

**SUBJECT: Deep Learning and Computer Vision**

**SUBJECT CODE: ECS795P**

**Course Work 1: Image Super-resolution Using  
Deep Learning**

**NAME: Ganesh Kumaran Masilamani**

**STUDENT NO: 200434339**

1. Suppose the settings of a SRCNN as:  $f_1=9$ ,  $f_2=3$ ,  $f_3=5$ , 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)

**GIVEN:**

$$f_1=9$$

$$f_2=3$$

$$f_3=5$$

**TO FIND:**

Number of pixels of low resolution image used to reconstruct a pixel in high resolution image with SRCNN

**FORMULAE USED:**

$$\text{Pixels used for reconstruction} = (f_1 + (f_2 - 1) + (f_3 - 1))^2$$

**SOLUTION:**

$$\begin{aligned}\text{Pixels used for reconstruction} &= (9 + (3 - 1) + (5 - 1))^2 \\ &= (9 + 2 + 4)^2 \\ &= (15)^2 \\ &= 225 \text{ pixels}\end{aligned}$$

**INFERENCE:**

Number of pixels of low resolution image used to reconstruct a pixel in high resolution image with SRCNN is **225 pixels**.

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

Image super-resolution would be the best to be performed in deep convolutional model because of the following characteristics,

- Deep convolutional model produces high accuracy as compared to recurrent or normal neural networks.
- This model had the ability to learn the end-end mapping between Low resolution image and High resolution image directly with small preprocessing (or) postprocessing on images are performed on optimization.

**REASON:**

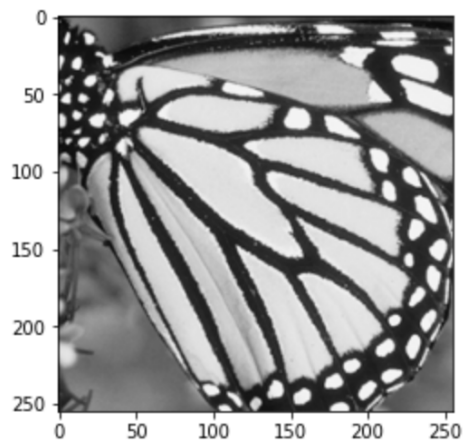
Convolutional neural network(CNN) is applied for Natural image noise reduction and Removing Noisy patterns. These mostly depends on denoising. This method is to embed the super resolution pipeline with the Autoencoder network under internal Notion based approach.

Whereas, Deep convolutional network optimizes end-end mapping. This type of network has high processing speed, and also gives the better accuracy in comparison to other models. It has only 3 convolutional layer and each has its own activation function which makes the model to be much useful practically.

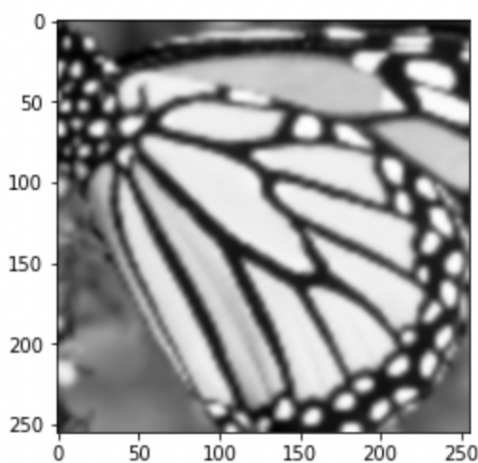
3. Please explain the physical meaning of peak signal-to-noise ratio (PSNR) in the context of image super-resolution. PS: place here the ground truth (GT) image, and the high-resolution images by SRCNN (HR-SRCNN) and bicubic interpolation (HR-BI) for reference. Also put the PSNR value below the high-resolution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

- It is used to calculate the Peak signal-to-noise-ratio between two images.
- It is the ratio between the maximum power of a signal and Maximum power of distorting noise
- Higher the Peak signal-to-noise-ratio(PSNR) better the quality of the reconstructed image. Whereas lower the PSNR higher the error and lower the quality of the image.
- It is measured in Decibels (i.e, unit of PSNR is decibels).

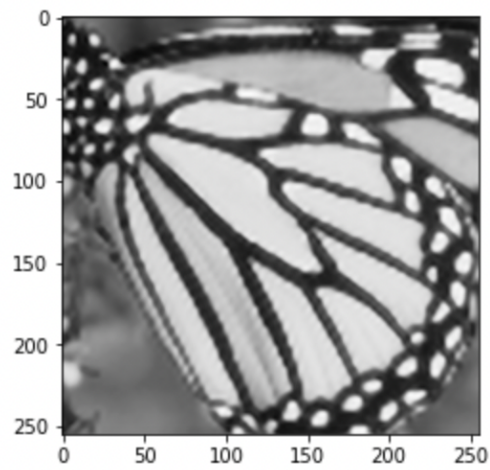
**Groundtruth image**



**High resolution image with BI**



### High resolution image with SRCNN



### PSNR of HR-BI

➡ PSNR of high resolution image with BI  
20.497630181368823

### PSNR of HR-SRCNN

➡ PSNR of high resolution image with SRCNN  
22.92269643922954