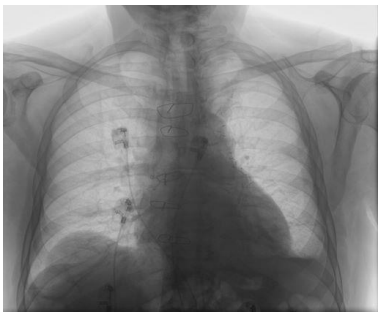
# Bishop's University
# Department of Computer Science
# CS462-CS562 – Image Processing & Mathematical Modeling of Image
# Winter 2024 – HW1

**Exercise 1: Image enhancement:**

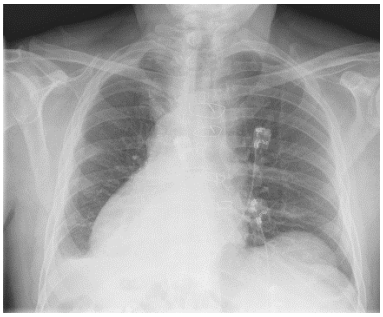
You are provided with an image depicted in Figure 1(a). Write Python code to perform the following tasks:

1. Compute the negative image, as illustrated in Fig 1(b).
2. Enhance the brightness of the input image, resulting in Fig 1(c) and (d).
3. Enhance the contrast of the input image, resulting in Fig 1(e) and (f).

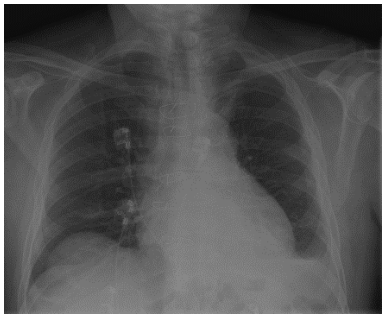
(a) Original image



(b) Negative image



(c) Brightness enhanced with 50



(d) Brightness enhanced with -50

(e) Contrast enhanced with +50

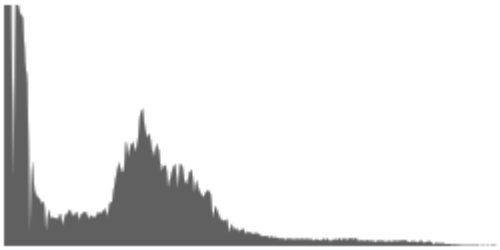
(f) Contrast enhanced with -50

Figure 1. Basic image processing operations

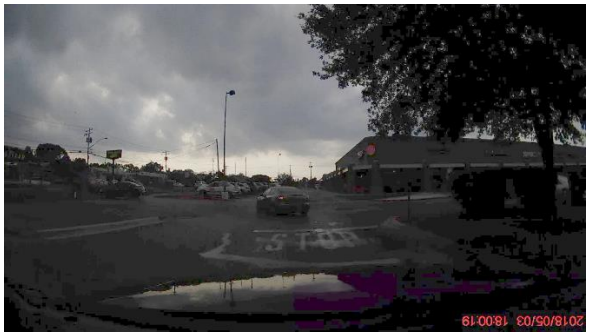
**Exercise 2: Image enhancement with Gamma correction.**

You are provided with an under-exposed image depicted in Fig 2(a).

(a) Input Image



(b) histogrm of gray scal intensity distribution of the image (a)



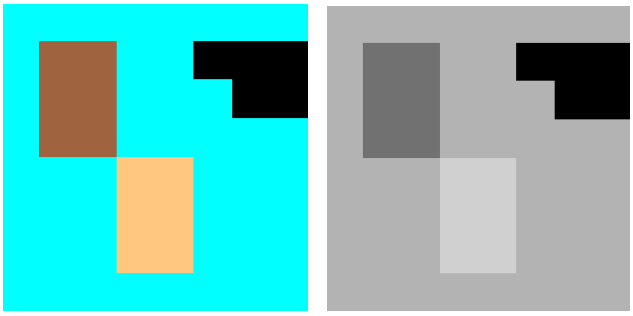
(c) Enhanced image with Gamma correection c=2.5

Figure 2. Image enhancement with Gamma correction.

1. Write Python code to enhance the contrast of the input image using Gamma correction, resulting in Fig 2(c).
2. Write Python code to enhance the contrast of the input image using the histogram equalization technique. Additionally, display the histogram of grayscale intensities for the enhanced image.

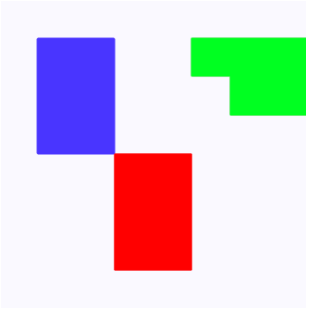
**Exercise 3: Connected component analysis.**

The figure below displays two images: an RGB image on the left and the corresponding grayscale image on the right.



1. Write Python code to convert the RGB image to the grayscale image.

2. Write Python code to detect connected components, as shown below.



3. Utilize a bar plot to compare the sizes (number of pixels) of the connected components.
4. Compute and print the percentage size of each connected component.