TRAINING SESSION ON CONVOLUTIONAL NEURAL NETWORK

Presented by:

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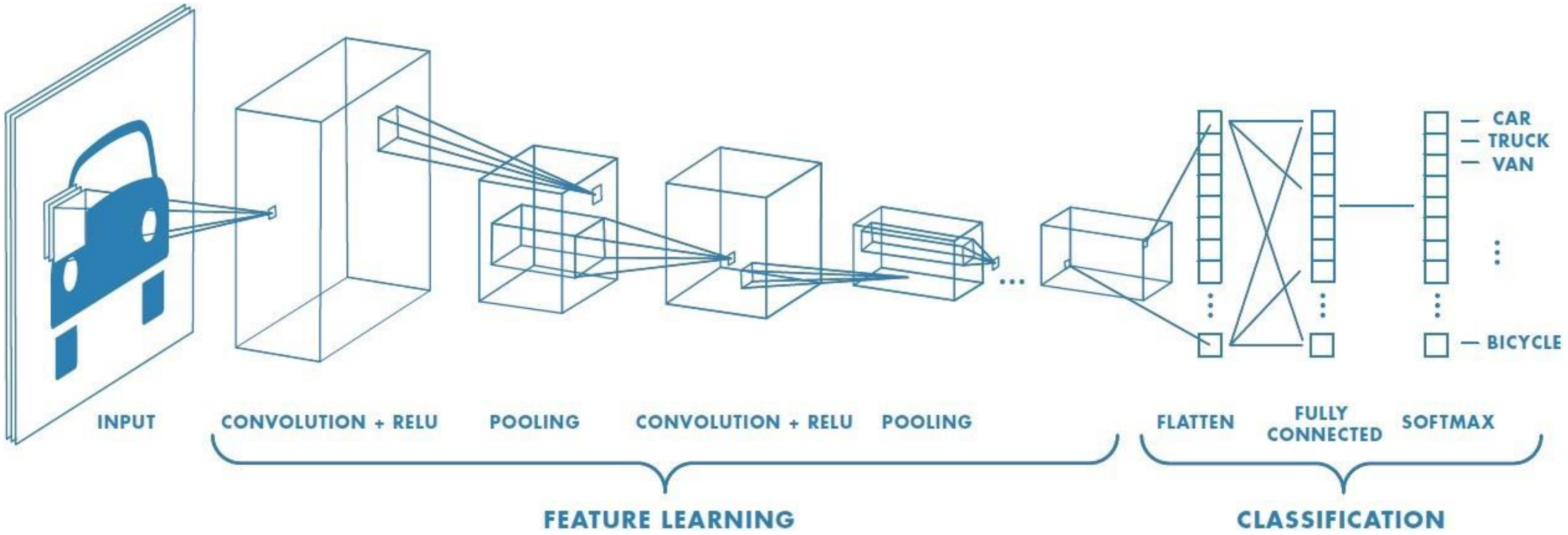
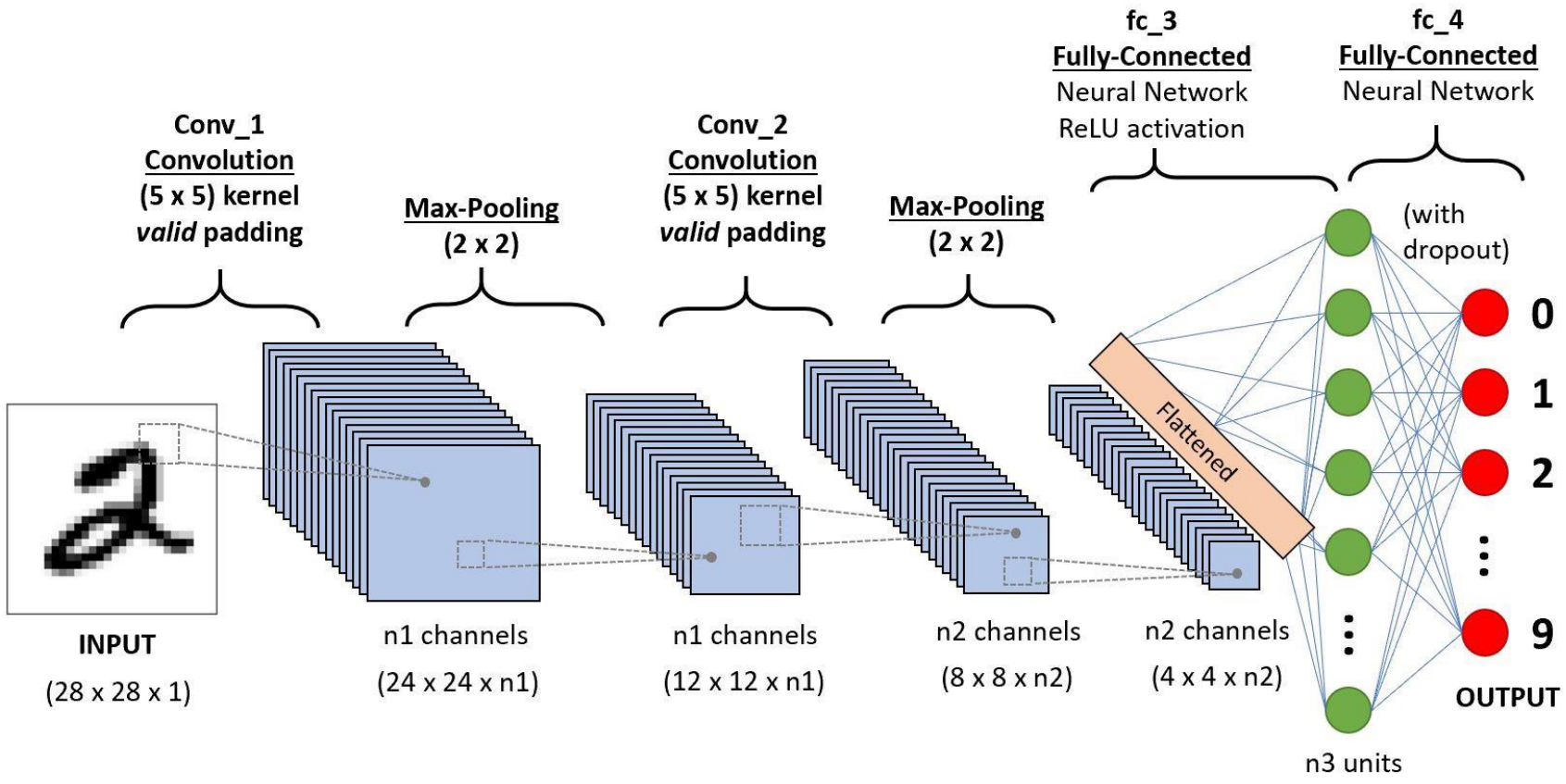
Introducing Convolutional Neural Networks



