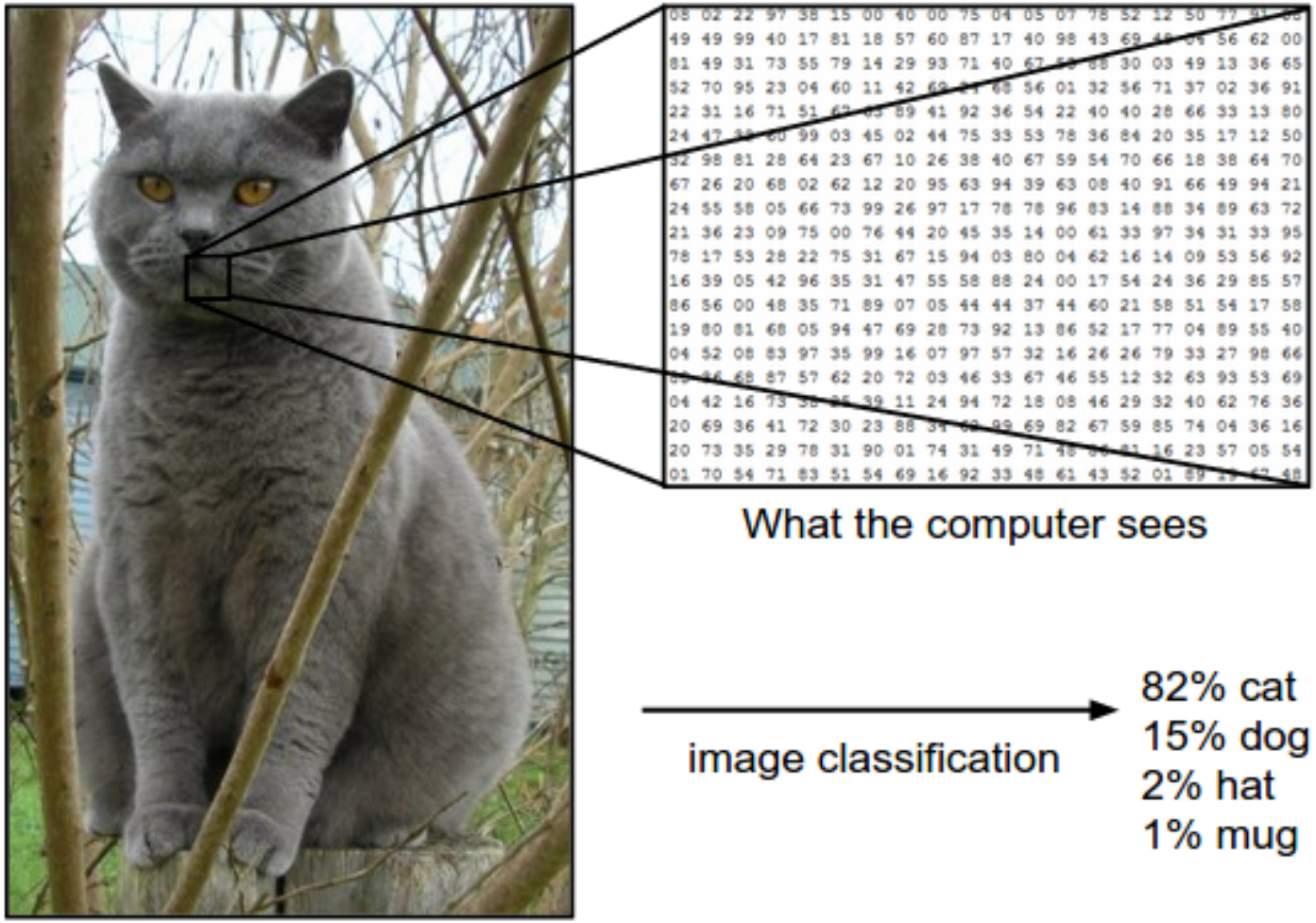
NARLabs 國家實驗研究院

國家高速網路與計算中心

影像瑕疵檢測

Image Classification



- 影像只是個3維陣列，其值為整數介於0~255之間
- e.g. 800 x 600 x 3 (3 channels RGB)

