2.2

December 7, 2024

[ ]:
```
import numpy as np
from PIL import Image
import matplotlib.pyplot as plt

"""
    The function compressImage accepts 4 parameters:
        imageURI: The URI of the image to be compressed
        nMax: The maximum number of n do you want to reach
        nSpace: The number of n iterations to be skipped - if you want all n to␣
 ↪be shown, nSpace = 1
        This function will output in the plt.plot slot all of the images with␣
 ↪their perspective n, and for comparison, the orginal
        image will be shown at the top
"""


def compressImage(imageURI, nMin, nMax, nSpace):
    if nMin >= nMax:
        print("Please enter an nMin that is at least larger than nMax by␣
 ↪nSpace")
        return
    elif nMax <= 0 or nMin <= 0:
        print("Please enter an nMin or nMax that is larger than 0")
        return
    elif nSpace <= 0:
        print("Please enter an nSpace that is greater than 0")
        return
    else:
        # Open the image and converting it into grayscale
        image = Image.open(imageURI)
        imageGrayed = image.convert('LA')

        # For comparison purposes, the original image is shown
        plt.figure(figsize=(9, 6))
        plt.imshow(imageGrayed)
        plt.show()
```

```
        # Converting into a numpy array
        imageMatrix = np.array(list(imageGrayed.getdata(band=0)), float)
        imageMatrix.shape = (imageGrayed.size[1], imageGrayed.size[0])
        imageMatrix = np.matrix(imageMatrix)

        # Computing the SVD of the image
        U, S, Vt = np.linalg.svd(imageMatrix)

        # For doing iterations of increasingly n = recommend to space them out,␣
↪or they will crash - python does not
        # handle storing multiple plt.plot efficiently
        for i in range(nMin, nMax, nSpace):
            compressedImage = np.matrix(U[:, :i]) * np.diag(S[:i]) * np.
↪matrix(Vt[:i, :])
            plt.imshow(compressedImage, cmap='gray')
            title = "n = %s" % i
            plt.title(title)
            plt.show()


# Recommended settings:
compressImage("member1.png", 5, 51, 5)
```