

CS354

Nathan Sprague

March 19, 2015

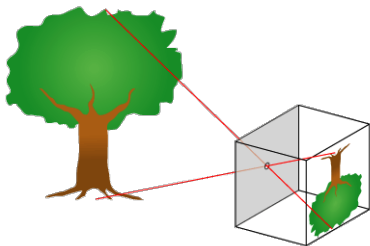
Computer Vision and Image Processing

- Computer Vision:
 - Working backward from an image of a scene to a physical description of the scene.
 - It's a hard/impossible problem.

Computer Vision and Image Processing

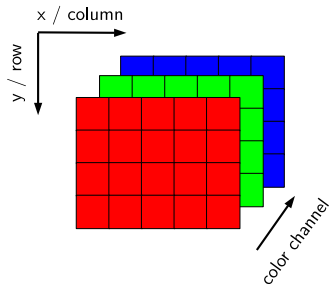
- Computer Vision:
 - Working backward from an image of a scene to a physical description of the scene.
 - It's a hard/impossible problem.
- Image processing:
 - Low level image transformations
 - blurring, sharpening, resizing etc.
 - Computer vision generally involves some initial image processing.

Image Formation



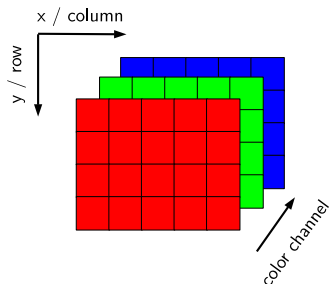
<http://commons.wikimedia.org/wiki/File:Pinhole-camera.png>

Image Representations



- Color images are often stored as a collection of RGB triples
- (0, 0, 0) is black, (255, 255, 255) is white.
- **RGB Color Model**

Images In Numpy



- We will work with images stored as three dimensional numpy arrays:
 - `img[row, col, color]`
- `img[0, 0, 0]` - Upper-left red value
- `img[3, 4, 2]` - Lower-right blue value
- `img[0:1, 0:2, :]` - Crop of upper left corner

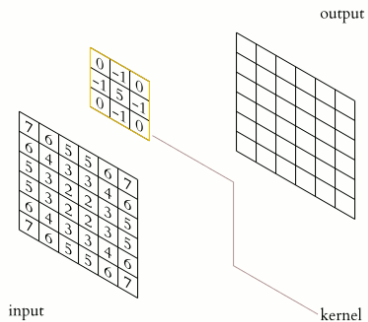
Why is Computer Vision Hard?

- Let's look at some balloons...

Image Processing - Convolutions

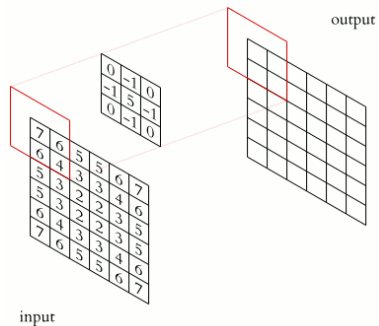
- Many low-level image processing tasks can be handled with the convolution operator:
 - Image Convolutions

Image Processing - Convolution Example



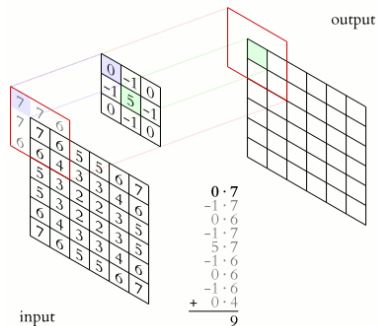
http://upload.wikimedia.org/wikipedia/commons/4/4f/3D_Convolution_Animation.gif
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Image Processing - Convolution Example



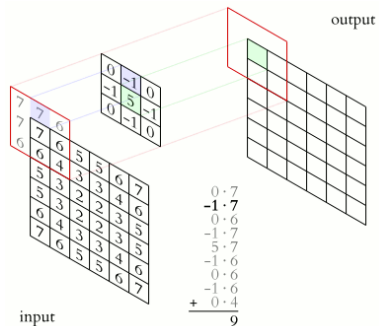
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Image Processing - Convolution Example



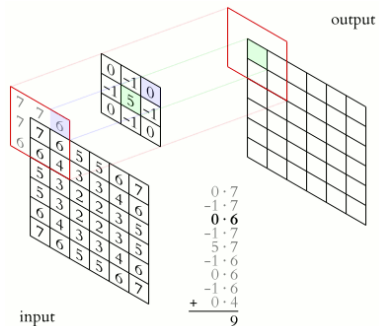
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Image Processing - Convolution Example