Source:http://cs231n.github.io/classification/

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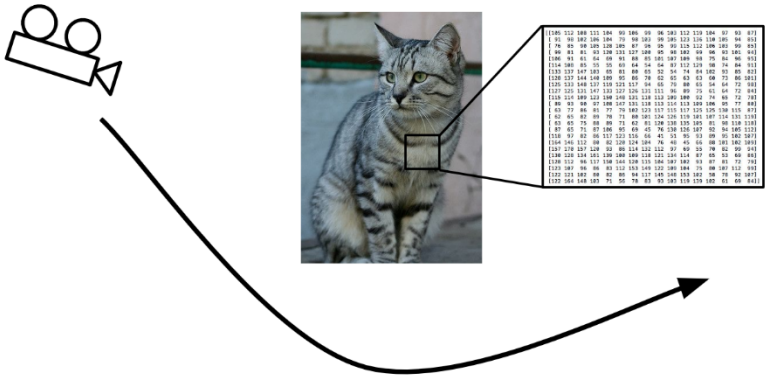
Image Classification Challenges

視角變化



背景干擾

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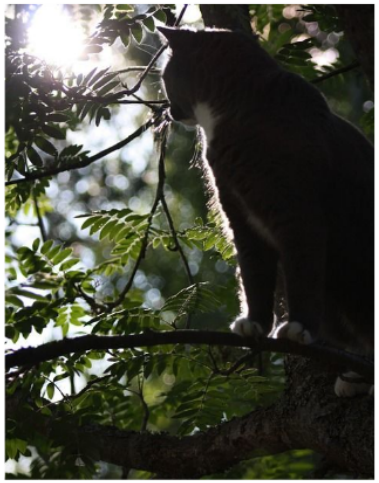
照明



