Automated Early Detection of Diabetic Retinopathy Using Deep Learning

Jibanul, Natnael, Moazam

March 3, 2021

Outline

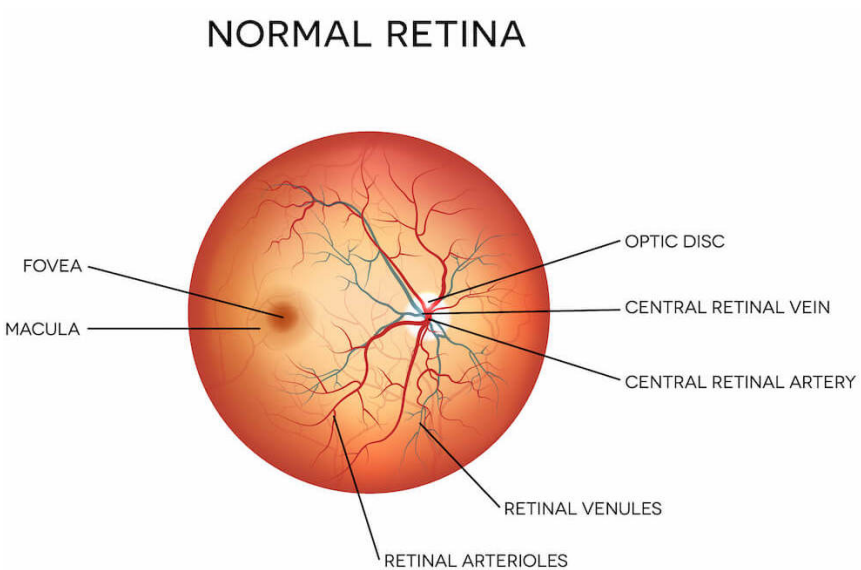
1. Background
2. Objective
3. Data
4. Reference

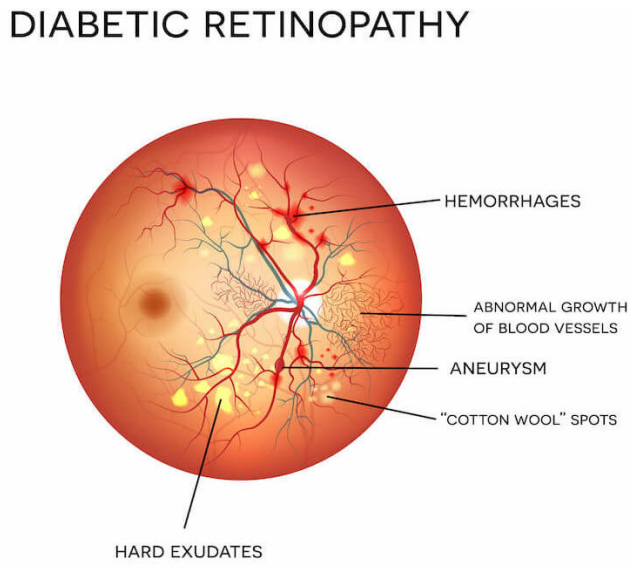
Background

Background

What is Diabetic Retinopathy?

- Diabetic retinopathy (DR) is an eye disease that is caused by damage to the blood vessels in the tissue at the back of the eye (retina).
- Diabetic retinopathy is the leading cause of blindness in the working-age population of the developed world.
- It is estimated to affect over 93 million people.
- Around 40% to 45% of Americans with diabetes have some stage of the disease.





Why Addressing This Problem Is Important?

- The progression to vision impairment can be slowed or averted if DR is detected in time.
- However this can be difficult as the disease often shows few symptoms until it is too late to provide effective treatment.
- Detecting DR requires trained clinician to examine the digital color fundus photographs of the retina which require large amount of time and manual labor.
- By the time human readers submit their reviews, often a day or two later, the delayed results lead to lost follow up, miscommunication, and delayed treatment.

Objective

Objective

General Objective:

- Build a deep learning model that can robustly detect diabetic retinopathy from retina images.

