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Digital Image Processing

Convolution and Correlation
Using Numpy and cv2

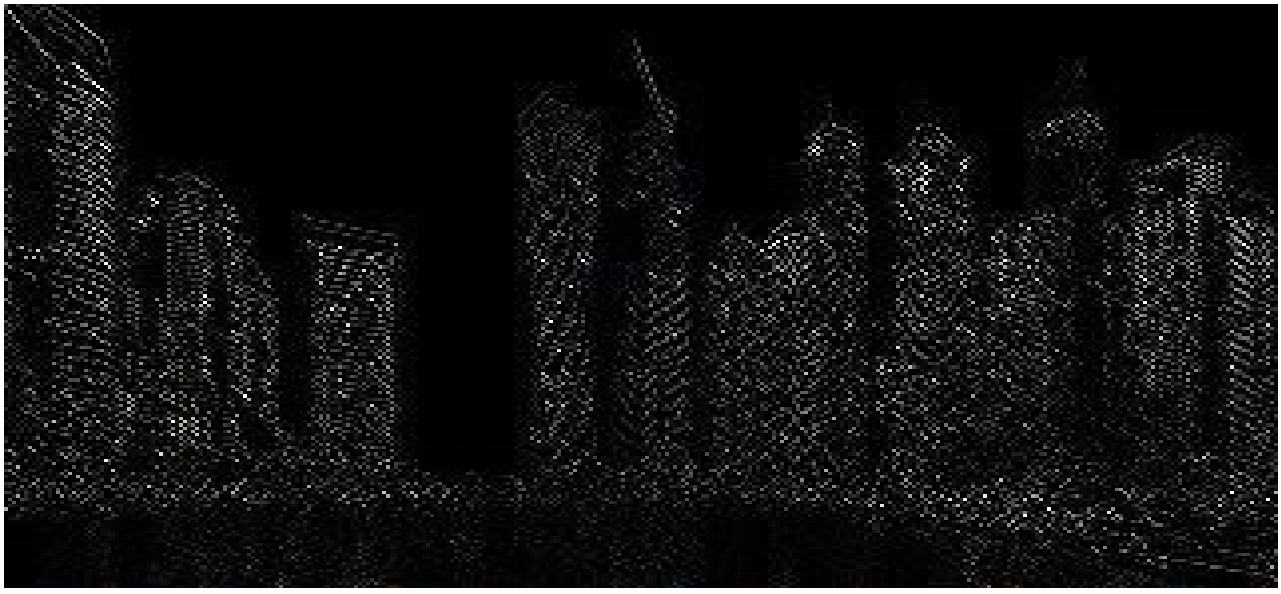
Introduction

Convolution and correlation in image processing are similar operations in digital image processing. In both these operations we pass a filter, usually smaller in size than the input image, over the input image and take the sum of the corresponding input pixels weighted by the kernel pixels. The two processes are almost the same, but the kernel is flipped along both the axes before convolving.

Convolution or Correlation can be used to accomplish tasks such as smoothing (blurring), sharpening(highlight sharp transitions), edge detection, etc

Input Image

Edge Filter



Sharp Filter

Filters used:

1) Edge filter : `[[ 0, -1 ,0] ,[-1, 4 ,-1], [ 0, -1 ,0]]`
2) Sharp filter : `[[1, 0, -1], [-1, 5, -1], [ 0, -1 ,0]]`

References:

1) Quora thread for what is image convolution
2) Deep Learning specialisation by Andrew NG