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遮蔽

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變形

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同類多樣性

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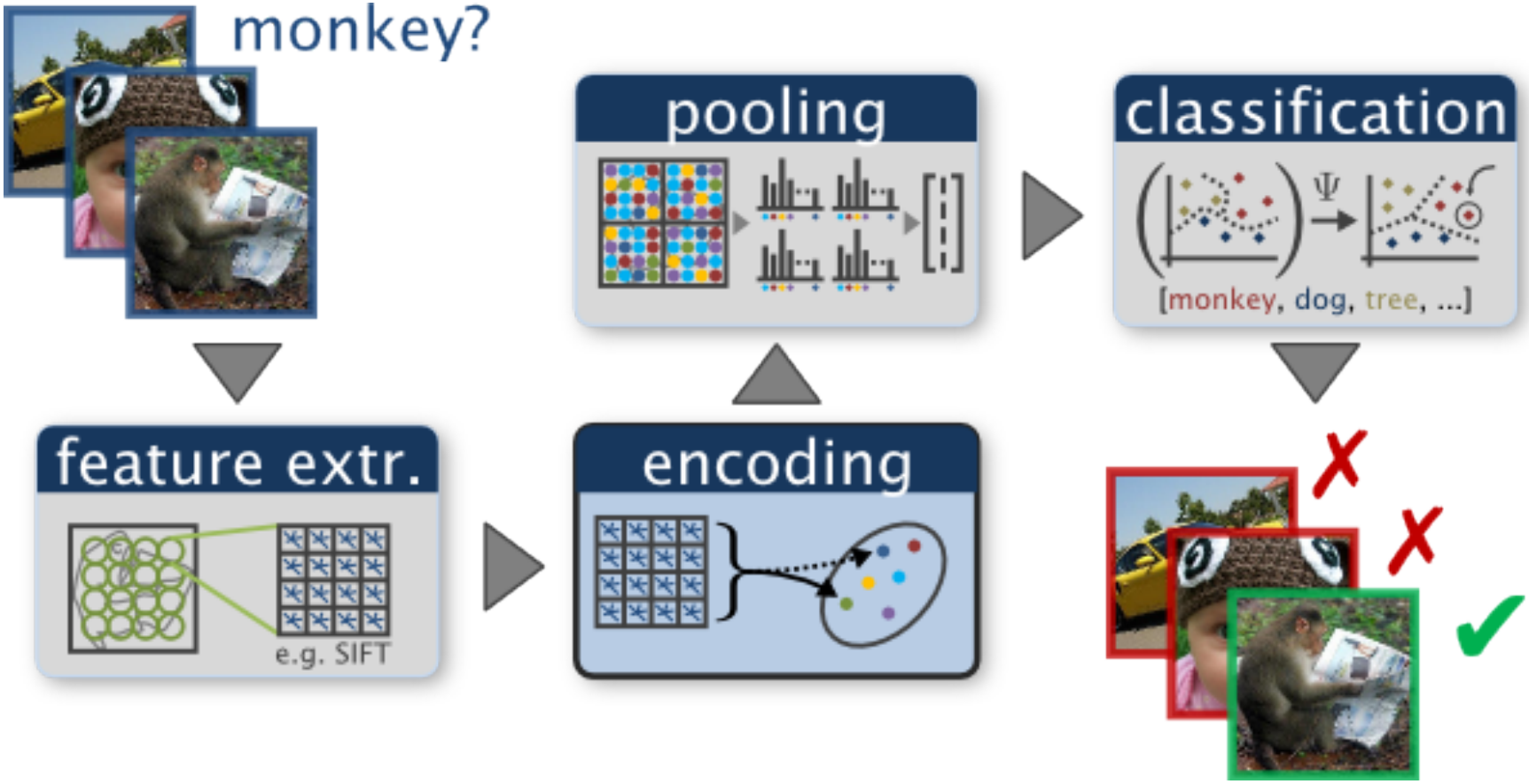
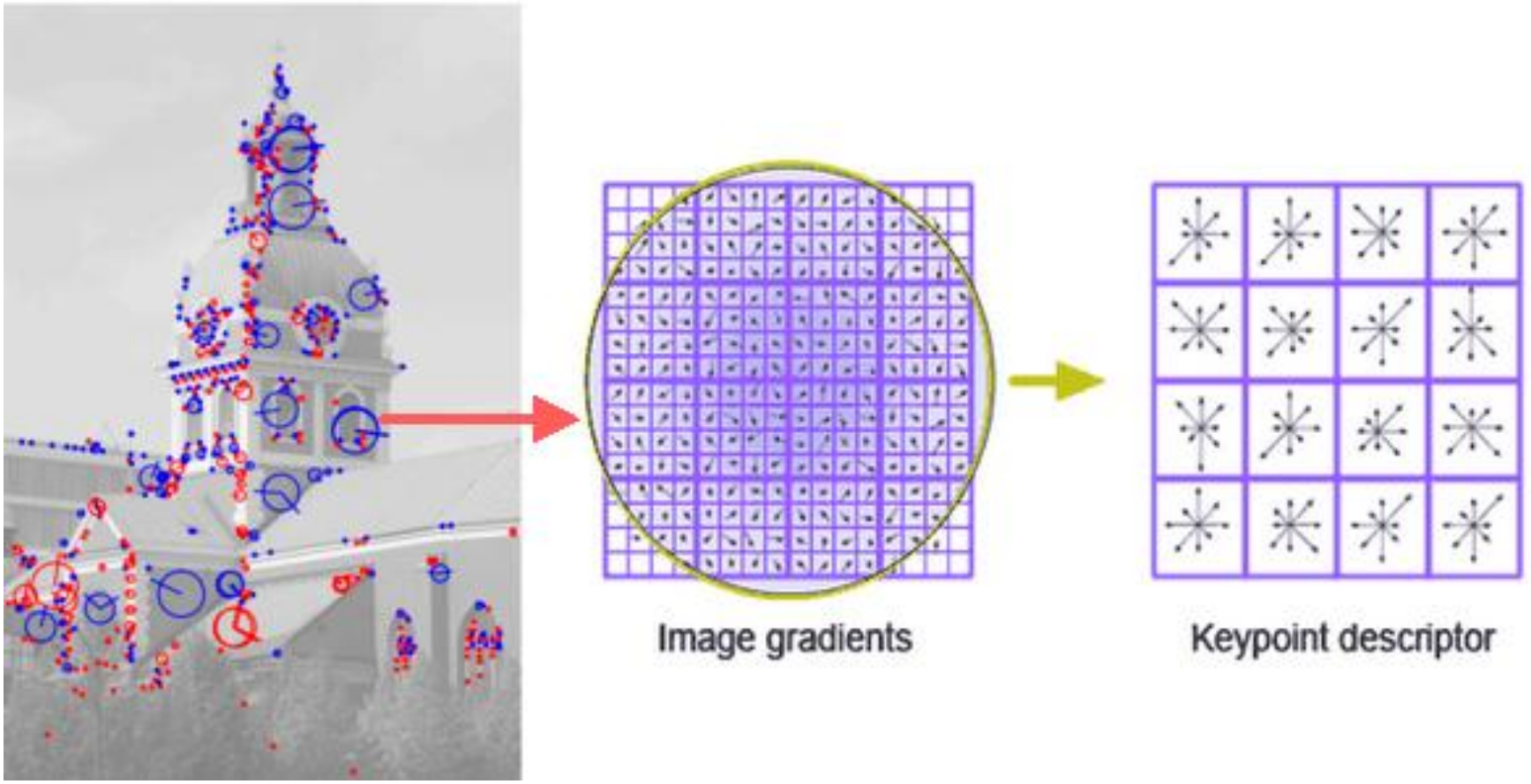
Image Classification Pipeline



