Assignment-2: Cs215

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Q5

Instructions to run the code is given in the end

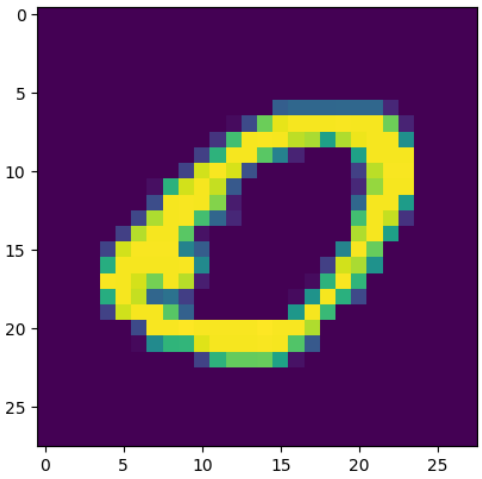
Reduction

The function reduction in the line 29 of q5.py is defined for converting the (784,1) image to (84,1) image. Idea is, there maybe 784 eigen values but their variance is very low in their respective eigen vectors, so consider the 84 eigen vectors corresponding to the descending order of 84 eigen values, these are the eigen values among whose direction the variance is high (spread is high), So the matrix newvariance in the line 48 takes the best 84 eigen vectors out of 784 eigen vectors and store their values in it. So, by multiplying the newvariance with the old image gives the new coordinates of (84,1).

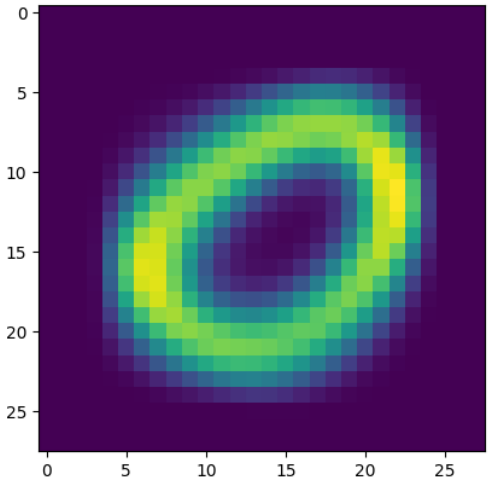
Reconstruction

Reconstruction can be done from the same logic as used in the above reduction, the function reconstruction in the line 43 does the reconstruction, again by multiplying the newvariance matrix with the (84,1) gives the (784,1) image. Since we have neglected some eigen vectors (i.e 784-84) the spread of the new image will be larger than the original images, the results directory contains two sets of images with the name formats “original_label{i}.png” and “reconstructed_label{i}.png” for each label. While reducing and reconstructing the images, the images are subtracted from the mean and is later added back after the reconstruction (just to convert the origin to the mean for my better understanding). Given are the original images and reconstructed images for each digit i

