

LP-VI Image Processing (2023-24)	
Experiment 1: Consider any image with size 1024*1024. Modify the image to the sizes 512*512, 256*256, 128*128, 64*64 and 32*32 using subsampling technique. Create the original image from all the above subsampled images using resampling technique	
Student Name:	Roll No. :
Batch:	Division :

Title: Implement Subsampling and Resampling Technique.

Aim: Implementation of Subsampling and Resampling Technique.

Prerequisites: Interpolation Techniques.

Theory:

Subsampling:

The subsample algorithm in MIPAV allows you to reduce an image in size by a factor of 2, 4, or 8 times. Each pixel of the subsampled image is a Gaussian-weighted average of the original image's 8 neighboring pixels for 2D images or 26 neighboring voxels for 3D images. For example, subsampling a 2D image with the x and y dimensions of 256×256 , respectively, by a factor of 2 produces a new image with x and y dimensions of 128×128 , respectively.

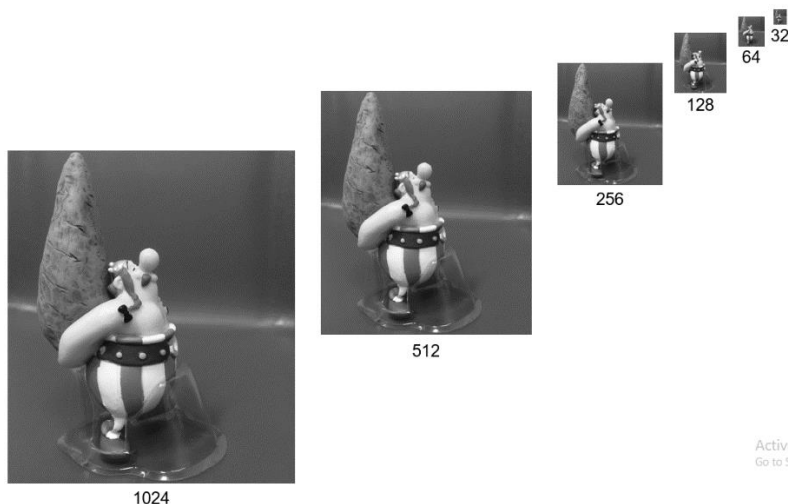


Figure 1: Sub-sampling of Image

The key idea in image sub-sampling is to throw away every other row and column to create a half-size image. When the sampling rate gets too low, we are not able to capture the details in the image anymore.

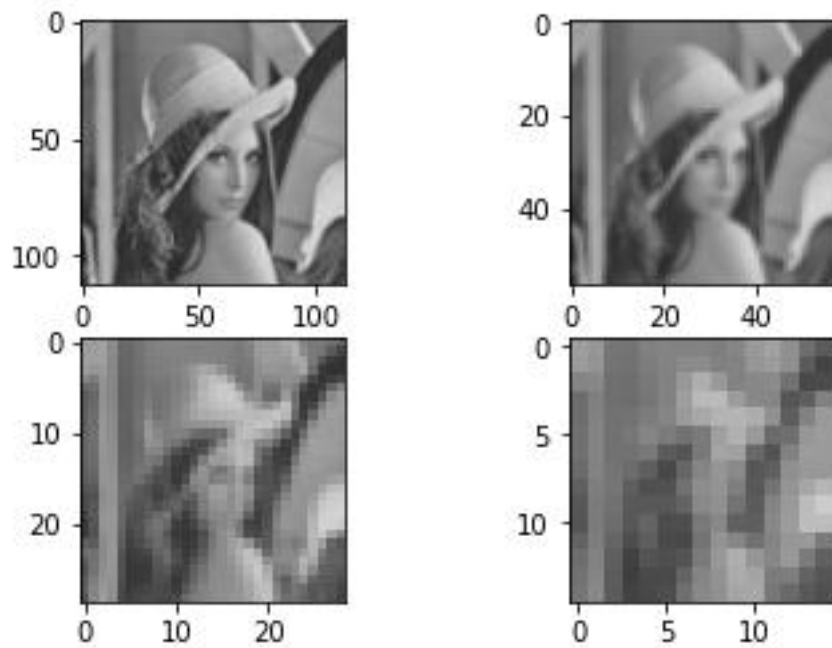


Figure 2: Sub-sampled Leena Image

Resampling:

Image resampling refers to the scaling of images. Scaling comes in handy in many image processing as well as machine learning applications. It helps in reducing the number of pixels from an image and that has several advantages e.g. It can reduce the time of training of a neural network as the more the number of pixels in an image more is the number of input nodes that in turn increases the complexity of the model.