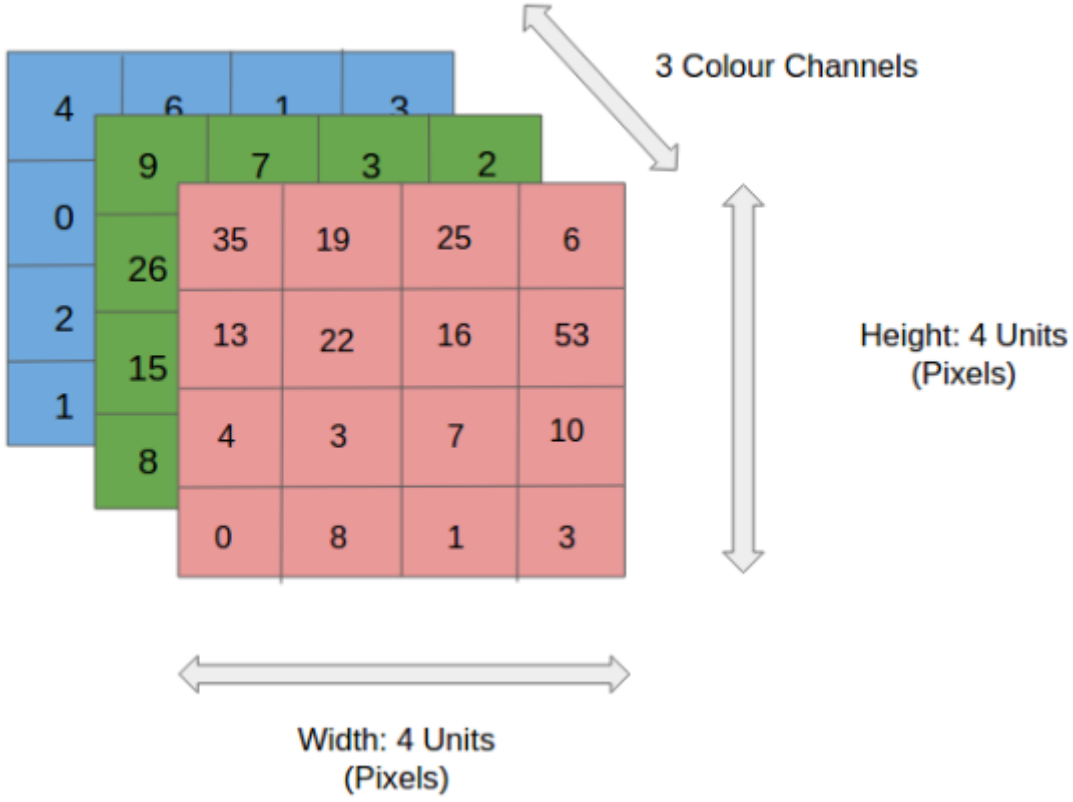
Introducing Convolutional Neural Networks



Introducing Convolutional Neural Networks

- preserve the spatial structure of the problem
- by learning internal feature representations using small squares of input data
- specifically designed to process pixel data.
- Convolutional layers learn local patterns using filters/kernels
- They are translation invariant
- They learn spatial hierarchies
- Input and output is a tensor called feature map

Image Data


3 Colour Channels
4
6
1
3
9
7
3
2
0
35
19
25
6
26
2
13
22
16
53
15
1
4
3
7
10
8
0
8
1
3
Height: 4 Units
(Pixels)
Width: 4 Units
(Pixels)

