ECS795P Deep Learning and Computer Vision, 2019

**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)

Total pixels = (f1 + f2 + f3 – (number\_of\_layers - 1)^2 = (9 + 3 + 5 – (3 - 1)^2 = 225

225 Pixels are used

1. Why the deep convolutional model is superior to perform image super-resolution? Give one reason to explain it. (10%of CW1)

The whole process is trained via back-propagation whereas previous models had only sought to optimise one part of the process. By using an end-to-end optimisation we are optimising the filters/feature extraction, the non-linear mapping AND the recombination of the hi-res patches.

1. 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)

Peak Signal to Noise Ratio (PSNR) is a measure of the noise introduced in the super-resolution process. As the name suggests it is giving a measure of the maximum signal divided by the noise. It compares the ground truth image to the output of the SRCNN. A higher PSNR indicates an output more similar to the ground truth. PSNR can be calculated using Minimum Square Error (MSE) and the maximum pixel value (e.g. 255 for 8 bits per pixel)

PSNR = 10 log10(MAX2/MSE)

Therefore minimising MSE should maximise PSNR.

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| GT |
| HR-BI (PSNR=20.5) |
| HR-SRCNN (PSNR=21.8) |