DA 526 (2023): Assignment 1

Segmentation of Blood Vessels from Fundus Images

(Submit as a Team of 3 to 5 members)

Total Marks: 100

Fundus images are medical images that capture the interior surface of the eye, including the retina, optic disk, and blood vessels. The accurate segmentation of blood vessels and optic disks from these images is important in various fields of ophthalmology, such as the diagnosis of diabetic retinopathy, glaucoma, and hypertension. Fig. 1 is a sample image from a large set of retina images taken using fundus photography under a variety of imaging conditions. In the image, the optic disk, blood vessels, fovea, and macula are clearly marked.

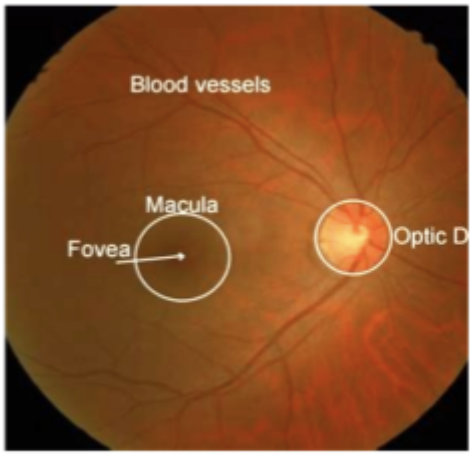

Figure 1

Problem:

You are given a new image shown in Fig. 2. The image is available here. Your goal is to extract the blood vessels using basic image-processing techniques taught in class. No machine learning algorithm should be used for this assignment. We will revisit this problem later when ML is covered in class to explore how to use ML.

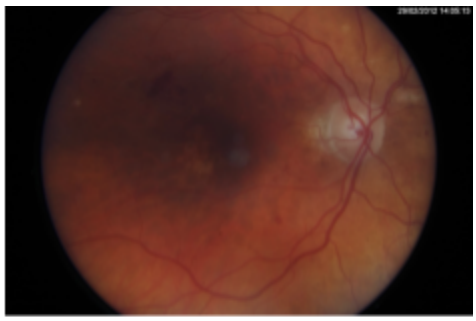

Figure 2

Deliverables:

(a) **A single Python script** that can generate a binary image corresponding to the blood vessel region. In the binary image, the pixels corresponding to the vessel region should be set to true while the other pixels should be set to false. *The code should be properly commented on.*

(b) **The binary image**: *vessel.png*. *The of size the image MUST be 2816x1880, i.e., the same as the input image.*

One of the team members should upload the deliverables to this Form: https://forms.office.com/r/zBRupZrw5K

An example of a binary image:

(a) (b)

(a) Original image and (b) binary image showing the vessels (ground truth)