Assignment 1 - Dataset Preprocessing

Computer Vision (10224)

Overview:

- A good dataset is a key for successful model training.
- This assignment guides you how to create two labeled datasets, which could later be used for supervised learning.

Motivation:

- Image augmentations are used to increase the variability and robustness of a dataset.

Goals:

- Create a larger dataset from a smaller one
  - Task number 1:
    - The original MNIST dataset includes images of single digits, in ten classes.
    - Your goal is to create a new three-digit image dataset, with 101 classes, based on the original MNIST dataset.
  - Task number 2:
    - Create a dataset of shape images with three classes: (Triangle, Rectangle and Circle/Elipse)

Tasks

1. MNIST 0-100 (101 Classes)

   - Install the keras package, make sure the version is 2.4.3 (This does not apply to Google Colab users, since Keras is pre-installed in Colab)
   - Download and load the MNIST dataset by using the code snippet bellow

     ```
     import keras
     from keras.datasets import mnist
     (x_train, y_train), (x_test, y_test) = mnist.load_data()
     ```

     x_{train/test} will hold the images, y_{train/test} will hold the labels.
   - Show at least 5 samples of each class (0-9). Always add proper titles and choose the correct color map.

- Your new dataset should include the three-digits numbers: [000, 001, ..., 055, ..., 099, 100], forming 101 classes.
- Each class should have at least 4000 different samples.
- Use the augmentations you created on lab 3 on your new dataset and show some results and explain which augmentations are applicable to this specific dataset, which are not and why.
- Each student should add about 10 new augmentations (you may use OpenCV). The total number of augmentations will be 15.
- Display typical results of your dataset, demonstrating the variability of the new dataset.
- Write a detailed summary of your work.

2. Shapes Dataset

- Shapes definition and functions requirements:
  - Minimal and maximal area: 100-600 pixels, the shape could not be cropped by image boundaries.
  - Each shape will have random size, location, orientation and color.
  - Each image will include one of the following shapes:
    - Triangle
    - Rectangle
    - Circle/Elipse
- Each image should be of dimensions 50x50x3.
- Create at least 300 different samples of each class i.e.(circles with different radius, etc..)
- Show the images you created without augmentations and with the augmentations from lab 3.
- Write a class, which loads the data you created, labels the data, i.e (triangle will be class 0, rectangle 1, etc.. an Integer) and splits it to train and test sets. 90% of the data should be train images and 10% test images. The class call should be as follows:
  `(x_train, y_train), (x_test, y_test) = data.load_data()`

3. Summary

- Write a short summary of everything you've done in this work.