ECS795P Deep Learning and Computer Vision, 2020

Coursework 1: Image Super-resolution Using Deep Learning

1. With the given parameters: f1=9, f2=3, f3=5,
   (f1 + f2 - 1 + f3 - 1)^2 = (9 + 3 - 1 + 5 - 1)^2 = (15)^2 = **225**
   225 pixels of LR image are needed to reconstruct a pixel of SR image.

2. One of the most common techniques for SR is interpolation. It is simple to implement but does not preserve the details or the sharp edges properly. Most commonly used interpolation methods produce blurry images. Example based methods or the sparse coding methods involve lots of steps, many of which cannot be optimized. Deep learning provides a fast and more efficient model for SR. SRCNN, the first deep learning model, outperforms the traditional methods and uses only 3 convolutional layers. Patch extraction and representation, non-linear mapping, and reconstruction. It provides end-to-end mapping between LR and HR images and also requires less pre and post processing of input and output images as the patch extraction and aggregation is done in the hidden neural network layers. That is why deep learning is superior for image super-resolution problems.

3. Peak Signal to Noise Ratio(PSNR) measures the deviation between the generated high-resolution image to the original image. For image super-resolution, PSNR is the ratio of maximum possible pixel value of the image (signal strength) to maximum mean squared error (MSE) between the original image and its estimated version (noise strength), expressed in logarithmic scale.

Ground Truth Image (GT):

HR-BI (PSNR=20.453967418499577)

HR-SRCNN (PSNR=21.77124828578912)