Source: https://tanmaybinaykiya.github.io/scene-

Feature extraction

Scale Invariant Feature Transform(SIFT)



Source: https://xmfbit.github.io/2017/01/30/cs131-sift/

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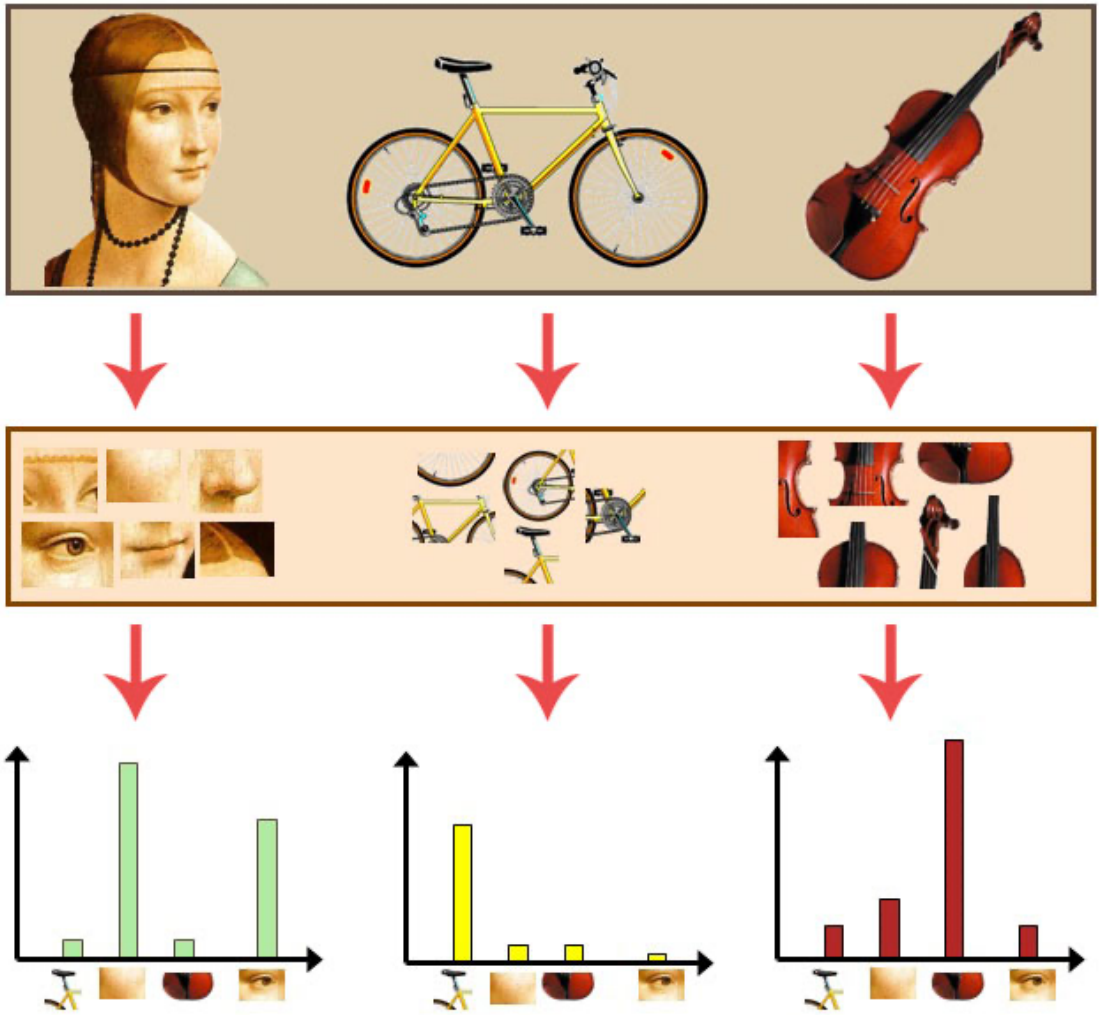
Feature encoding