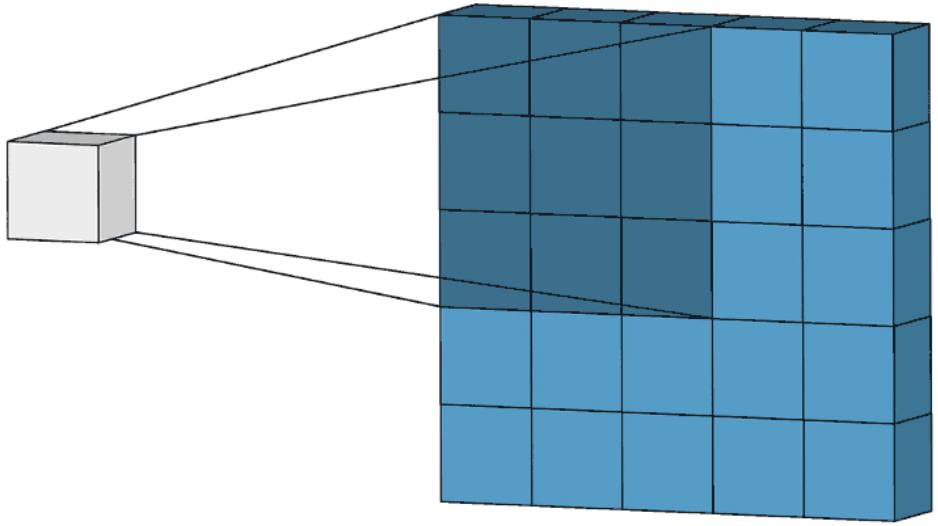
Building Blocks Of a CNN

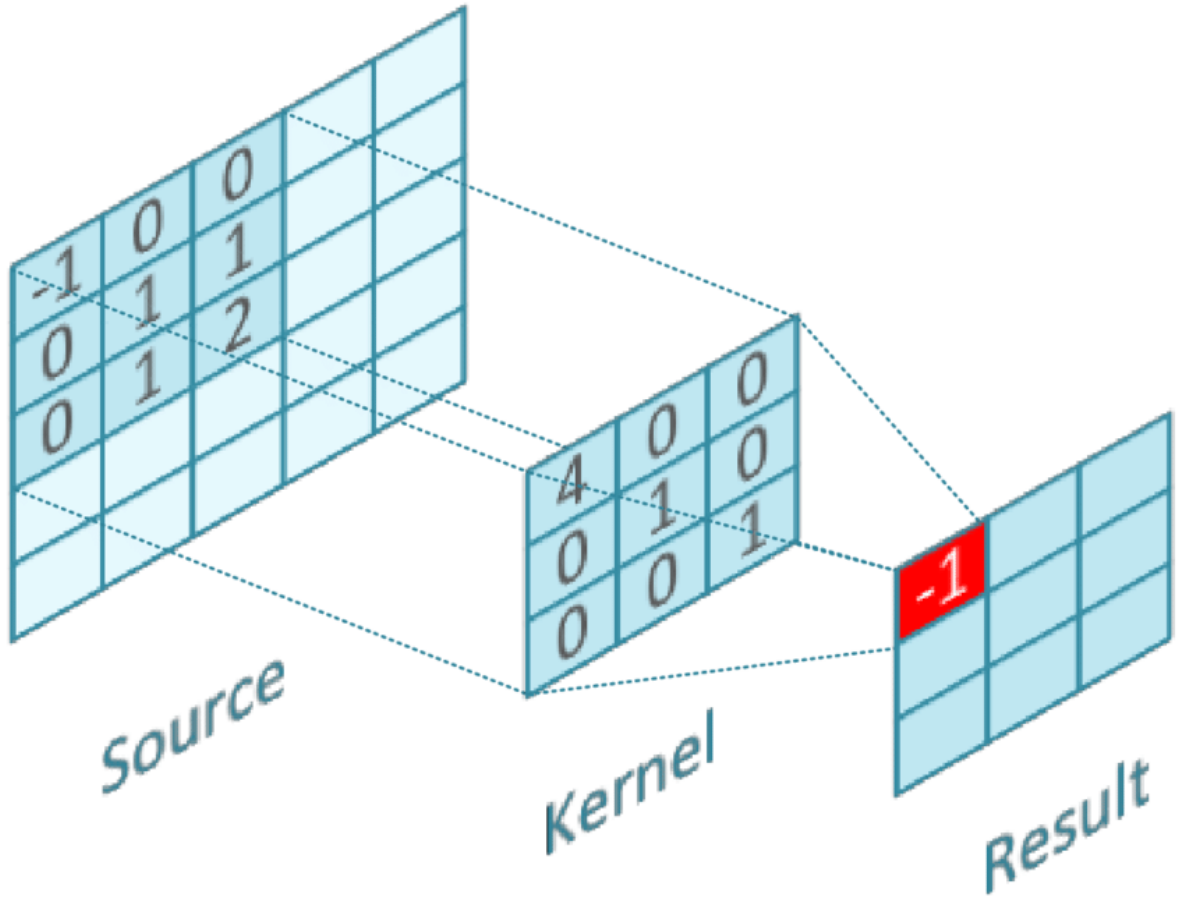
- Convolutional Layers
- Pooling Layers
- Fully-Connected Layers

