Lab Assignment 3

Image Manipulations

- Questions 1 to 7 must be completed in lab hours
- You have to submit the complete assignment on LMS before submission deadline

1. **Converting image data structures:**

a) Create a numpy array from the Image object. You can read an image using PIL and convert it to numpy array.

b) Reverse: Convert from numpy array into a PIL Image object.

2. **Converting from one file format to another**. Read an image in one file format and save it to another: for example, from PNG to JPG.

3. **Cropping an Image:** Take any RGB image as input and crop that image. Show input and output both together
    a) Using direct function in Python
    b) Write your program using arrays and matrices. This is required to make you familiar with images and their dimensions

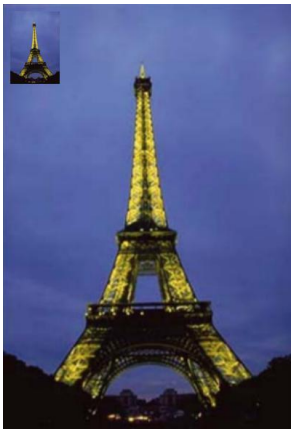
4. **Negative of an image:** Write a program to obtain negative of an image. Do not use any direct function. Suppose the intensity values of your input image vary from 0-255. Negative of an image can be obtained using following formula, where y is the intensity value of a pixel in output image and x is the intensity value of same pixel in input image.

$$y = 255 - x$$

5. **Creating a circular mask on the input image.** The example of output image is below. Hint: Slicing and masking with numpy arrays can be used to create a circular mask on the input image.

6. **Reading and displaying multiple images at once**

7. **Create a thumbnail** from an image. Output example is shown below



8. **<u>Drawing on an image in Python:</u>**

a) You can draw lines or other geometric shapes on an image. For example, drawing ellipse on input image and output will look like below.

b) Drawing text on an image. Write some text on input image. Use a function in Python to change its font as well

9. **R,G,B channels splitting and merging**. Read any RGB image as input, split three channels R, G, B and display these channels/matrices as output images. Then, merge the three channels again and display same RGB image.

10. **<u>Optional Problem</u>**

Image Morphing: Convert your image to one of your friend/family member's image

Start from one face image (your face) and end up with another image (your friend's face) by using a linear combination of the two image numpy ndarrays given with the following equation. You can do this iteratively increasing α from 0 to 1

$$(1-\alpha).image_1 + \alpha.image_2$$

One example is shown below: Converting face from George Bush to Arnold