Specific Objectives:

- Preprocess the data to allow our model extract useful features.
- Perform data augmentation to make our model robust to noise and variations in the dataset.
- Experiment with, build, and finetune a baseline model.
- Test our model's performance on unseen real world data.

Data

Data

- Retinal images were provided by EyePACS, a free platform for retinopathy screening. [1]
- The dataset comprises of ∼89K images.
- Total size of the data is approximately 83 GB.
- Images are high-resolution ranging from 10M-5M pixels.
- Dataset is divided into five classes:
  - No DR
  - Mild
  - Moderate
  - Severe
  - Proliferate DR

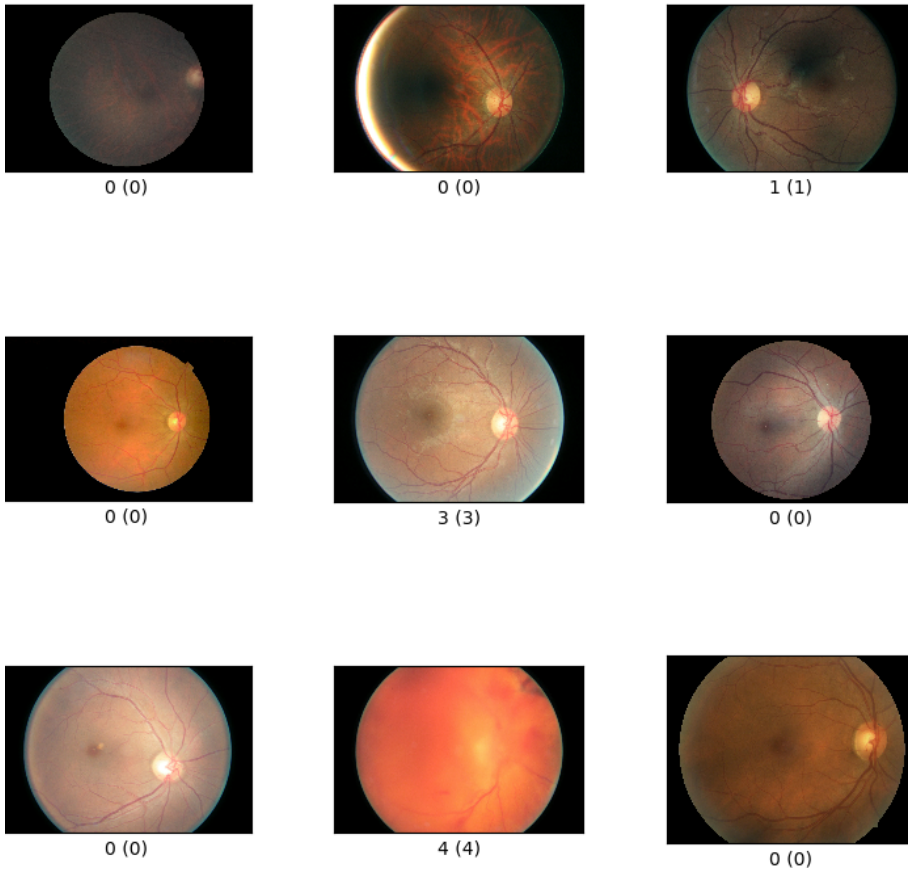
[1] https://www.kaggle.com/c/diabetic-retinopathy-detection/data

Dataset Challenges

- Collected from various camera equipment causing different quality images. Difficult to generalize.
- Some images are inverted as one would see through a microscope as compared to it appearing anatomically, making it difficult to compare left to the right eye.
- Noise in images (out of focus, underexposed, overexposed, etc) and labels.
- Data classes are highly imbalanced.

Data Examples

2



[2] https://www.kaggle.com/c/diabetic-retinopathy-detection/data

Reference

Reference

1. Kaggle link. https://www.kaggle.com/c/diabetic-retinopathy-detection/overview
2. Figure 1. https://gadsdeneye.com/diabetic-retinopathy/

Thank You!