Convolutional Layers

- Filters
- Feature Maps
- Padding
- Stride

Convolutional Operation

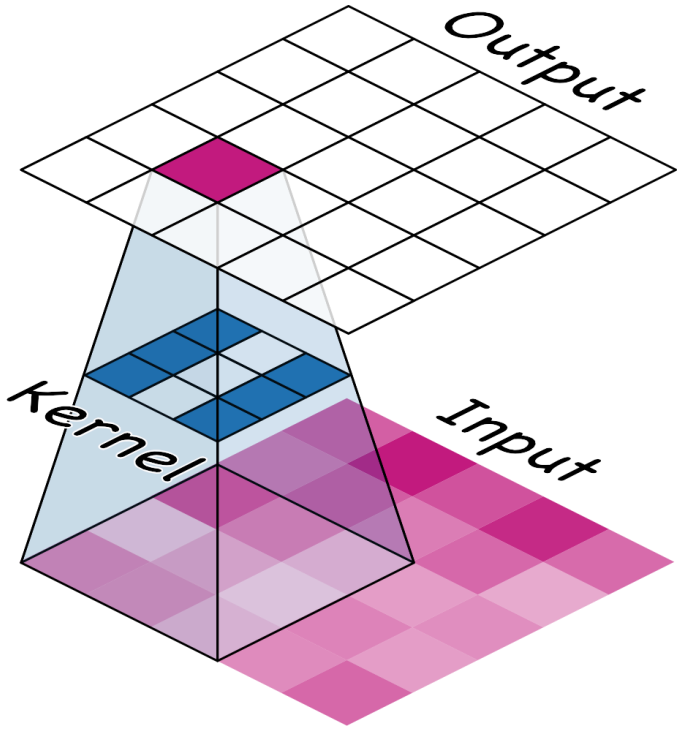




Kernels / Weights / Filters

- The weights a convnet learns during training are primarily contained in its convolutional layers. These weights we call kernels.

-1	2	-1
-1	2	-1
-1	2	-1



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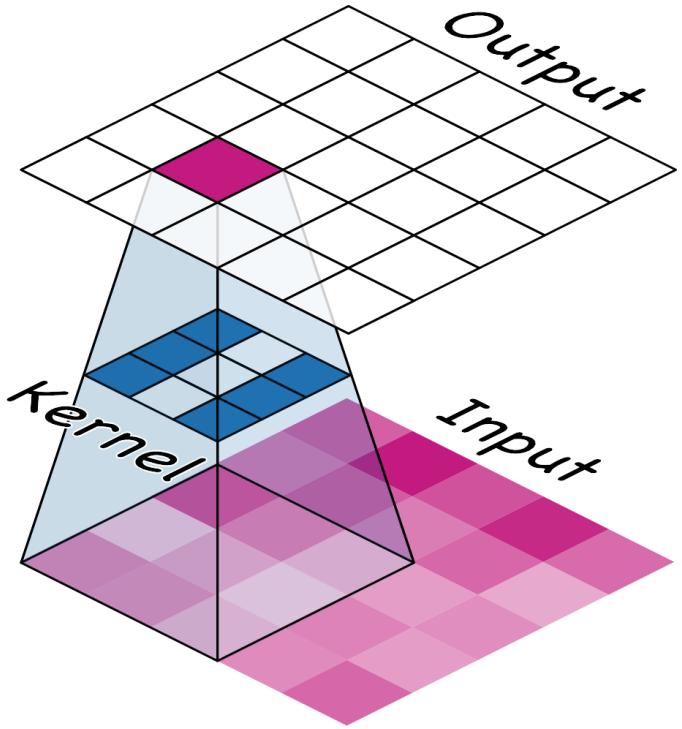


