

智慧化企業整合 Intelligent Integration of Enterprise

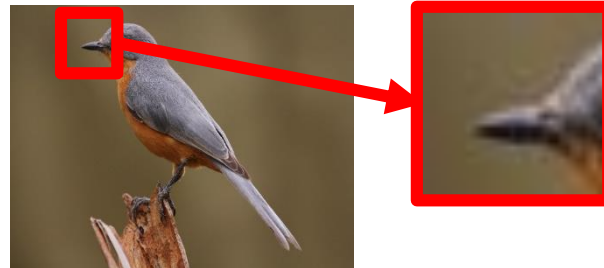
Convolutional Neural Network

Outline

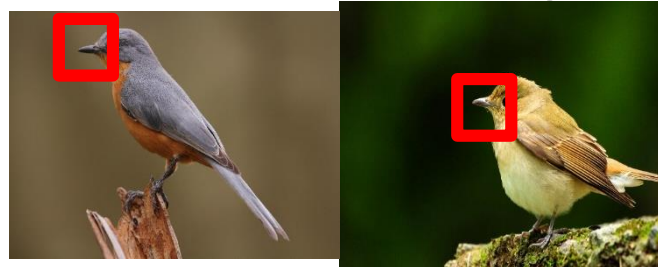
- Why CNN for image
- Convolutional Neural Network
 - ✓ Convolution Layer
 - ✓ Pooling Layer-Max Pooling
 - ✓ Flatten
- Demo
- Class Assignment & Homework

Why CNN for image?

- Some patterns are much smaller than the whole image



- The same patterns appear in different regions.

