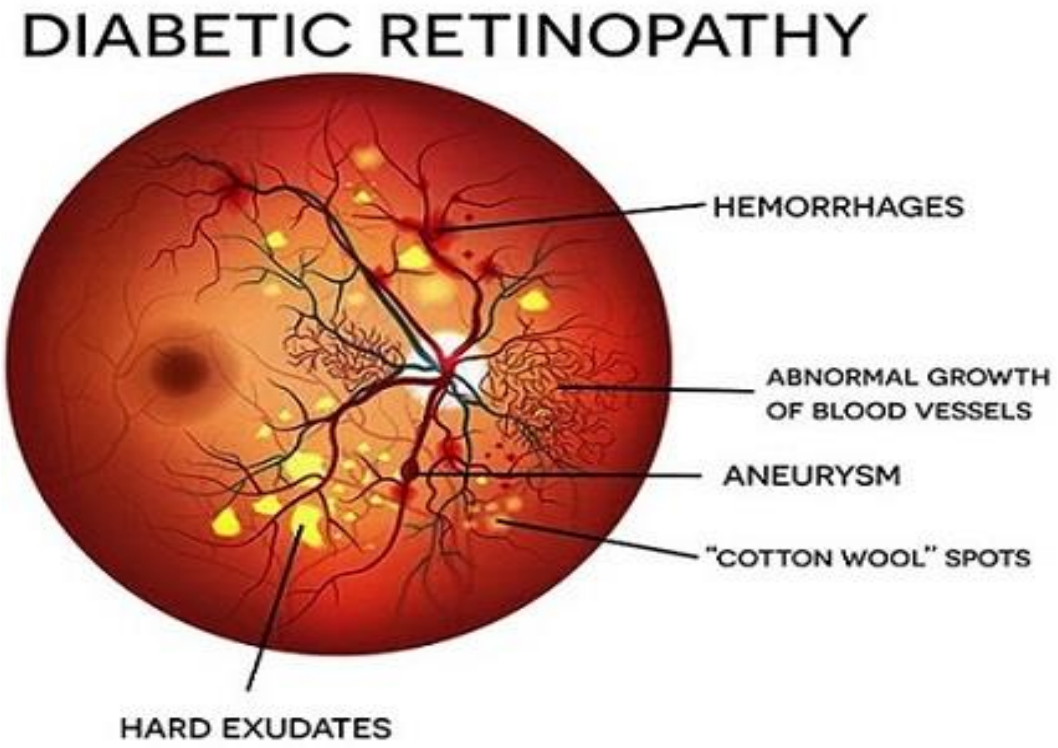
DIABETIC RETINOPATHY DETECTION



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PROBLEM STATEMENT

- Diabetic Retinopathy (DR) is a condition which develops in the eye, which if not treated at initial stages, could lead to **permanent blindness**.
- The World Health Organization estimates that 347 million people have the disease worldwide.
- India is said to be the diabetic capital of the world by 2030 with over 80 million people affected by it, and the prevalence of DR among persons with diabetes was 16.9% in India.
- There is a need for early identification of persons with diabetes retinopathy (DR) so that DR can be eliminated.
- For early and accurate detection of DR and stages of DR developing a DL model is required.

META DATA

- A large set of high-resolution retina images taken under a variety of imaging conditions. Left and right field is provided for every subject. Images are labeled with a subject id as well as either left or right (e.g., 1_left.jpeg is the left eye of patient id 1).
- It contains 88,702 high-resolution images with various resolutions, ranging from 433 × 289 pixels to 5184 × 3456 pixels, collected from different cameras.
- A clinician has rated the presence of diabetic retinopathy in each image on a scale of 0 to 4, according to the following scale:

- 0 - No DR
- 1 – Mild
- 2 – Moderate
- 3 - Severe
- 4 - Proliferative DR

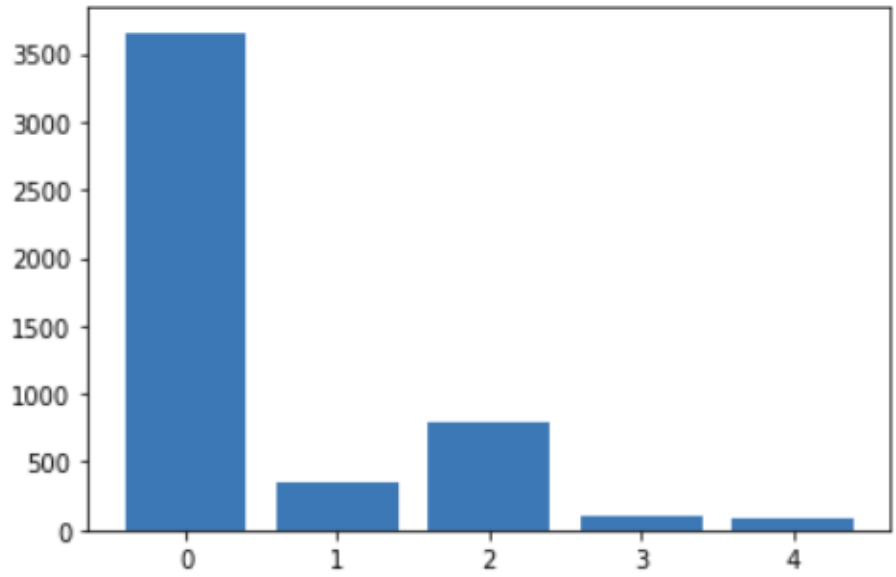
The images in the dataset come from different models and types of cameras, which can affect the visual appearance of left vs. right. Some images are shown as one would see the retina anatomically (macula on the left, optic nerve on the right for the right eye). Others are shown as one would see through a microscope condensing lens (i.e., inverted, as one sees in a typical live eye exam). There are generally two ways to tell if an image is inverted:

- It is inverted if the macula (the small dark central area) is slightly higher than the midline through the optic nerve. If the macula is lower than the midline of the optic nerve, it's not inverted.

- If there is a notch on the side of the image (square, triangle, or circle) then it's not inverted. If there is no notch, it's inverted.

PRE-PROCESSING PIPELINE

- Diabetic Retinopathy Detection Dataset is a large dataset (around 88.29 GB) containing 5 zip files for training and 7 zip files for testing, we plan to use minibatches for training and testing as a technique to handle this large data.
- The Images are of High Resolution with their dimension's being around 4928 x 3256 (On Average) hence, we plan to Re-size the Image to a smaller dimension to speed-up the training process.
- After Exploring the data, we can see (Shown in the Image below) that there is a class Imbalance problem hence we will try to balance the distribution.



- We will use the Data Augmentation like Translating, Flipping and Rotating the Images to Increase the variety of the Images to be fed into the Network.
- Data Normalization technique used to Normalize the Images and convert them into a similar distribution.

OBJECTIVES

- The need for reliable diabetic retinopathy screening systems became a critical issue recently due to the increase in the number of diabetic patients. Using DL in DR detection and classification overcomes the problem of selecting reliable featured for ML; on the other hand, it needs a huge data size for training.
- Implementing data augmentation to increase the number of images and overcoming overfitting on training stage.
- We aim to Implement Unet, VGG, ResNet, or AlexNet CNN architectures and achieve an **Accuracy** of about 70-72%, Sensitivity 25-28%, **Specificity** 90-92%.
- As we know for this dataset an own CNN structure a customized architecture gives notable accuracy than existing architectures, we also try to implement that and improve accuracy.