DIABETIC RETINOPATHY PREDICTION USING DEEP LEARNING

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Abstract

I. Introduction

One of the major causes of eye vision loss is diabetes. While delayed examination would have a higher effect on the retinal area of the eye, early detection of diabetes is crucial.

1.1 Background of the project

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a. Dataset

For this research project I'm using dataset available at Kaggle("Diabetic Retinopathy Detection" 2015). This Retinal images were provided by EyePACS. The dataset containing large set of high-resolution retina images taken under a variety of imaging conditions. For each image, a left and right field is provided. Images are identified by a image id and either the left or right eye (for example, 1 left.jpeg represents the patient number 1's left eye).

Table 1: ("Diabetic Retinopathy - Stages" 2017)

DR classes	Level	Description
No DR	0	Healthy Retina (Normal)
Mild	1	Retina with tiny bulges (microaneurysms)
Moderate	2	Retina with microaneurysms, higher risk of developing vision problems in the future
Severe	3	Retina with severe and widespread microaneurysms, including bleeding into the retina
Proliferative	4	New blood vessels and scar tissue have formed on your retina, which can cause significant bleeding and lead to retinal detachment

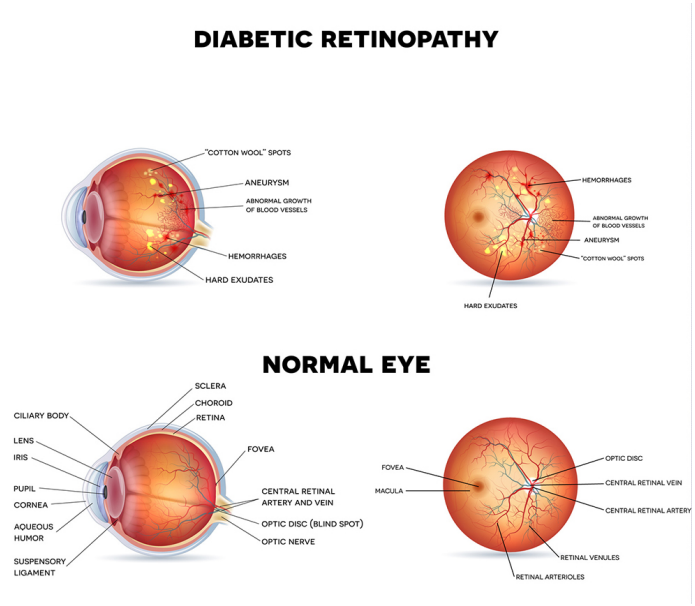

Figure 1: Normal Retina Vs Diabetic Retinopathy Retina ("Diabetic Retinopathy Vs Normal," n.d.)

b. Data pre-processing

Image pre-processing was performed with the aim to decrease unclear image and reduce image size. The plot below illustrates the class imbalance in the original dataset.

The dataset consist of 35,126 set of images. The orginal image have 1944 * 2592 * 3 size, and all images are jpeg format. The classes have an uneven distribution of images.

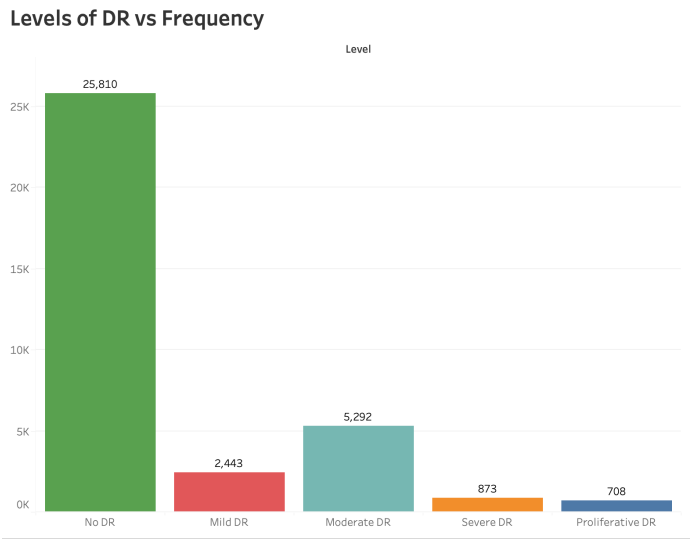

Figure 2: Sum of number of records for each level

1. Image Resizing

   Due to the enormous size of the dataset, it was drastically downsized before being sent to the network. Each input image is 256 * 256 in size after resizing.

2. Removing Unclear Image

   Some images have a blackish or white tint. Because it might affect the outcome, this type of image cannot be fed into the network. The removal of an unclear image is a crucial step that must be taken.

3. Dividing images into classes

   Images are classified into 5 folders based on the DR levels.

Bibliography and References

"Diabetic Retinopathy - Stages." 2017. https://www.nhs.uk/conditions/diabetic-retinopathy/stages/.
"Diabetic Retinopathy Detection." 2015. https://kaggle.com/competitions/diabetic-retinopathy-detection.
"Diabetic Retinopathy Vs Normal." n.d. https://www.advancedretinaassociates.com/patient-education/diabetic-retinopathy/.