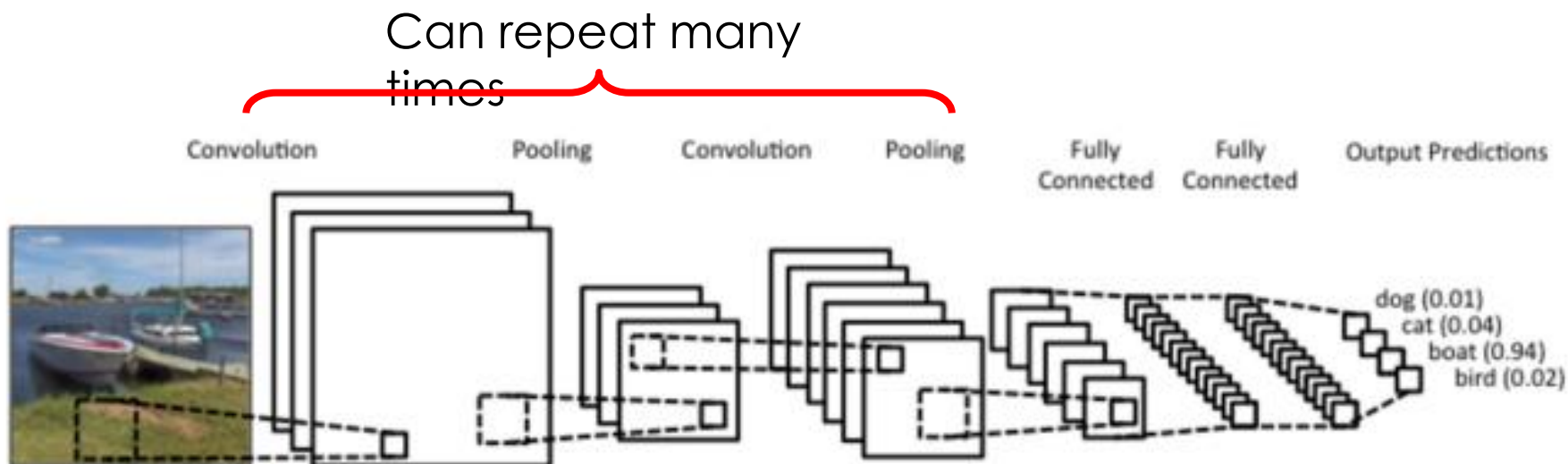


- Subsampling the pixels will not change the object



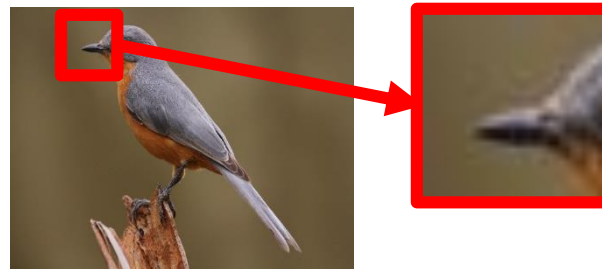
Convolutional Neural Network

The Whole CNN



Why CNN for image?

- Some patterns are much smaller than the whole image

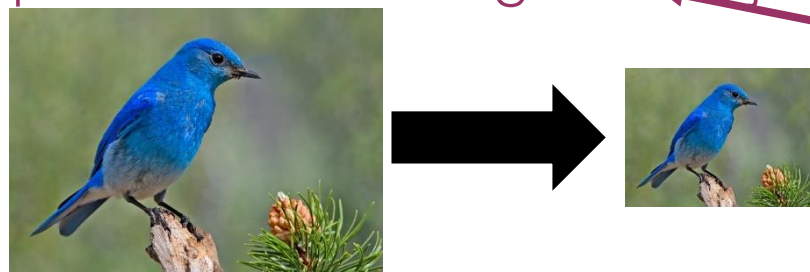


Convolution

- The same patterns appear in different regions.



- Subsampling the pixels will not change the object



Max Pooling

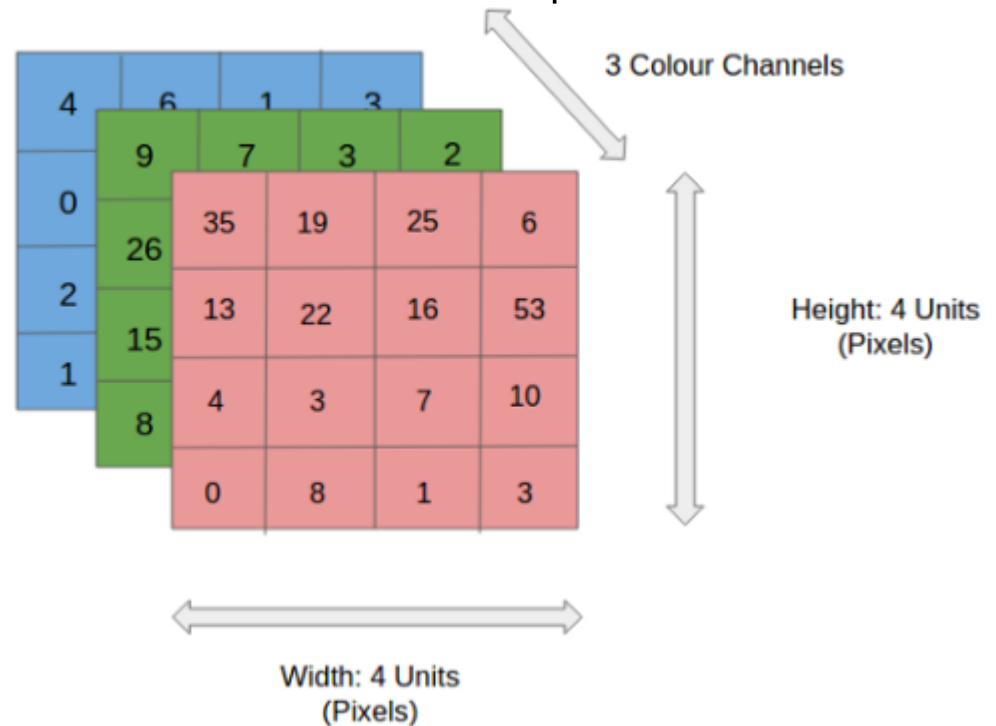
Convolution Layer

network parameters to be learned.