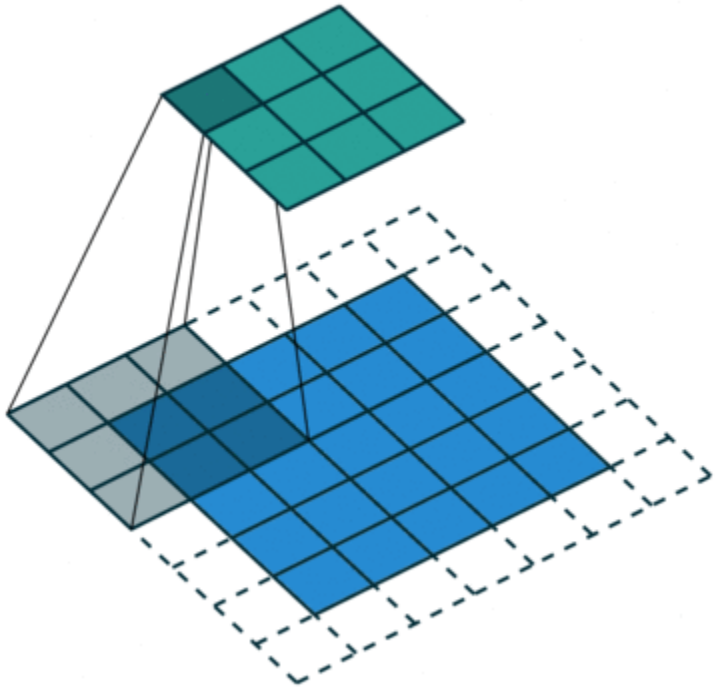
Kernels / Weights / Filters

-1	-1
1	1

-1	-2	-1
0	0	0
1	2	1

-2	-1	0
-1	1	1
0	1	2

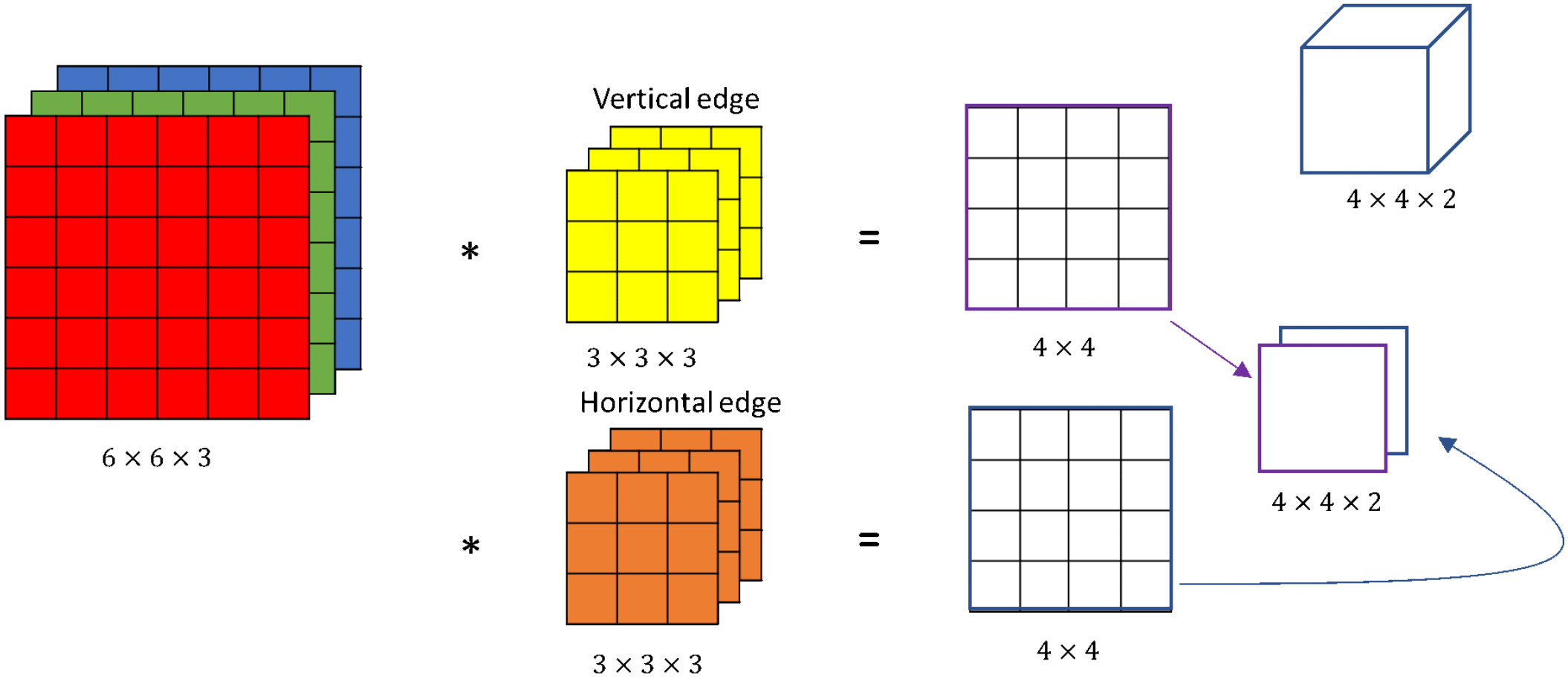
Padding



Stride

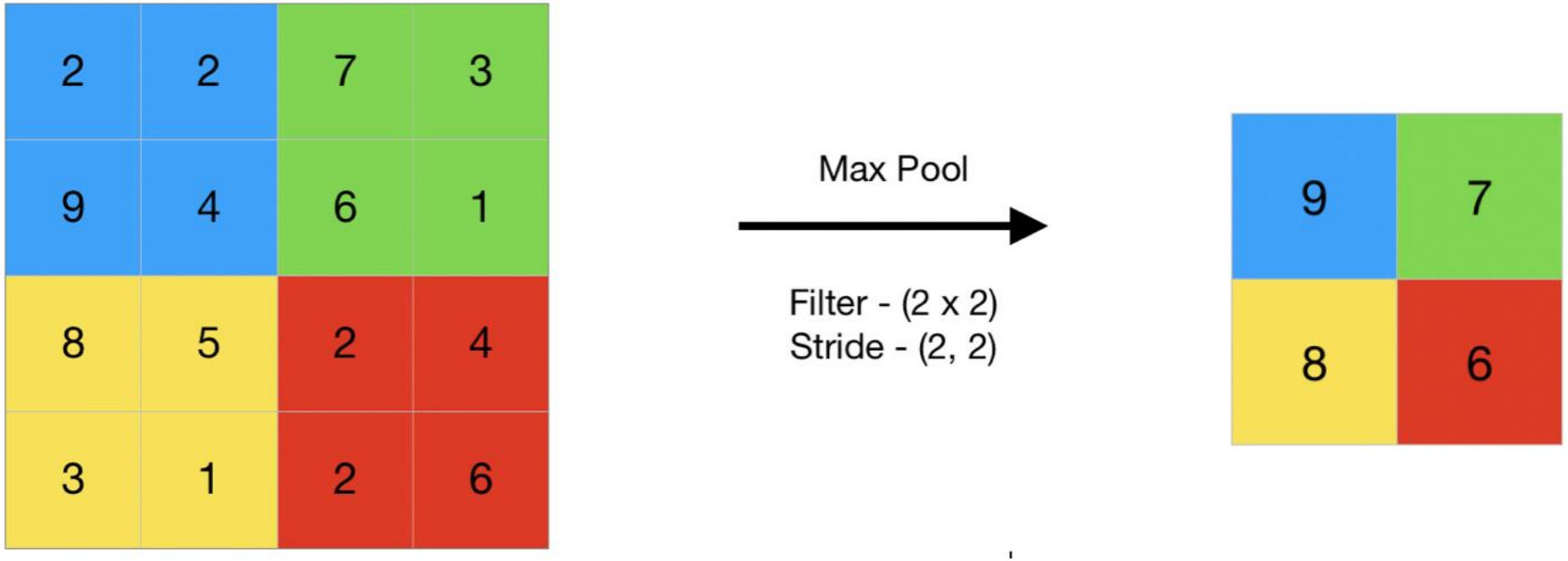
- Stride is a component of convolutional neural networks tuned for the compression of images.
- Stride is a parameter of the filter that modifies the amount of movement over the image.

