Diabetic Retinopathy Screening Using Imbalanced Retina Images with Low Resolutions

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1 Problem statement

Diabetic retinopathy, is a medical condition in which damage occurs to retina due to diabetes. It leads to blindness[1].Our goal is to construct a pipeline to automatically classify Diabetic Retinopathy (DR) by skewed, limited digital color fundus photographs of the retina with low-resolution (binary classification).

2 Motivation

Most studies on automated method of DR screening are based on eye images with high resolution, which is not practical.

3 Proposed approach

We expect to develop a pipeline(preprocessing + CNN) aims at improve DR screening accuracy at low-resolution images. We mainly focus on three aspects: 1. how to deal with low resolutions; 2. imbalanced data-sets 3. limited datasets.

low resolution To deal with this problem, we mainly plan to using two strategy, one is to use images process methods to enhance image quality, such as using auxiliary method to discard poor quality images[2] or using prior-dark channel prior to remove haze from original images [6]; another is adjust in deep learning pipeline.

imbalanced datasets Most of the image class is negative. To address this problem, we consider two strategy: one is use weighted loss or oversampling the negative class, for negative class loss, we update the parameters more and we oversampling the negative images when construct a mini-batch. The other method is to introduce external processed images to augment the negative images.

limited datasets Considering that the datasets is not enough to train a classical convolutional neural network(such as ResNet or VGG19), we are considering to use two strategy: one is to run data augmentation, such as rotate and translation etc; the other is to use transfer learning, i.e. applying the pretrained weights for the network, and freeze the weight in lower layers and only training the weights of rest layers[3].Note that a drawback for transfer learning is that it requires pretrained weights for CNN.

10707 Class Project (2017).

4 Datasets

A private diabetic retinopathy images datasets (1870 negative samples, 3304 positive samples)
We also plan to use EyePACS-1 datasets[4] and Messidor-2 datasets[5] to get pretrained weights.

5 References

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