Exercise 0 for MA-INF 2201 Computer Vision WS24/25
09.10.2024
Submission on 14.10.2024
Introduction to OpenCV

Strict rules you have to follow for all your submissions for this course:

- You are required to write code compatible with Linux, python 3.9, and opencv 4.10.
- For each exercise, we will include all the packages you can use in the template code. You are not allowed to use any other packages.
- You must submit a code that runs and produces reasonable results.
- Do not cheat and copy the solution from anywhere. We need to verify that the code is yours and that you fully understand it.

Any violation of these rules will result in receiving zero points for the corresponding sheet.

This sheet is designed to help you get familiar with *OpenCV*. Hint: Install *python*, *opencv-python*, and *numpy* in your virtual environment (e.g., Anaconda) to avoid library conflicts on your machine.

1. Read an introduction to OpenCV and write a program that reads the image `bonn.png` and displays it using `imread` and `imshow`. *(0.5 Points)*
2. Convert the image into an intensity image using the function cvtColor and display it. *(0.5 Points)*
3. Multiply the intensity image I by 0.5 and subtract it from each color channel. Make sure that the values do not become negative, i.e. the new (R, G, B) values are (max(R - 0.5I, 0), max(G - 0.5I, 0), max(B - 0.5I, 0)). Do this by using pixel-wise operations in a nested for-loop. Display the result. Hint: OpenCV reads the images in `BGR` format in contrast to the commonly adopted `RGB` format.*(1 Point)*
4. Perform the operation above in a one-line python statement. Hint: you can use expand dims function in numpy to add additional dimension in a numpy array. *(1 Point)*
5. Extract a 16×16 image patch out of the original image centered at the middle of the image, display it, and copy the content to a random location of the image. Hint: you can use `random` python module to generate random numbers. *(1 Point)*
6. Draw 10 random rectangles and 10 random ellipses on the image using rectangle and ellipse and display it. Fill the shapes with colors of your choice. *(1 Point)*

Please list the names of your group members in the README. Upload all code and documentation to the corresponding Sciebo folder for the sheet (e.g. *sheet0* for this exercise). Note that the points from this sheet are bonus points. However, it is strongly recommended that you solve the exercises to get experience with OpenCV.