Convolution on RGB images



Pooling Layers

- Average Pooling
- Max Pooling
- Etc.



Fully Connected Layers

- Feed forward layers
- Non linearity
- After feature extraction used to create non linear combinations for predictions

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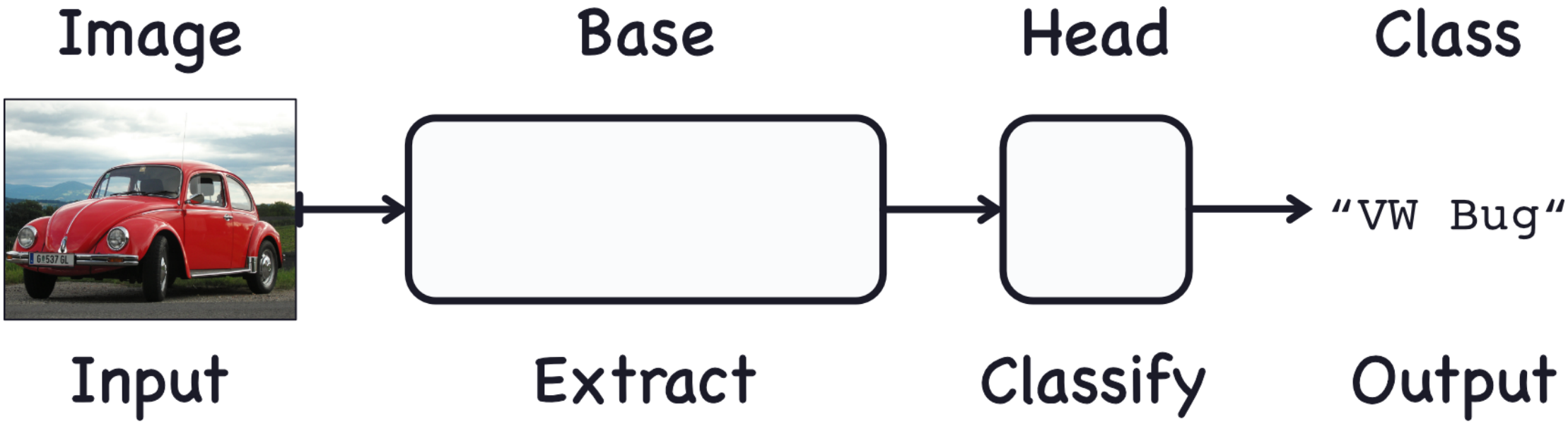
Convolutional Classifier