Bag of visual words

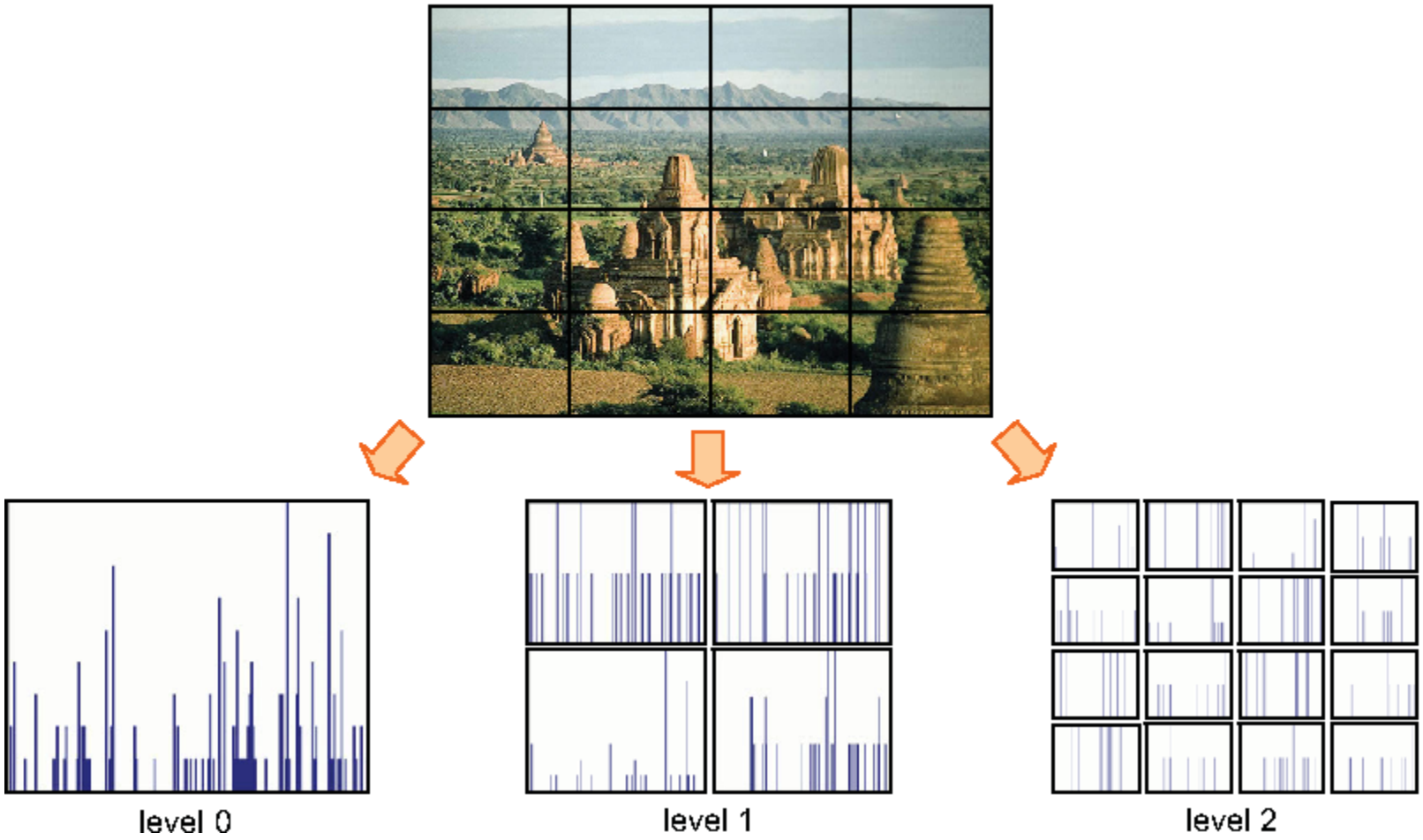


Source: https://www.researchgate.net/figure/An-illustration-of-the-visual-Bag-of-Words-BoW-representation-for-three-input-images_fig1_278827397

Pooling

Spatial Pyramid Matching

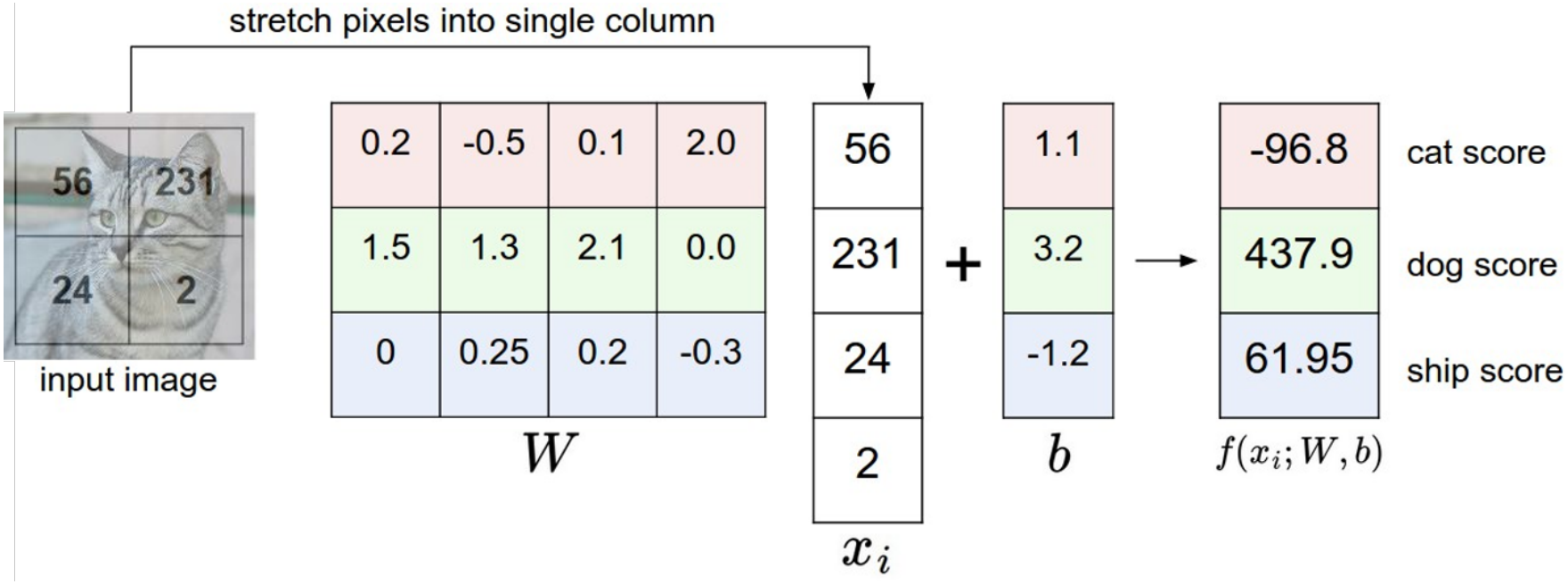
Lazebnik et al.