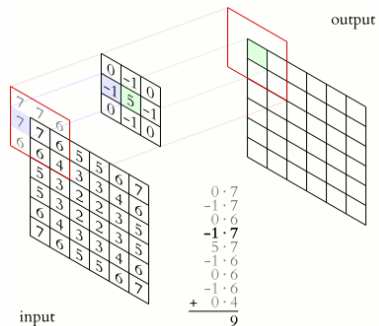
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Image Processing - Convolution Example



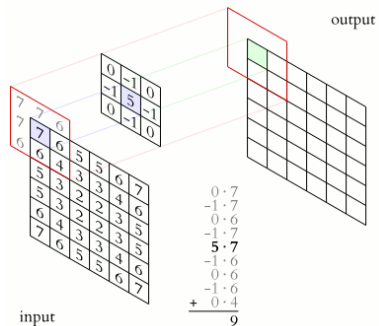
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Image Processing - Convolution Example



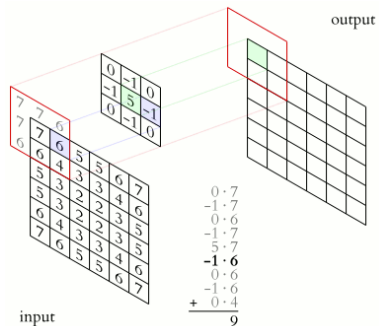
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Image Processing - Convolution Example



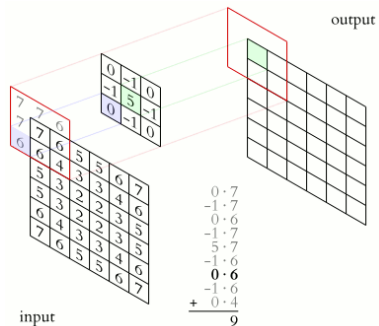
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Image Processing - Convolution Example



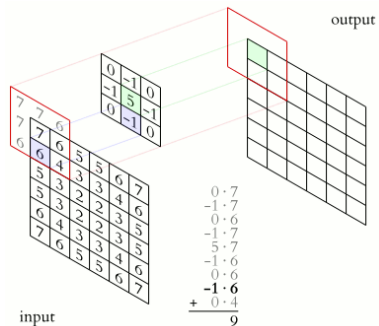
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Image Processing - Convolution Example



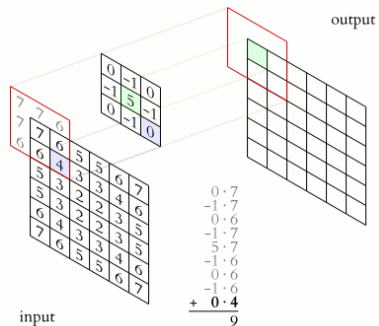
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Image Processing - Convolution Example



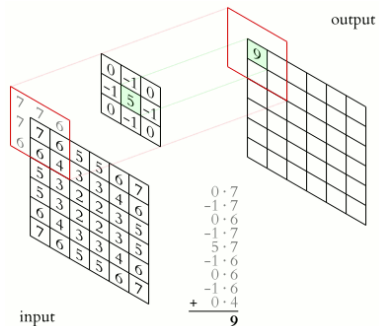
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Image Processing - Convolution Example



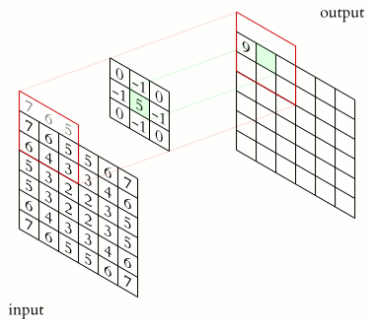
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Image Processing - Convolution Example



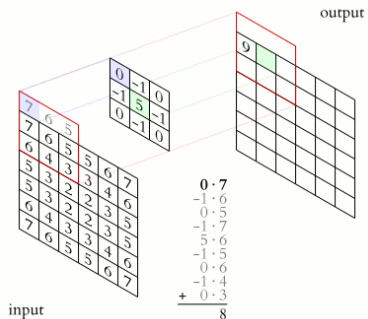
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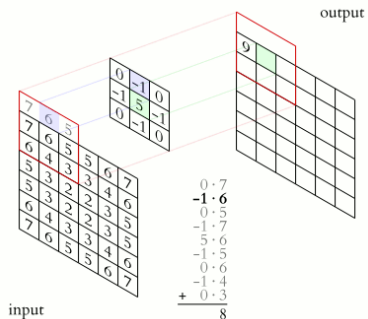
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Image Processing - Convolution Example