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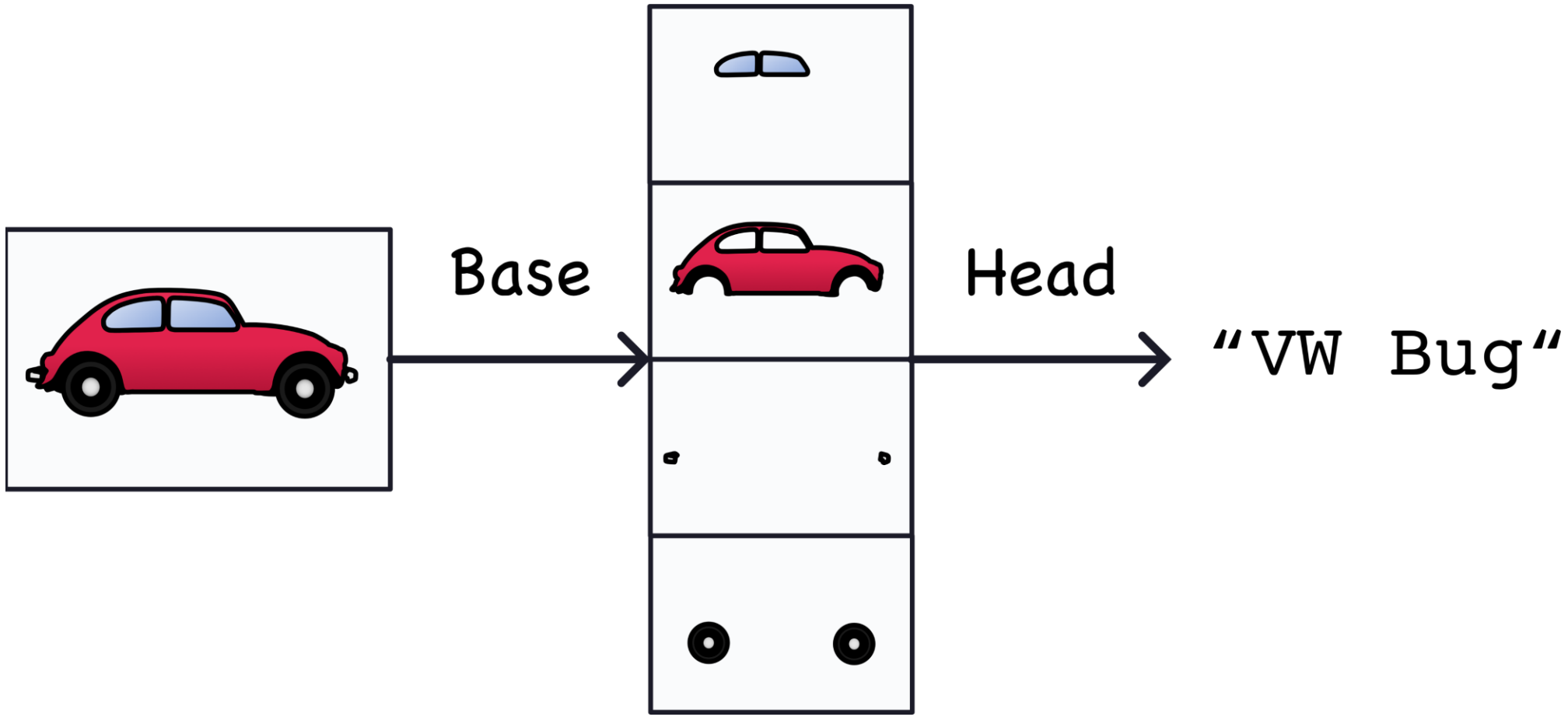
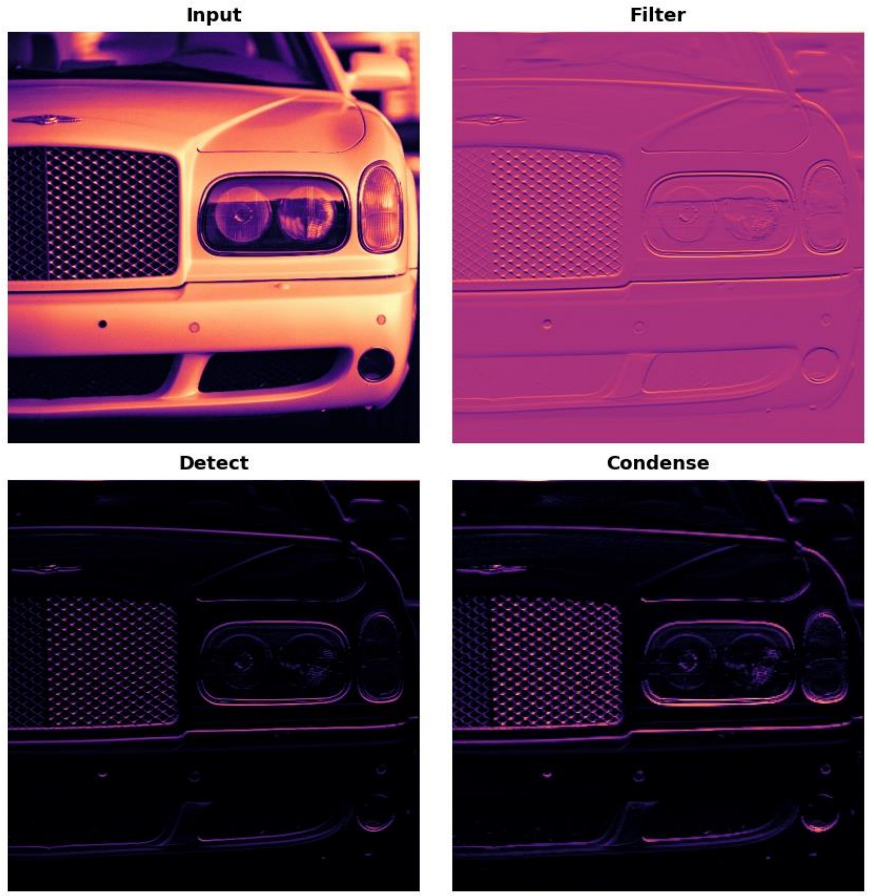
Convolutional Classifier



