ECS795P Deep Learning and Computer Vision, 2020

Course Work 1: Image Super-resolution Using Deep Learning

1. Suppose the settings of a SRCNN as: f1=9, f2=3, f3=5, how many pixels of the low-resolution image are utilized to reconstruct a pixel of the high-resolution image with the SRCNN? (10% of CW1)
   (9+3-1+5-1) ^2 = 225 pixels

2. Why the deep convolutional model is superior to perform image super-resolution? Give one reason to explain it. (10%of CW1)
   The information exploited for reconstruction is comparatively larger than Image super-resolution---for example, using (5+5-1) ^2 = 81 pixels is smaller than using the information of (9+5-1) ^2 = 169 pixels by deep convolutional model. This is one of reasons SRCNN gives superior performance. More pixel are used compared to sparse coding. All channels at the same time. CNNs can deal with all three channels at the same time, unlike other current (for the time) models.

3. Please explain the physical meaning of peak signal-to-noise ratio (PSNR) in the context of image super-resolution. PS: place here the ground truth (GT) image, and the high-resolution images by SCRNN (HR-SRCNN) and bicubic interpolation (HR-BI) for reference. Also put the PSNR value below the high-resolution images. (10% of CW1)

   PSNR is the ratio between the maximum possible power of a signal and the power of corrupting noise that affects the fidelity of its representation. Because many signals have a very wide dynamic range, PSNR is usually expressed in terms of the logarithmic decibel scale.

   The PSNR (in dB) is defined as:

$$PSNR = 10 \cdot \log_{10} \left(\frac{MAX_I^2}{MSE} \right)$$

GT

HR-BI
(PSNR=20.497630173285614)

HR-SRCNN (PSNR=
21.77124828578912
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