<h1 style="text-align:center">ASSIGNEMT 5.0</h1>

TASK 01: Read this colour image and convert this to a grayscale image. Find out the shape of the colour image and gray scale image.

Syntax : To read the colour image:- `cv2.imread('file_name', cv2.IMREAD_COLOR)`
         To read the gray scale image:- `cv2.imread('file_name', cv2.IMREAD_GRAYSCALE)`

TASK 02: The colour image consists of many colours that means there are many separate channels. Slice all them all and show all one by one.
Syntax: To slice and show the channel :-
`im1_ch1 = im1[:,:,0]; im1_ch2 = im1[:,:,1];  im1_ch3 = im1[:,:,2];`

Task 03: Show the given image using matplotlib.pyplot by doing show you don't need to have a separate tab to show the image. Convert the image from BGR to RGB format and by using plt.imshow() show the image.

Syntax : `cv2.cvtColor(im1, cv2.COLOR_BGR2RGB)`

[pi_brown.jpg and letter_M_green.jpg]

TASK 04: Combine both pi_brown.jpg and letter_M_green.jpg through a pixel-wise addition.
Syntax :
```
im1 = cv2.imread(' pi_brown.jpg ', cv2.IMREAD_COLOR)
im2 = cv2.imread(' letter_M_green.jpg ', cv2.IMREAD_COLOR)
im3 = cv2.addWeighted(im1,0.4 ,im2, 0.5, 0.5)
```

TASK 05: Perform the boolean 'bitwise_and' operation to the above figures and show the figure.
Syntax : `im_and = cv2.bitwise_and(im1, im2, mask = None)`
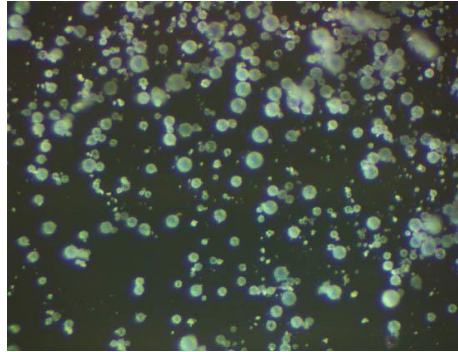
[particles.jpg]

TASK 06: Perform 'erosion operation' on the image (particles.jpg) to visualize the particles more distinctively. To perform the erosion operation the identity matrix s 3 × 5 and for 2 iteration and show the image before erosion and after erosion.
Syntax : `im1 = cv2.erode(im0, np.ones((3,5), np.uint8), iterations=2)`

TASK 07: Perform the dilation operation of the image (particles.jpg) where the identity matrix is of 3 × 5 and for 2 iteration and show the image before dilate operation and after dilate operation.

Syntax:
`im1 = cv2.dilate(im0, np.ones((3,3), np.uint8), iterations=3)`

TASK 08: From the image (particles.jpg) reduce the noise by performing morphological opening operation. Display the original image and the image after reducing the noise.

TASK 09: Create an empty image of size 50 × 50 with 2 channels. Then convert both the original image and the image with less noise into grayscale image and perform a bitwise_xor operation and stored it in the new empty image. Convert the new image from BGR TO RGB format and show it.

TASK 10: Perform the morphological opening operation (this helps to reduce the shite noises from the image) and then perform the morphological gradient operation (it will calculate the difference between and dilation and erosion of the image). Then plot the pre-processing image, the morphological open operated image and the morphological gradient operated image as three sub plots.

Syntax :
```
im0  =  cv2.morphologyEx(im01,  cv2.MORPH_OPEN,  np.ones((3,3),
np.uint8))
im1=cv2.morphologyEx(im0,  cv2.MORPH_GRADIENT,  np.ones((3,3),
np.uint8))
```

TASK 11: Convert both the morphologically opened and gradient image in gray scale. Then create a empty image of size 50×50 with two channel and then perform the bitwise_and and bitwise_xor operation and show the images.

TASK 12: The figure given below is an x-ray of the shotgun wound of the wrist of a soldier, showing the shrapnels trapped inside. Surgery is necessary for the removal of the shrapnels, for which a total count of the same is extremely important. Write a python code that reads the x-ray image and calculates the total number shrapnels, which need to be removed. Assume the soldier has suffered high blood loss due to injuries and the operation has to be performed in a very short time, write a code to prepare a work plan for the surgery team, which highlights the shrapnels in red, green and yellow colors, depending on the density of their distribution (in the decreasing order)
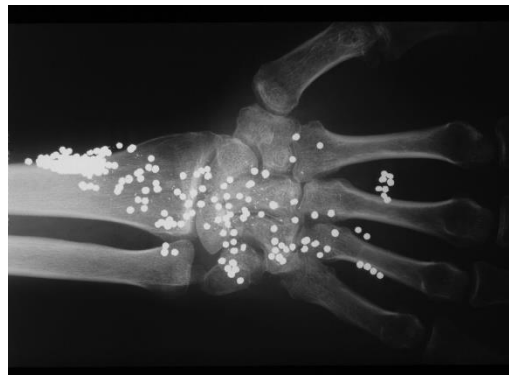
[shotgun_injury]

TASK 13: The figure presented below is the CT scan of an octogenarian suffering from neurocysticercosis, showing the developed cysts (small oval regions). While the bigger cysts are quite prominent, the smaller ones are not so distinct. Write a python code for the processing the following:

a.   Enhance the image so that the smaller cysts are clearly visible.

b.   Make an approximate count of the total number of cysts.
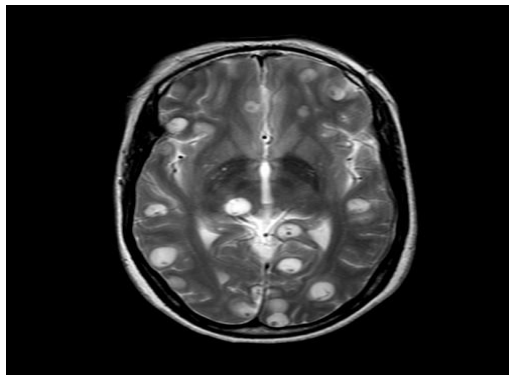
[neurocysticercosis]

TASK 14: The figure below shows the angiogram of the elbow and proximal forearm. Write a python code to calculate the total area of the artery network.
Bonus marks for removal of the arrows.

Hint : Use the threshold operation to manipulate the contrast of the angiogram.

[The angiogram of the elbow and proximal forearm]