Feature Extraction

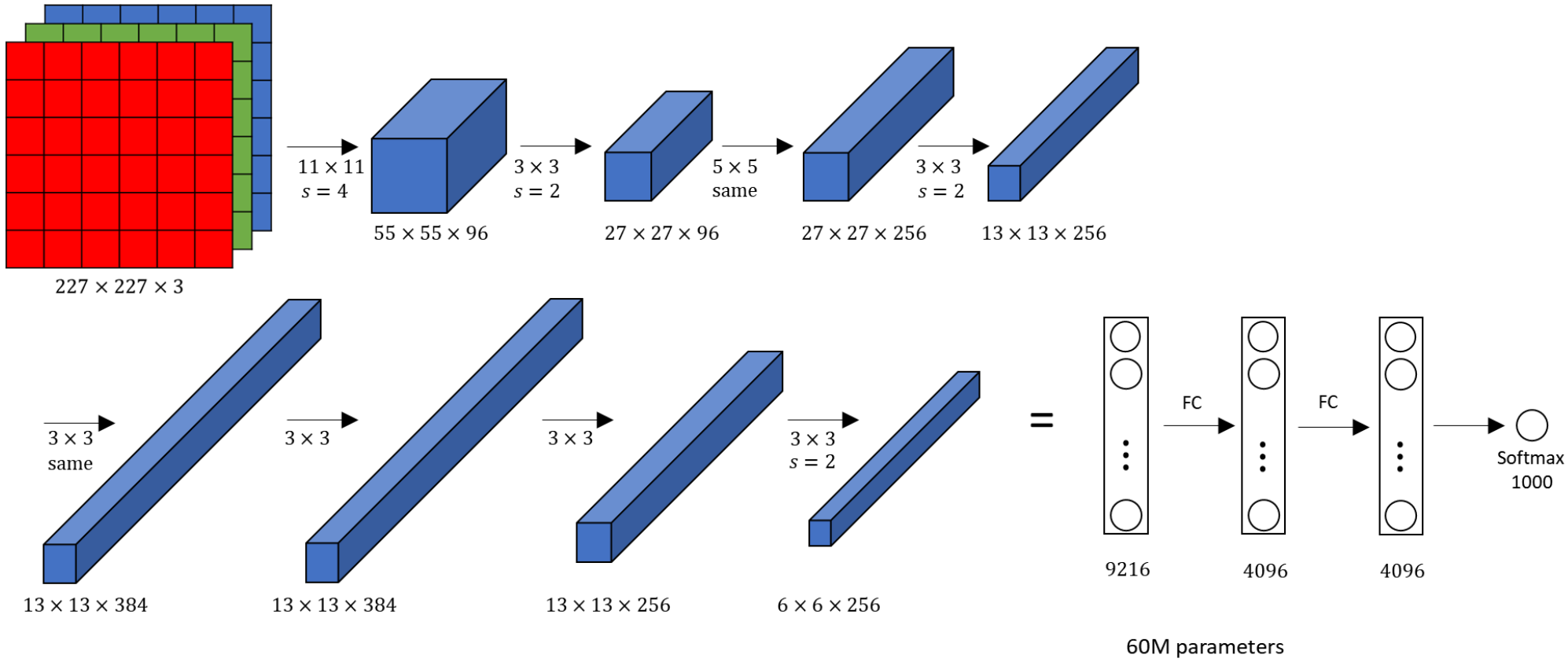
- The feature extraction performed by the base consists of three basic operations:
  - Filter an image for a particular feature (convolution)
  - Detect that feature within the filtered image (ReLU)
  - Condense the image to enhance the features (maximum pooling)

Feature Extraction



One Layer Of CNN

Alexnet


227 × 227 × 3
11 × 11
s = 4
55 × 55 × 96
3 × 3
s = 2
27 × 27 × 96
5 × 5
same
27 × 27 × 256
3 × 3
s = 2
13 × 13 × 256
3 × 3
same
13 × 13 × 384
3 × 3
13 × 13 × 384
3 × 3
13 × 13 × 256
3 × 3
s = 2
6 × 6 × 256
=
9216
FC
4096
FC
4096
Softmax
1000
60M parameters

Transfer Learning

- Instead of building a convnet from scratch if we can reuse the learned model.
- E.g. alexnet, VGG16, etc.
- they were trained on different dataset (IMAGENET)
- Lets explore this

Case 1

- Extract Features from the input
- Use just before we reach flatten layer

Case 2

- Freeze initial few layers
- Only allow training on last few layers on new dataset by modifying them or using another classifier all together

Case 3

- Tune the complete model
- Keep learning rate very small

Thank You