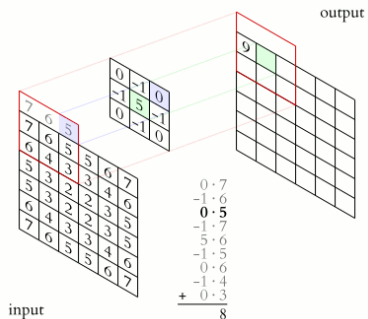
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Image Processing - Convolution Example



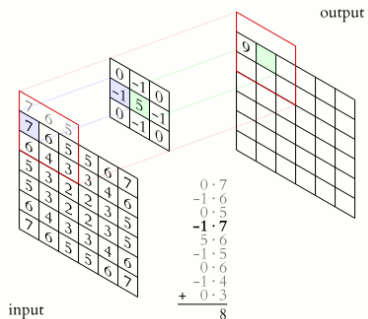
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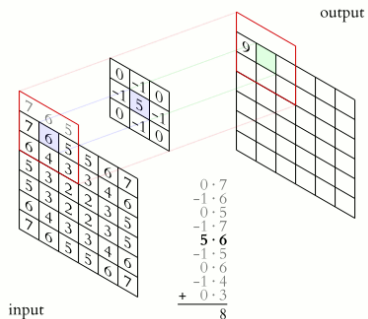
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Image Processing - Convolution Example