Label-0

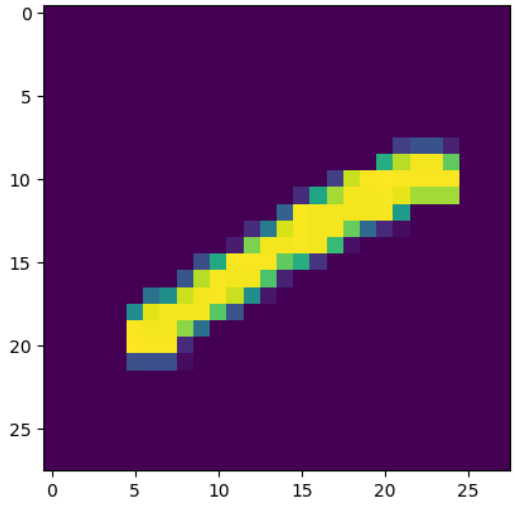


Original

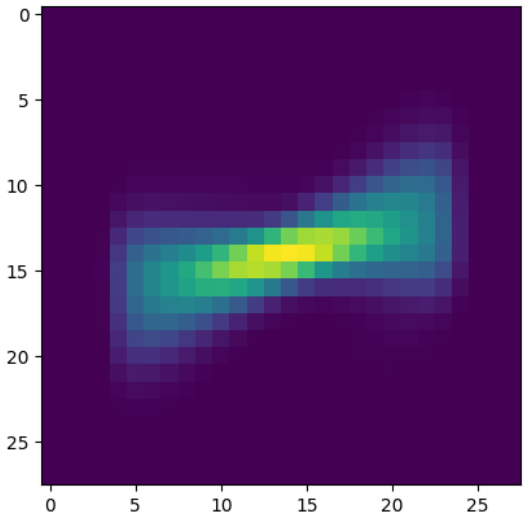


reconstructed

Label-1

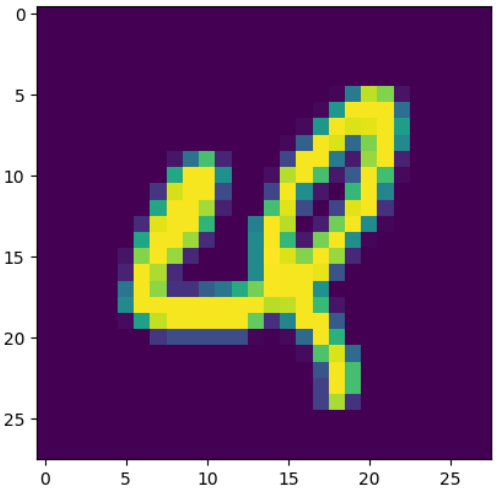


Original

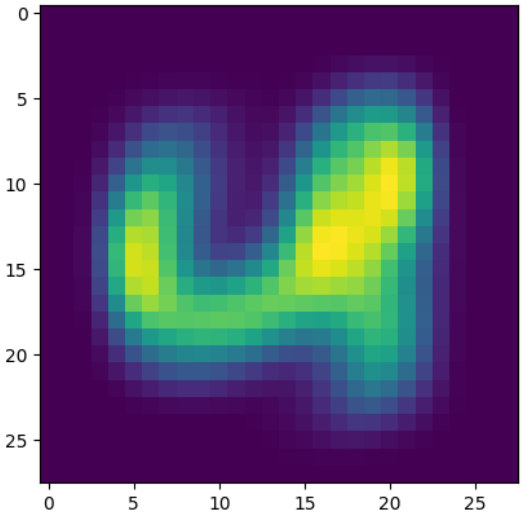


reconstructed

Label-2

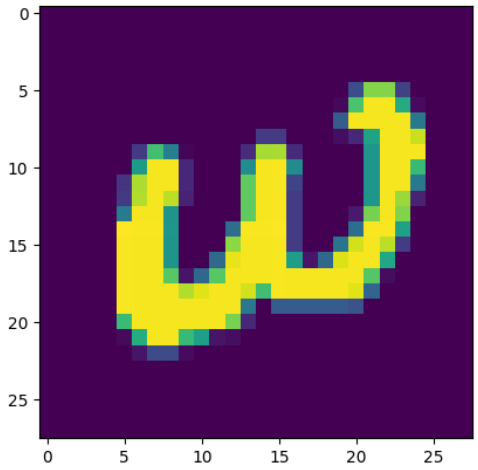


Original

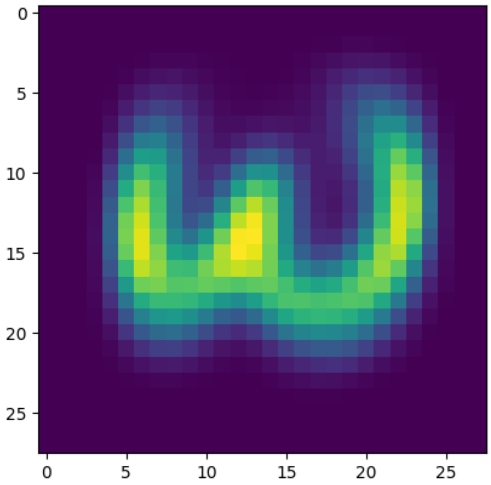


reconstructed

Label-3

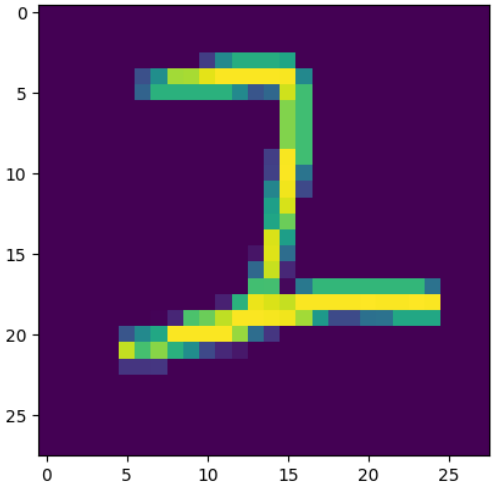


Original

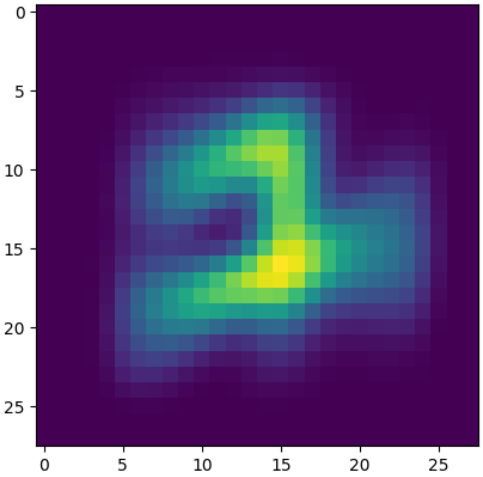


reconstructed

Label-4

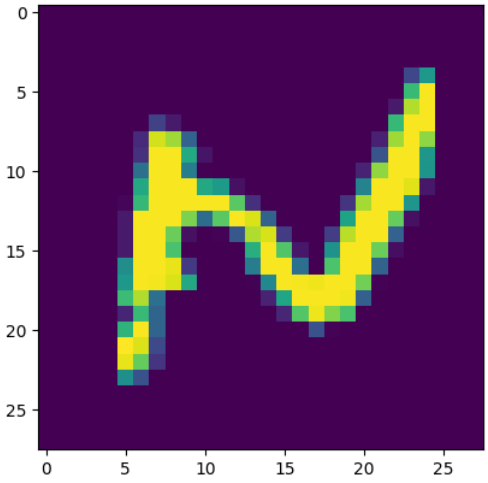


