# Basic Image Processing

Assignment 1

# Instructions

- You have to submit the assignment till Nov 16
- Grading will be viva based
- Use Python for this assignment. Using of in-built functions is not allowed

# Read and Write Images

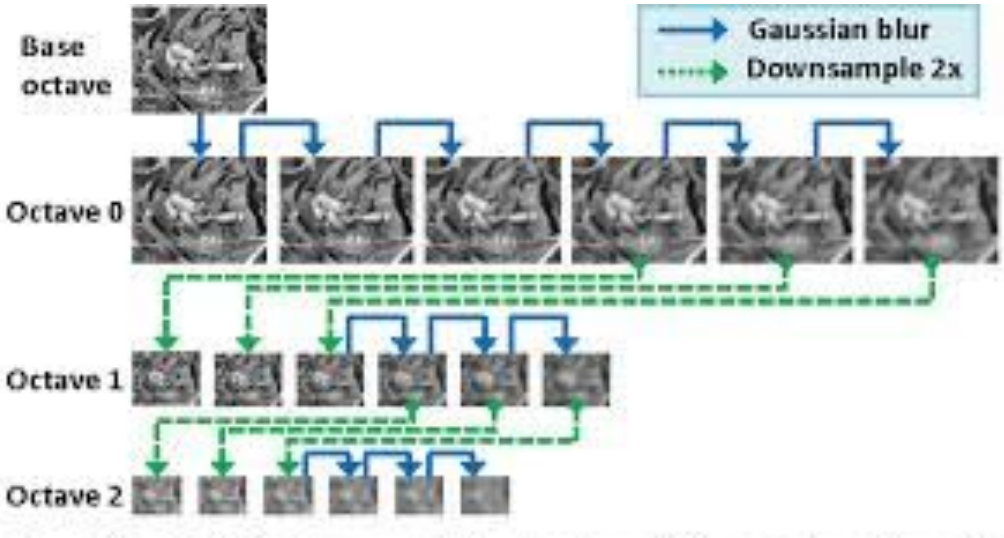
- You will be provided with a folder containing images, text files and subfolders.
- Read all the jpg images
- Resize the images to 224x224
- Save the images in the png format in a folder called justJpg

# Display Matching Items in Two Images

- Take any image pair
- Find the pixel coordinates of a same content in two images
- Plot both images  and draw the line between the corresponding image items
- Example is given below

# Generating Image pyramid

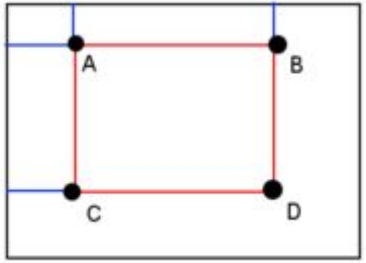
- Given an image, apply gaussian filter on the image using different sigma values
- Downsample the image into half
- Repeat step 1 with small sigma
- Repeat Step 2 3x times
- Example is shown on the right



# Integral Image

$$I(x,y) = \sum_{\substack{x' \le x \\ y' \le y}} i(x',y')$$

$$I(x,y) = i(x,y) + I(x,y-1) + I(x-1,y) - I(x-1,y-1)$$




Sum = D - B - C + A

1.

| | | | | | |
|---|---|---|---|---|---|
| 31 | 2 | 4 | 33 | 5 | 36 |
| 12 | 26 | 9 | 10 | 29 | 25 |
| 13 | 17 | 21 | 22 | 20 | 18 |
| 24 | 23 | 15 | 16 | 14 | 19 |
| 30 | 8 | 28 | 27 | 11 | 7 |
| 1 | 35 | 34 | 3 | 32 | 6 |

2.

| | | | | | |
|---|---|---|---|---|---|
| 31 | 33 | 37 | 70 | 75 | 111 |
| 43 | 71 | 84 | 127 | 161 | 222 |
| 56 | 101 | 135 | 200 | 254 | 333 |
| 80 | 148 | 197 | 278 | 346 | 444 |
| 110 | 186 | 263 | 371 | 450 | 555 |
| 111 | 222 | 333 | 444 | 555 | 666 |

15 + 16 + 14 + 28 + 27 + 11 =
101 + 450 − 254 − 186 = 111

**A=($x_0$, $y_0$), B=($x_1$, $y_0$), C=($x_0$, $y_1$) and D=($x_1$, $y_1$)**

$$\sum_{\substack{x_0 < x \le x_1 \\ y_0 < y \le y_1}} i(x,y) = I(D) + I(A) - I(B) - I(C)$$

https://en.wikipedia.org/wiki/Summed-area_table

# Converting Array into Image

- Create Numpy array
- Add values
- Convert Array into Image
- Sample Image is shown

```
octave:4> dumIM= zeros(4,4,3)
dumIM =

ans(:,:,1) =

   0   0   0   0
   0   0   0   0
   0   0   0   0
   0   0   0   0

ans(:,:,2) =

   0   0   0   0
   0   0   0   0
   0   0   0   0
   0   0   0   0

ans(:,:,3) =

   0   0   0   0
   0   0   0   0
   0   0   0   0
   0   0   0   0
```

```
octave:9> dumIM(1:2,1:2,1)= 255;
octave:10> dumIM(1:2,3:4,2)= 255;
octave:11> imshow(dumIM)
```