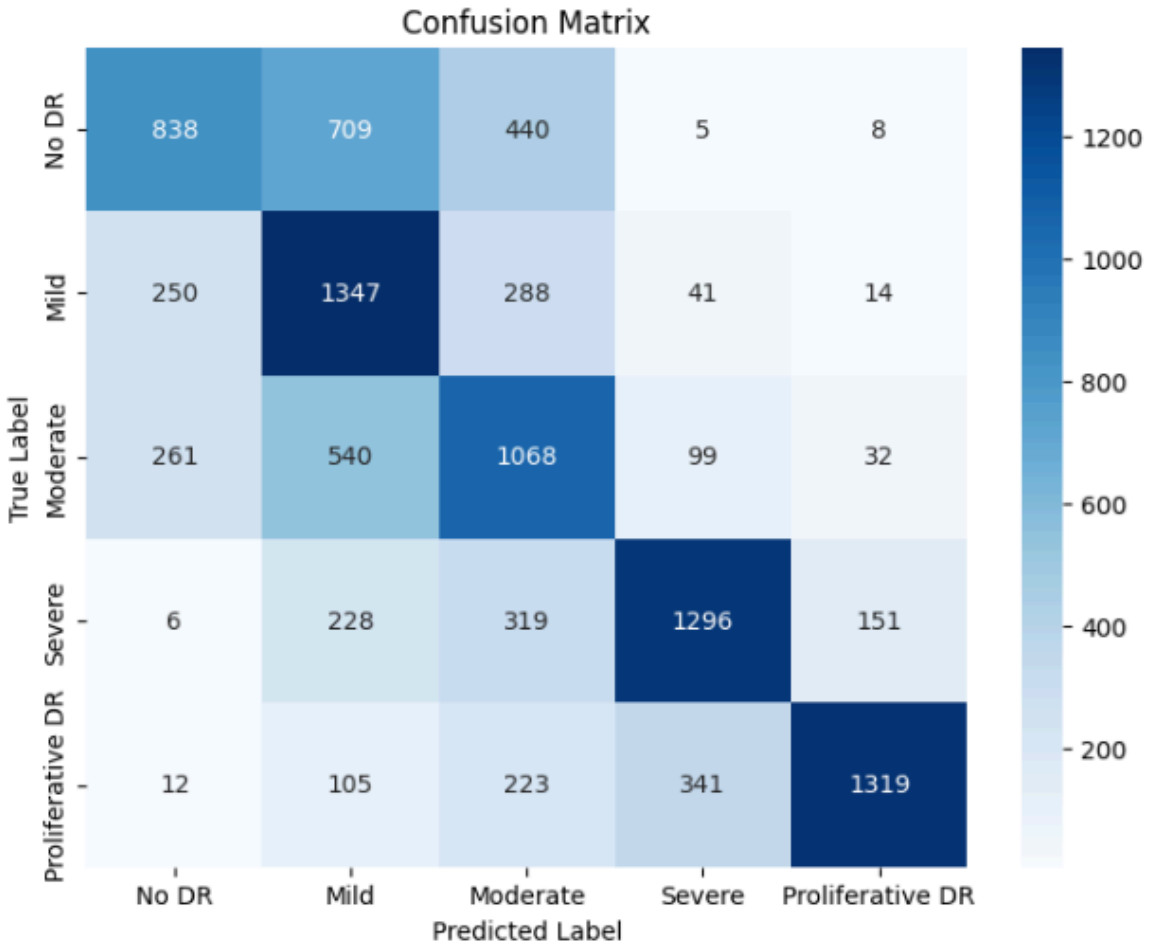
The model was trained for 10 epochs.

Results:



Training accuracy was 86% while testing accuracy was 59%.

Confusion Matrix:



This confusion matrix clearly shows that the majority of the images were correctly classified.

Conclusion:

This hackathon was really fun and informative. Our majority of time was spent on understanding the data and pre processing it to make my features more prominent. Medicals image classification requires thorough research because without it it's impossible to tell what features should be highlighted.