Assignment 3

1) Convolutional Neural Networks (CNNs) have been have been mostly used to classify or recognise different objects on the given input images. In this assignment, the CNN algorithm will be designed to use to recognize different animals in the nature (elephant, crayfish, flamingo, hedgehog, kangaroo and leopards). In this task, you will have 6 different objects to recognize. The total number of images for each object is 70. Use training set (60 image for each object) to train your CNN model and use the testing data sets (totally 10 images) to test your trained model in your implementation. Based on the dataset, *construct your CNN algorithm.*

   a) *Describe your CNN model.*
   b) *Train the CNN with the grayscale and same size images (convert RGB to grayscale and resize) and use the grayscale images directly as input images for the CNN. Estimate the accuracy of the algorithm. Also, show the confusion matrix.*
   Example figures of RGB (Color), Grayscale and Binary images

   c) *Train the CNN with the Binary shapes of objects and use binary shape of image directly as input images for the CNN. Estimate the accuracy of the algorithm. Also, show the confusion matrix.*
   d) *Compare b and c, and conclude your results with your own words.*

Hint: *Resize each image with the same size before training and testing images.*

 In this task, you are free to choose the parameter values in your constructed CNN. The parameters which you will use:

   - *No. of Convolutional layers*
   - *Filter size in Convolution*
   - *Number of filters in Convolution*
   - *Stride*
   - *Padding*
   - *RELU*
   - *Pool layer*
   - *In fully connected network, you can decide number of hidden layers and number of neurons.*
   - *In fully connected network, you can decide learning rate.*
   - *In fully connected network, you can decide activation functions which you want to use.*

- *You can decide no. of iterations and batching size.*

OPTIONAL QUESTION (You can do this if you want to)

2) Create your own dataset with at least 200 images such as your mobile phone, your book, bottle, your cup etc. Use CNN method to detect, recognize and track your own created object in real time video. To do this,

   a. First of all, you will create your own dataset with your object (only your selected object will be seen in the images). See example in the object dataset which I uploaded.
   b. Store all these images in a folder.
   c. In the implementation, read all images and store them in a defined variable.
   d. Construct your CNN model with the parameters that you select.
   e. Train your dataset with the CNN method.
   f. Open your camera using the software and read each frame captured from your video camera.
   g. There are three ways to detect the objects:
      i. In each frame, use windowing method with the size of your trained images and give each windowing to the trained CNN model as a testing dataset.
      ii. In each frame, segment the objects using a segmentation method and give each segmented object to the trained model as a test data
      iii. In each frame, use edge detection method and find the region of detected edges of objects and give each detected object to the trained model as a test data
   h. Once, you used all segmented or detected objects as testing set for trained model, you will have many probabilistic results.
   i. In this case, you will have many results (probabilistic results) for each frame.
   j. Finally, select the maximum probability value.
   k. The maximum probability value will be the object which you want to find and which you want to detect and track.
   l. After that, you can draw rectangle to select the region of interest in the frame.
   m. Go to g.

You are free to use any parameter in CNN and software.

IMPORTANT

* The submission deadline is **15th *of April until 23:59***. You use any software code to resolve this problem.

*Please upload your answer document in the itslearning under **Submission for Assignment 3.**

* The outcome of your results will be **pass** or **fail**.