What we see

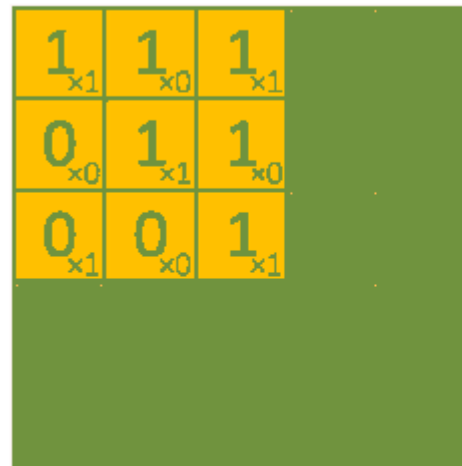


What computer see



Convolution Layer

Kernels/filters: each filter detects a small pattern (for example: 3 x 3).

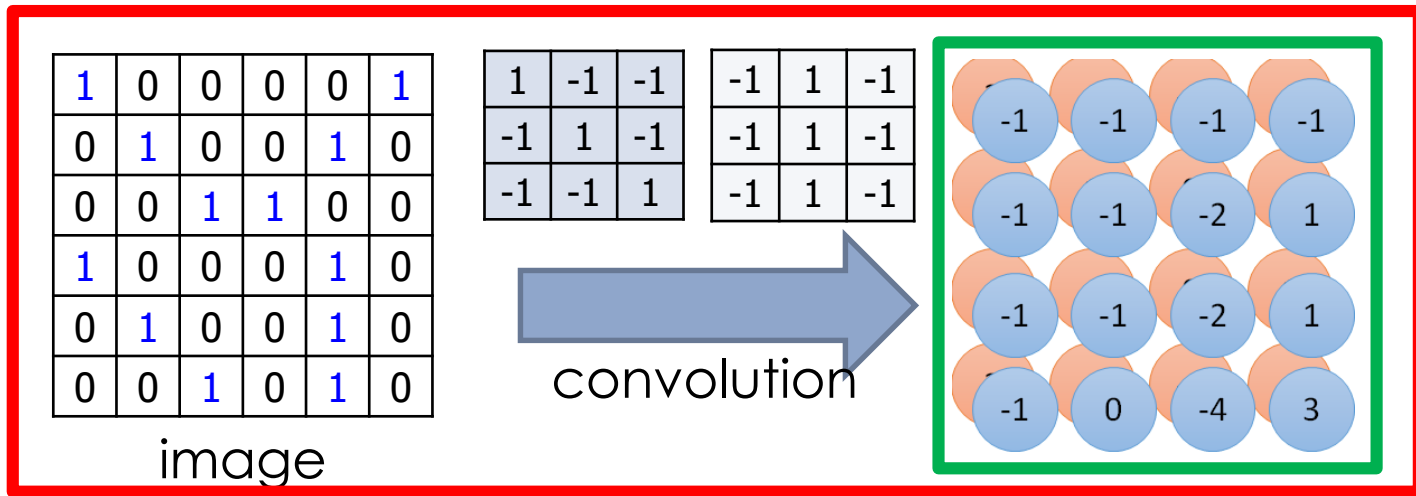


Image

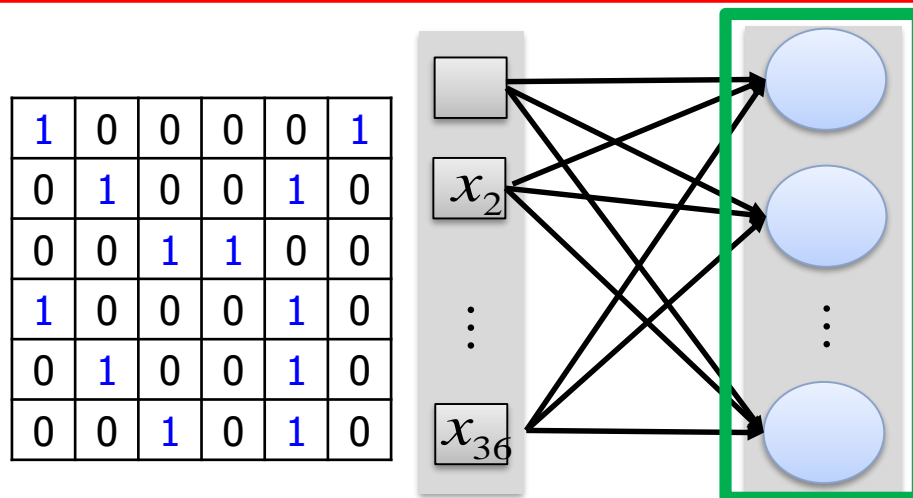


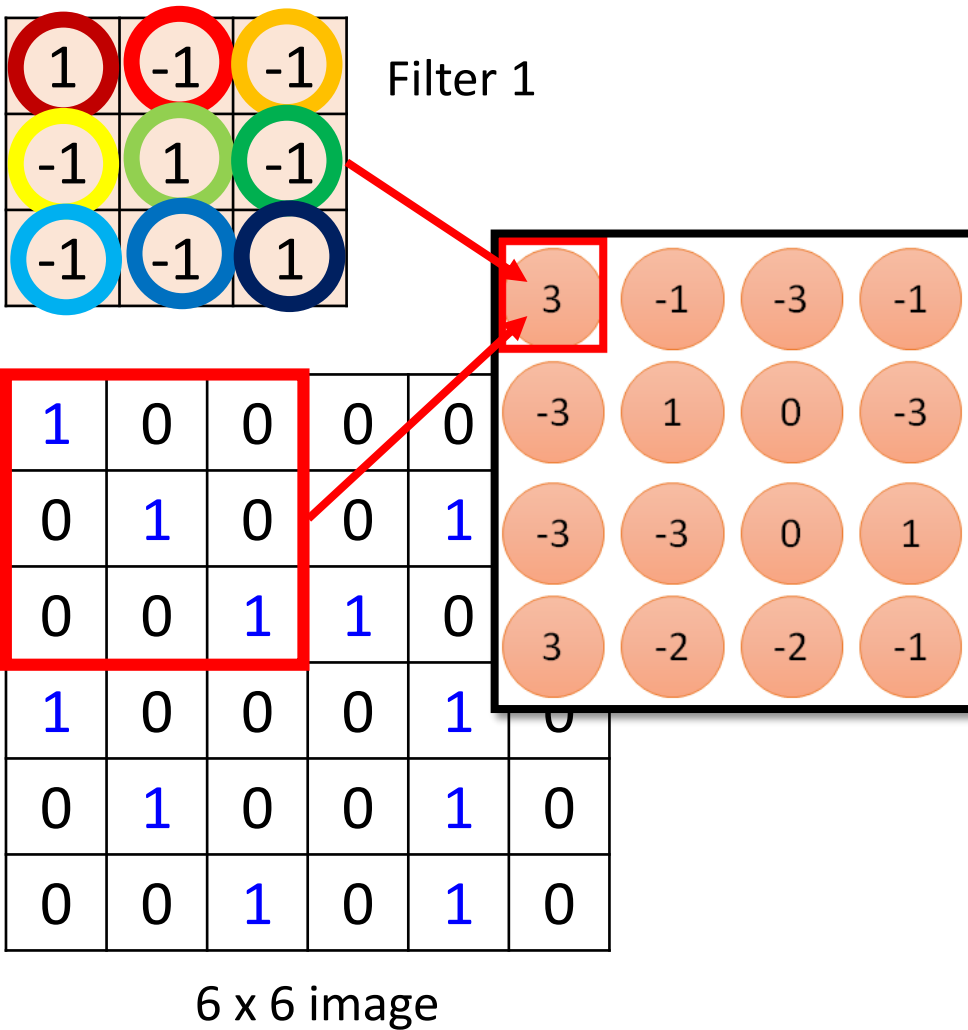
Convolved
Feature