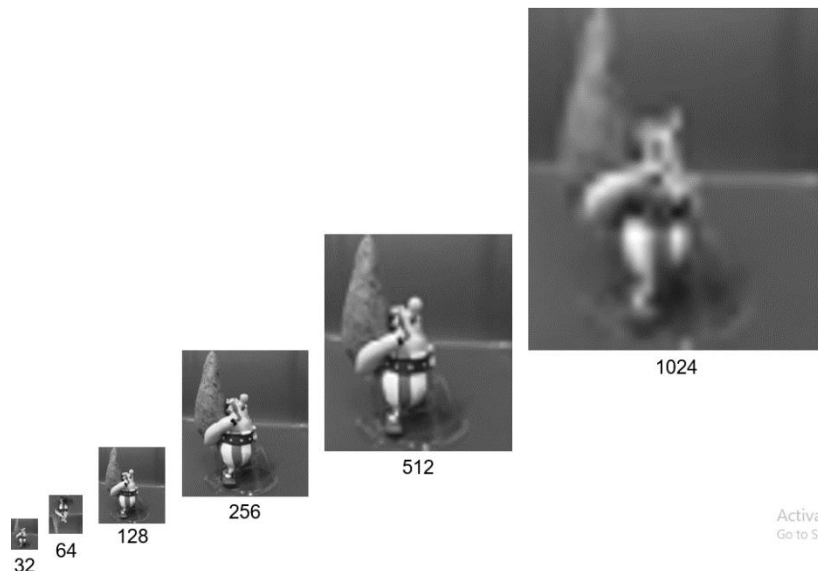


Figure 3: Resampled of Image

It also helps in zooming in on images. Many times we need to resize the image i.e. either shrink it or scale it up to meet the size requirements. OpenCV provides us several interpolation methods for resizing an image.

Choice of Interpolation Method for Resampling:

- `cv2.INTER_AREA`: This is used when we need to shrink an image.
- `cv2.INTER_CUBIC`: This is slow but more efficient.
- `cv2.INTER_LINEAR`: This is primarily used when zooming is required. This is the default interpolation technique in OpenCV.

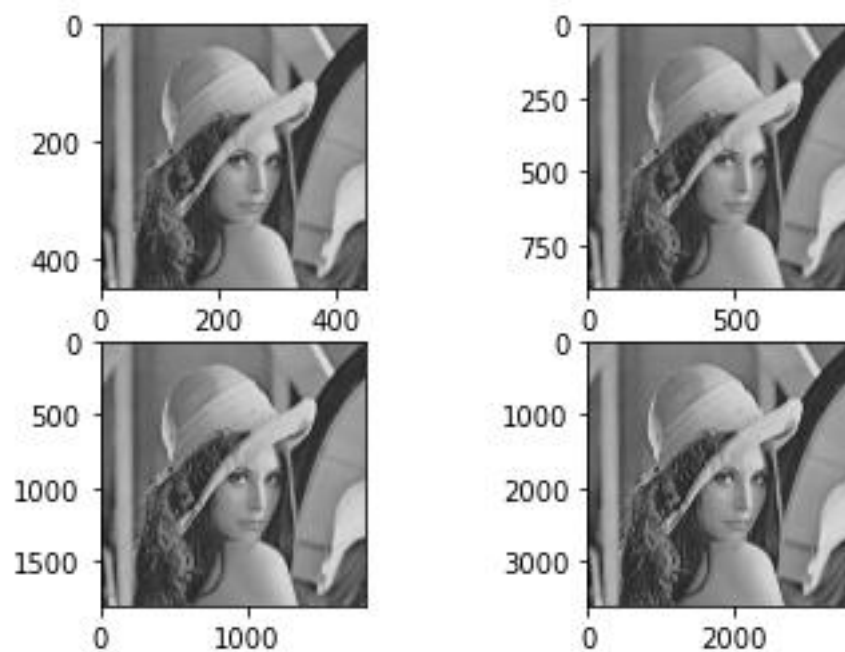


Figure 4: Resampling Leena Image

Conclusion: We have implemented Sub-sampling and Resampling Techniques on an image.

Questions:

1. What is Sub-sampling?
2. What is Interpolation?
3. Explain Bicubic Interpolation?
4. Explain `resize()` function?
5. What is `pyrUp()` and `pyrDown()`?