CS205 C/C++ Program Design – Project 2.

If you chose another topic, and the topic was confirmed by the instructor at bb.sustech.edu.cn, you can do your own one.

Please implement a convolutional neural network (CNN) using C/C++. You can follow https://github.com/ShiqiYu/SimpleCNNbyCPP where a pretrained CNN model is provided. The model contains 3 convolutional layers and 1 fully connected layer. The model can predict if the input image is a person (upper body only) or not. More details about the model can be found at SimpleCNNbyCPP web site.

You are welcome to implement more layers, and to make the implemented layers to be more general (such as the convolutional layer can be for any size of kernels, not just 3x3).

Do not use any third-party library except OpenCV to read image data from image files. You should implement all layers using C/C++.

Hints:

1. Only the forward part is required to implement, and the backward part (the training part) is not mandatory.
2. You can implement a unoptimized version firstly to verify the correctness of the implementation. Then you can optimize it for a better speed.
3. You can use OpenCV to read images. The image data stored in cv::Mat is `unsigned char` type. You should convert the data to `float` and normalize to `[0.0f, 1.0f]` from `[0, 255]`before operate it in a convolutional layer. Be careful with the order of pixel colors in cv::Mat. It is BGR, not RGB. The CNN model needs RGB data.

Requirements:

1. (20 points) The convolutional layer for 3x3 kernels is correctly implemented. It should support stride=1 and stride=2 as well as padding=1.
2. (30 points) The program can output the confidence scores correctly for images. You can take the sample images at SimpleCNNbyCPP web site to test.
3. (20 points) Optimize your implementation and introduce it in your report. Some comparisons, analysis and conclusions are welcome.
4. (5 points) The program is tested both on X86 and ARM. It can output the same results for the same inputs on the two platforms.
5. (5 points) Please host your source code at GitHub.com. you can just put a link in the report.
6. (20 points) The report is well organized, and **NOT** longer than 15 pages. It is fine to have ~10 pages. The font size should be ~10.

7. If you do not host your source code at GitHub.com, please upload your source with your report to the Blackboard system. You should upload your report to the Blackboard system whatever you host your code at GitHub.com or not.
8. Your total score will also be affected by your source code quality and report quality.

Rules:

1. Please submit your report before the deadline. After the deadline (even 1 second), 0 score!
2. Do not code your program unnecessarily complex. Simple is beautiful!
3. Please pay more attention to your code style. After all this is not ACM-ICPC contest. You have enough time to write code with both correct result and good code style. You will get deduction if your code style is terrible. You can read Google C++ Style Guide (http://google.github.io/styleguide/cppguide.html) or some other guide for code style.