Convolution v.s. Fully connected



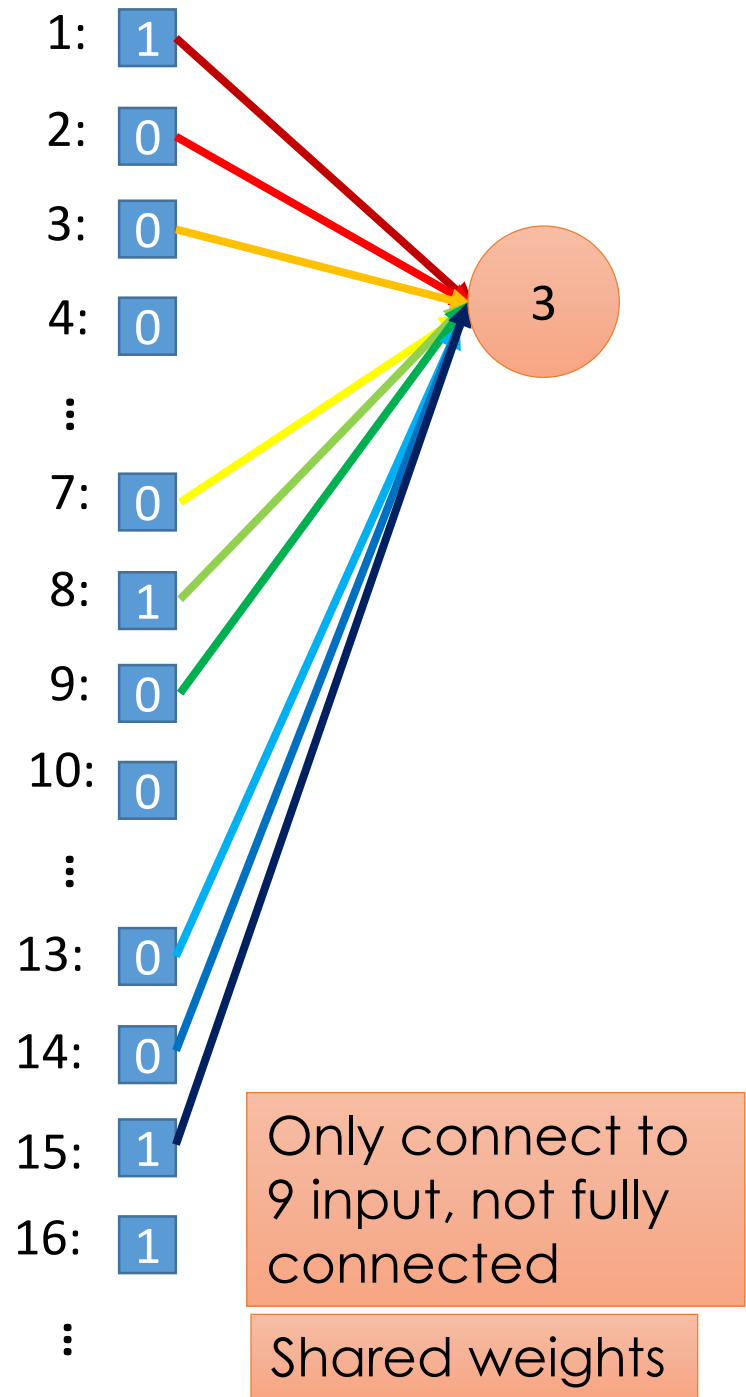
Fully-
connected





6 x 6 image

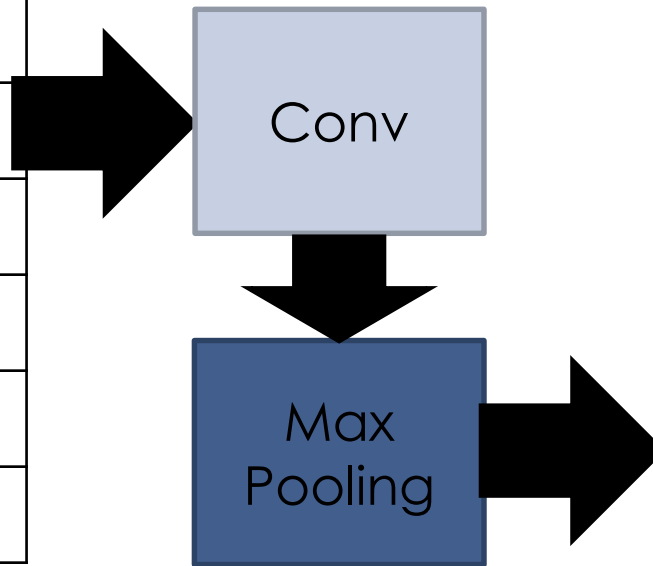
Less parameters!



