

Neural Network Home Work 3

Deadline: May 8 (Saturday), 2021

Problem (English Version):

1. Implement a SOM neural network with C or Matlab, and using this SOM neural network to realize the image compression process in the way as discussed in the class. The steps for realizing this process are as follows:

(1) Use the image "Lena.bmp" as the training image to train the SOM neural network. The training sample vectors are constructed with 3×3 sub-blocks of the image "Lena.bmp", with each one being a 9-dimension vector (i.e., $L=9$). The size of the Code book is $N_C=512$.

(2) Use Lena.bmp, CR.bmp, and HS4.bmp as testing images to test the trained SOM neural network, respectively. And use the testing results to reconstruct the corresponding 3 compressed images.

(3) Present your testing results, including the 3 compressed images (with the original image on the left side and the compressed result on the right side), the compression ratio, and the $PSNR_s$, for each compressed image.

* Note

Definition of $PSNR$:
$$PSNR = 10 \log_{10} \frac{255^2}{MSE},$$

where $MSE = \frac{1}{mn} \sum_j \sum_i [\hat{f}(i, j) - f(i, j)]^2$, $f(i, j)$ the original image and $\hat{f}(i, j)$ the corresponding compressed result.

神经网络 作业-3

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1. 试编程实现基于 SOM 网络的矢量量化方法，进行图像数据压缩。训练图像采用“Lena.bmp”图像，用 3×3 子块构成 9 维矢量进行训练，码本规模取 $N_C=512$ 。然后分别用 Lena.bmp、CR.bmp、HS4.bmp 三个图像进行检验。在解答中要求对所做内容作简要的说明，并分别给出原图像和压缩后的图像、图像压缩比、图像恢复峰值信噪比 ($PSNR$)。

(注：峰值信噪比定义为 $PSNR = 10 \log_{10} \frac{255^2}{MSE}$ ，

其中 $MSE = \frac{1}{mn} \sum_j \sum_i [\hat{f}(i, j) - f(i, j)]^2$)。