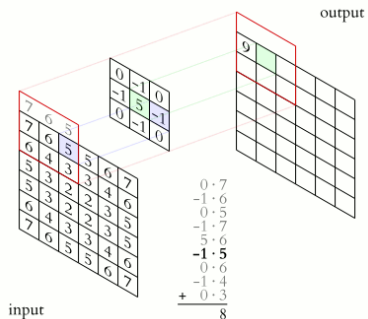
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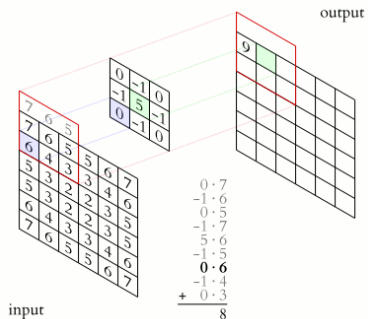
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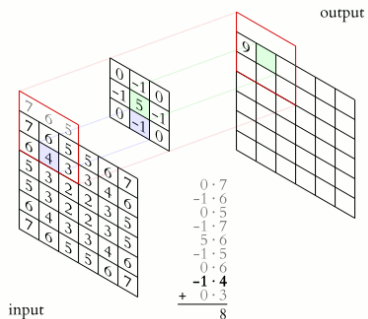
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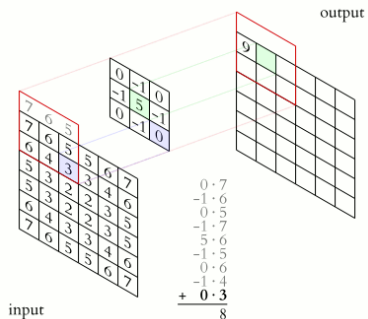
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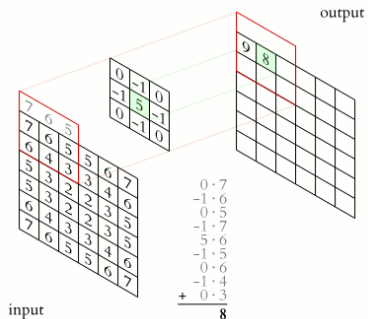
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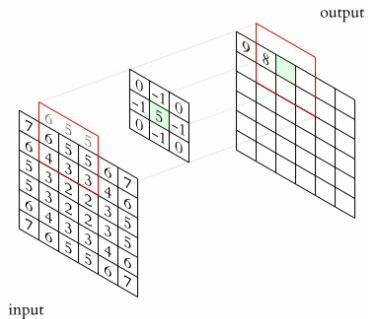
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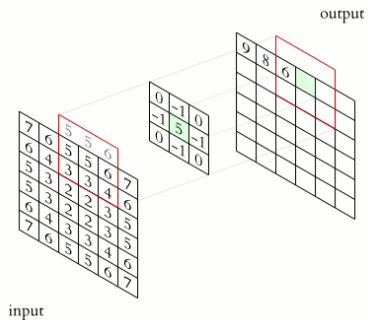
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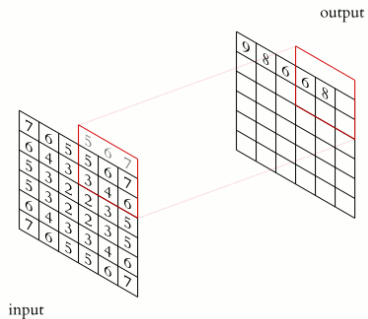
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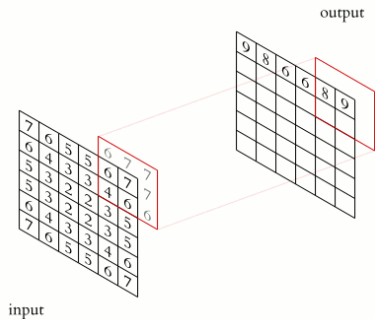
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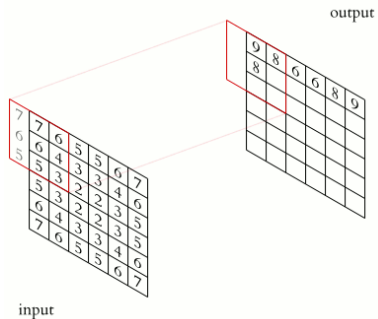
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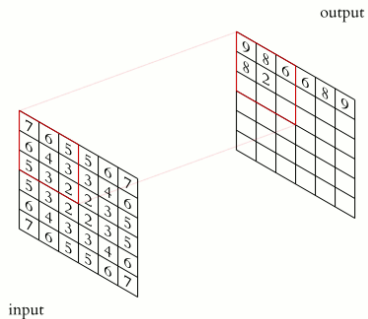
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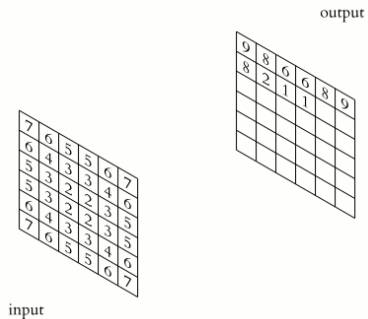
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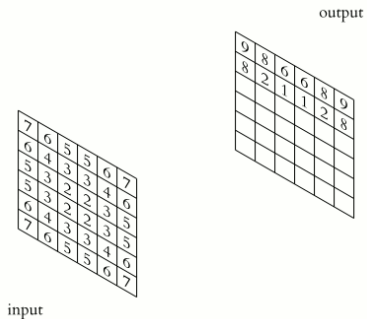
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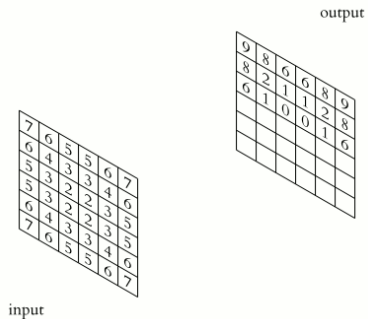
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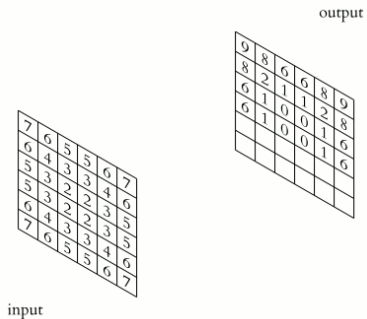
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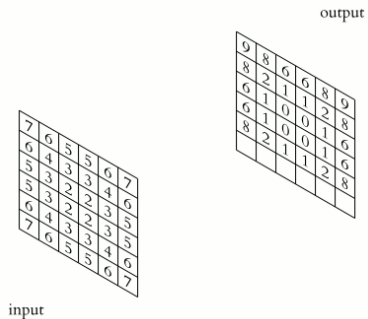
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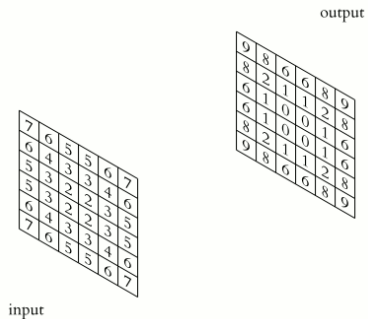
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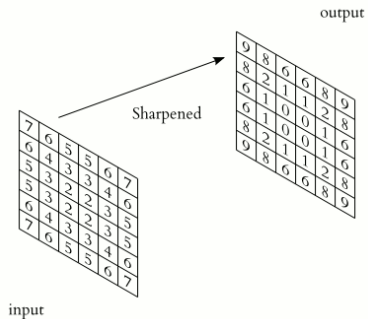
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