CS231A: Computer Vision, From 3D Perception to 3D Reconstruction and beyond Homework #0

(Spring 2024) Due: **Tuesday, April 8**

On to the problems!

1 Basic Matrix/Vector Manipulation (20 points)

(e) Without using a loop, multiply each row of M element-wise by a. **Solution**: I simply multiply **M** to transpose **a** *shape* $= (3, 1)$ to use broadcast mechanism of numpy.

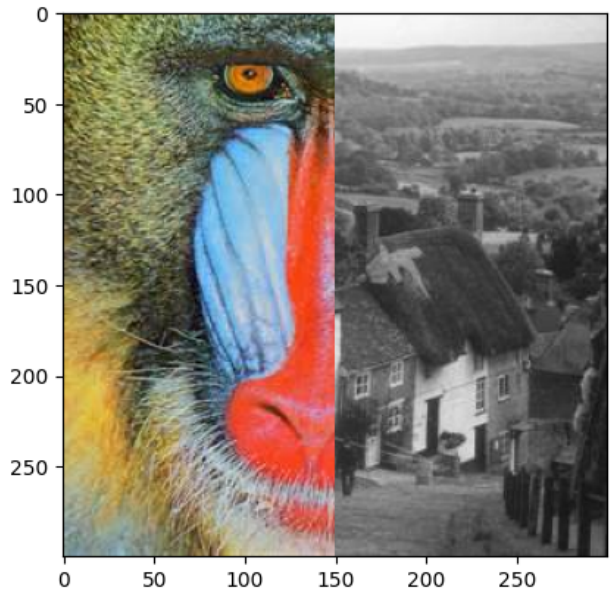
(f) Without using a loop, sort all of the values of the new M from (e) in increasing order and plot them in your report. **Solution**: Using `np.reshape` to flatten matrix and `np.sort`.

2 Basic Image Manipulations (40 points)

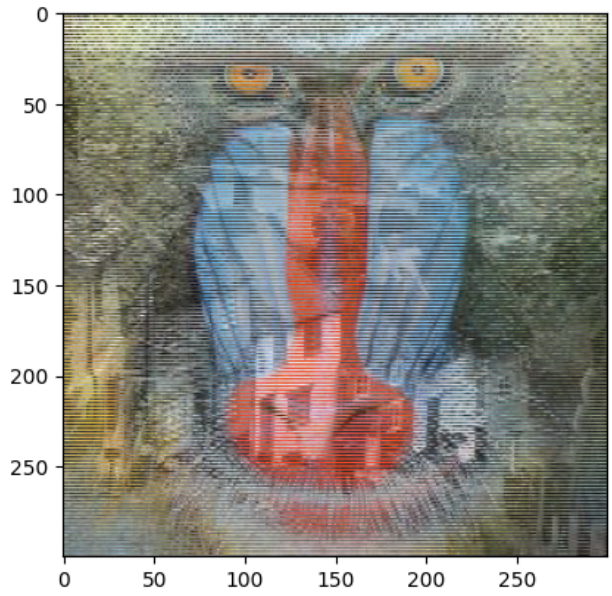
Do the following by filling out p2.py:

(c) Add the images together and re-normalize them to have minimum value 0 and maximum value 1. **Solution**: Divide by max value of image to strech from 0 to 1.

(d) Create a new image such that the left half of the image is the left half of image1 and the right half of the image is the right half of image2.

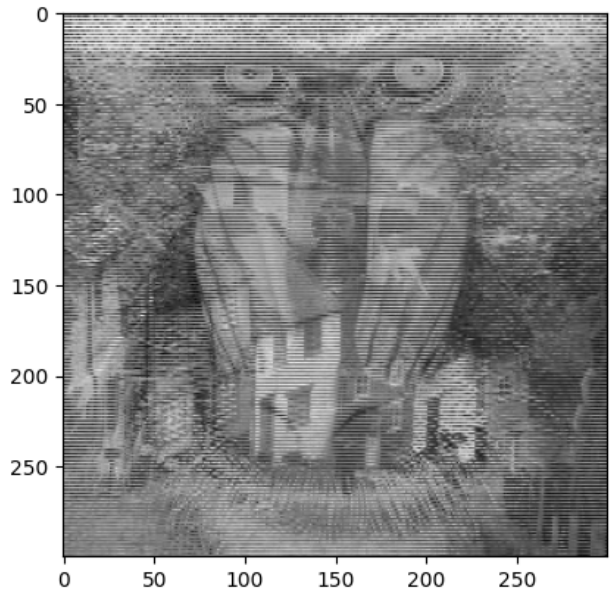


(e) Using a for loop, create a new image such that every odd numbered row is the corresponding row from image1 and the every even row is the corresponding row from image2 (Hint: Remember that indices start at 0 and not 1 in Python).



(f) Accomplish the same task as part e without using a for-loop (the functions reshape and tile may be helpful here). **Solution**: I use slicing with $step = 2$.

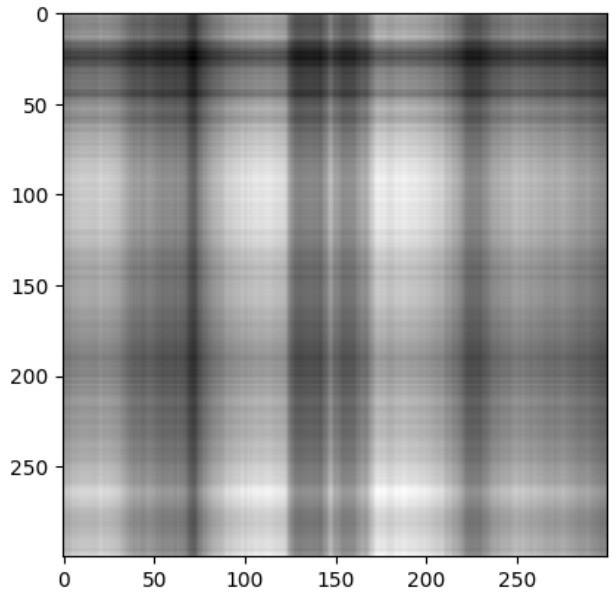
(g) Convert the result from part f to a grayscale image.



3 Singular Value Decomposition (40 points)

Do the following by filling out p3.py:

(b) **Save and Include the best rank 1 approximation of the (grayscale) image1 in your report.**



(c) **Save and Include the best rank 20 approximation of the (grayscale) image1 in your report.**