Original

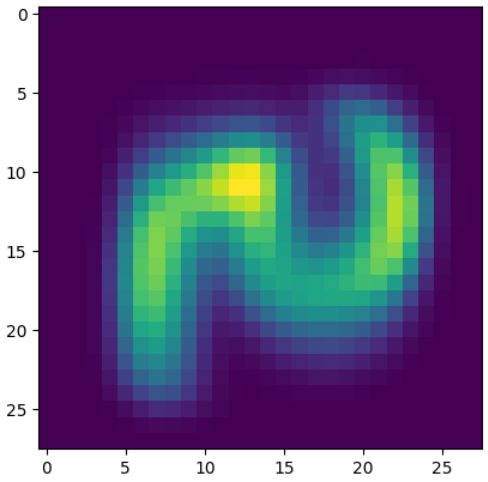


reconstructed

Label-5

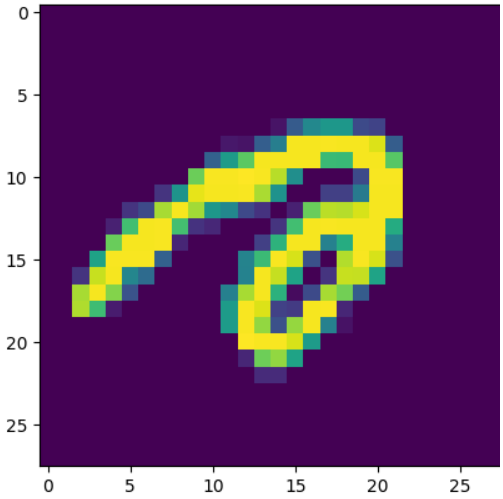


Original

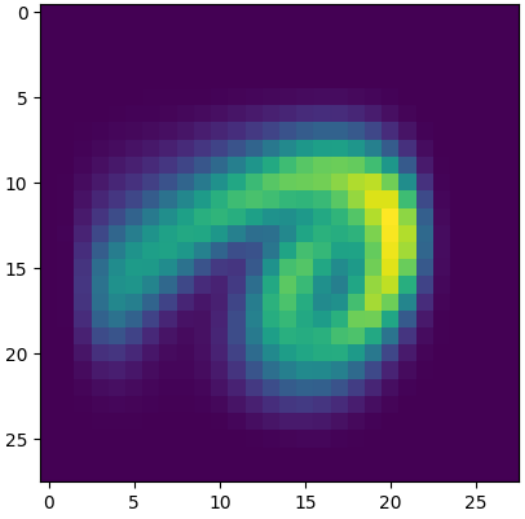


reconstructed

Label-6

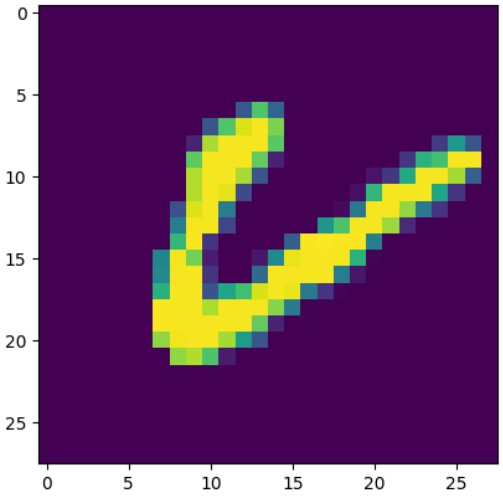


Original

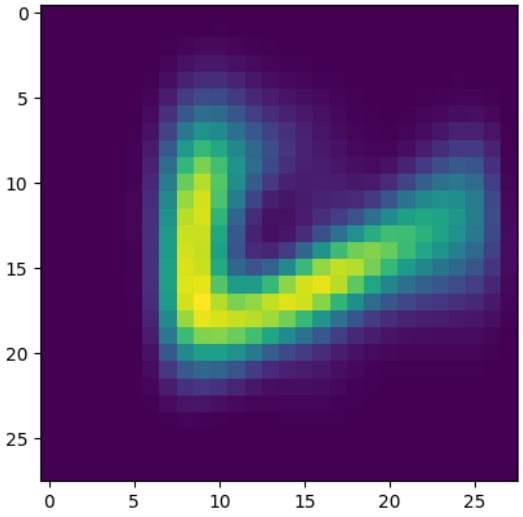


reconstructed

Label-7

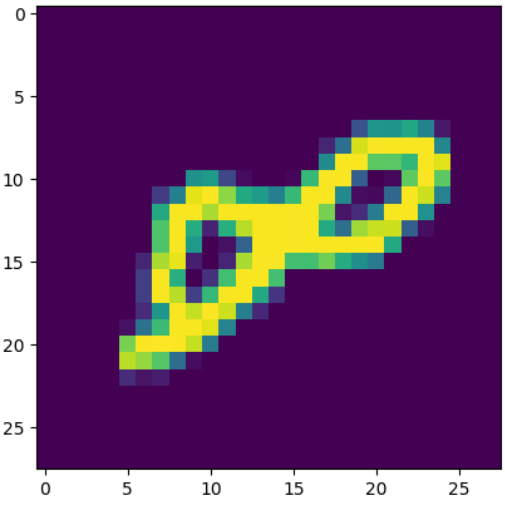


Original

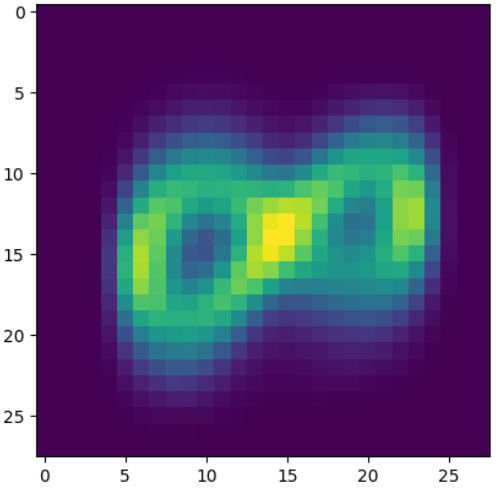


reconstructed

Label-8

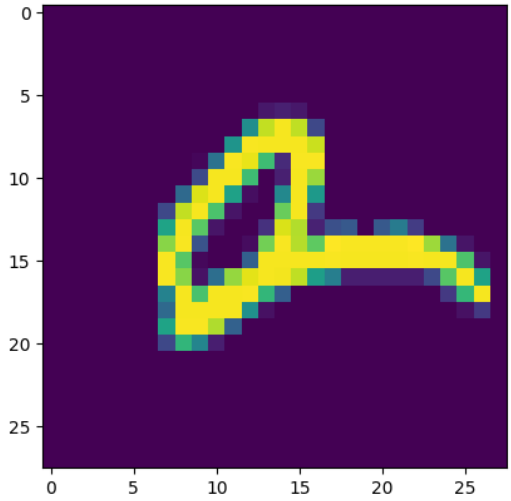


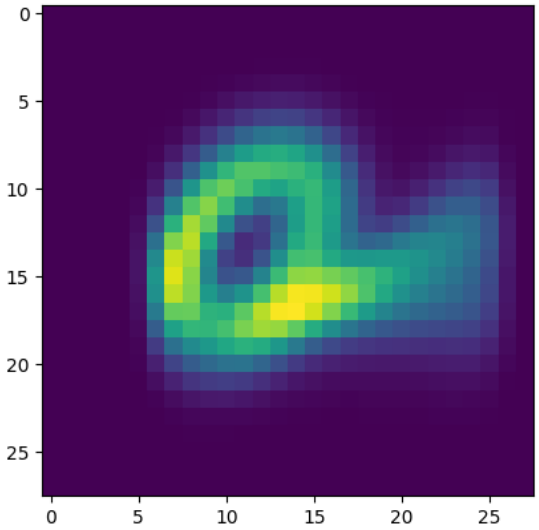
Original



reconstructed

Label-9





Original reconstructed

Above are the side-by-side images for each digit, left is the original image and right Is the reconstructed image, as excepted the reconstructed image is more spread (less boundaries sharpness).

Instructions to run the code :-

Please move to the Q5 directory and

- python3 ./code/q5.py will the run the python script q5.py and generate images of total of 20, i.e two for each label one is original and other is reconstructed image.