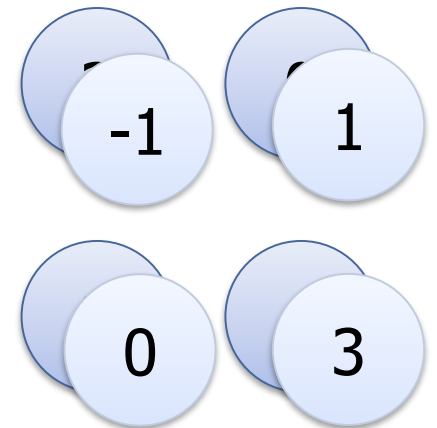
Pooling Layer-Max Pooling

1	0	0	0	0	1
0	1	0	0	1	0
0	0	1	1	0	0
1	0	0	0	1	0
0	1	0	0	1	0
0	0	1	0	1	0

6 x 6 image



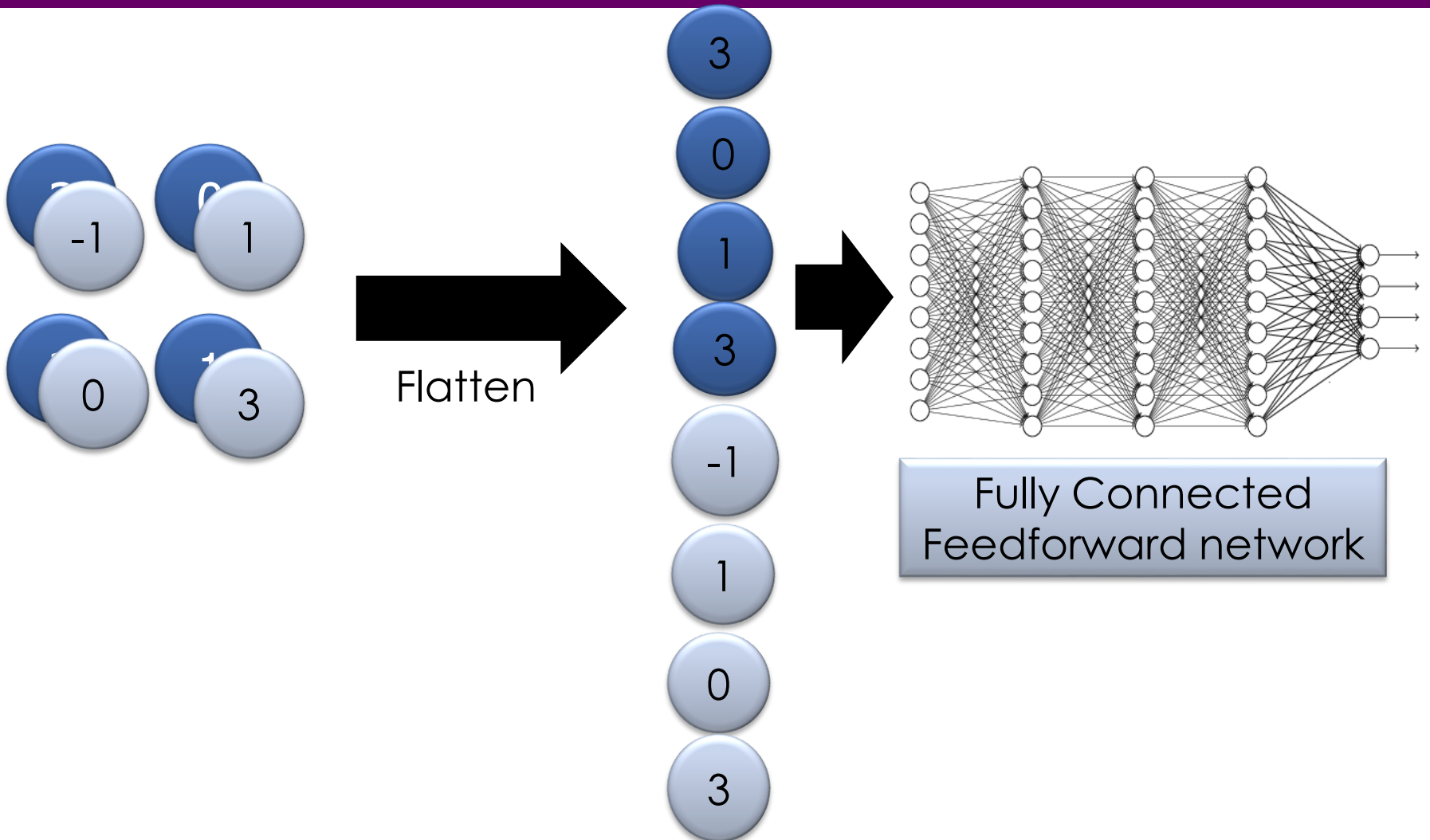
New image
but smaller



2 x 2 image

Each filter
is a channel

Flatten



Demo

References

- [http://speech.ee.ntu.edu.tw/~tlkagk/courses/ML_2016/Lecture/CNN%20\(v2\).pdf](http://speech.ee.ntu.edu.tw/~tlkagk/courses/ML_2016/Lecture/CNN%20(v2).pdf)
- <https://medium.com/jameslearningnote/%E8%B3%87%E6%96%99%E5%88%86%E6%9E%90-%E6%A9%9F%E5%99%A8%E5%AD%B8%E7%BF%92-%E7%AC%AC5-1%E8%AC%9B-%E5%8D%B7%E7%A9%8D%E7%A5%9E%E7%B6%93%E7%B6%B2%E7%B5%A1%E4%BB%8B%E7%B4%B9-convolutional-neural-network-4f8249d65d4f>

Class assignment

- Please train a CNN with 3 Conv2D layers and 2 Maxpooling 2D layers(try different activations, e.g. sigmoid, relu, etc.). to predict the class of input images in **Fashion Mnist dataset**, and the testing accuracy should be at least 95%.
- Turn in your work with the format of .ipynb , and please write some brief comments in your ipynb to illustrate your results.
- File name: class6_Your Chinese Name

Homework

- Please use the **Cifar-10 dataset** and what we taught in TA class to train a CNN model (you may design your own CNN model), and the testing accuracy should be at least 60%.
- You are encouraged to implement different methods to train your model.
(EX: dropout or different optimizers)
- Turn in your work with the format of .ipynb , and please write some brief comments in your ipynb to illustrate your results.
- File name: hw6_Your Chinese Name