Source: https://pdfs.semanticscholar.org/d55b/f8b8eba06866f7e34731319bde3800971d7d.pdf

Classification

Example with an image with 4 pixels, and 3 classes (cat/dog/ship)



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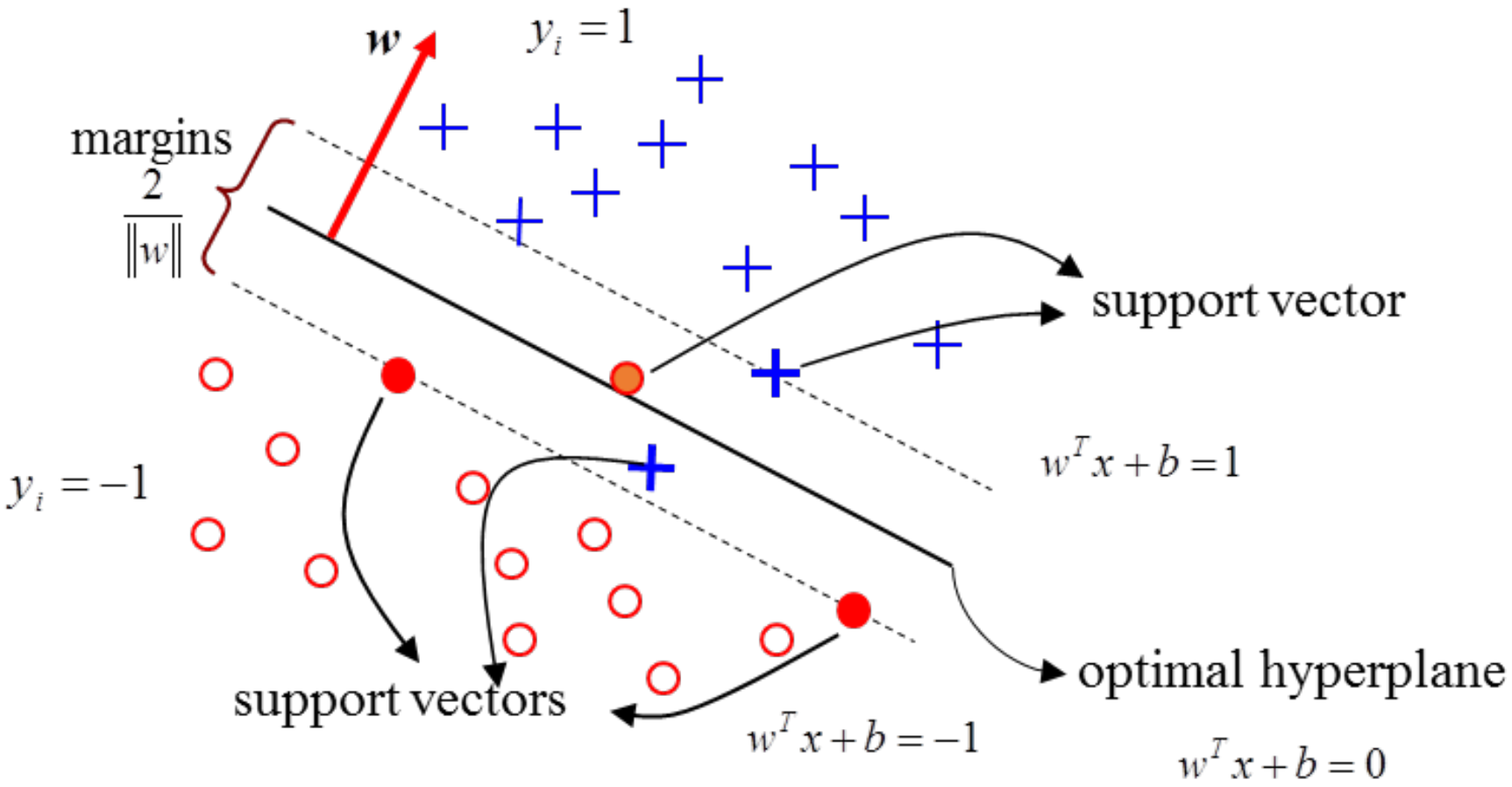
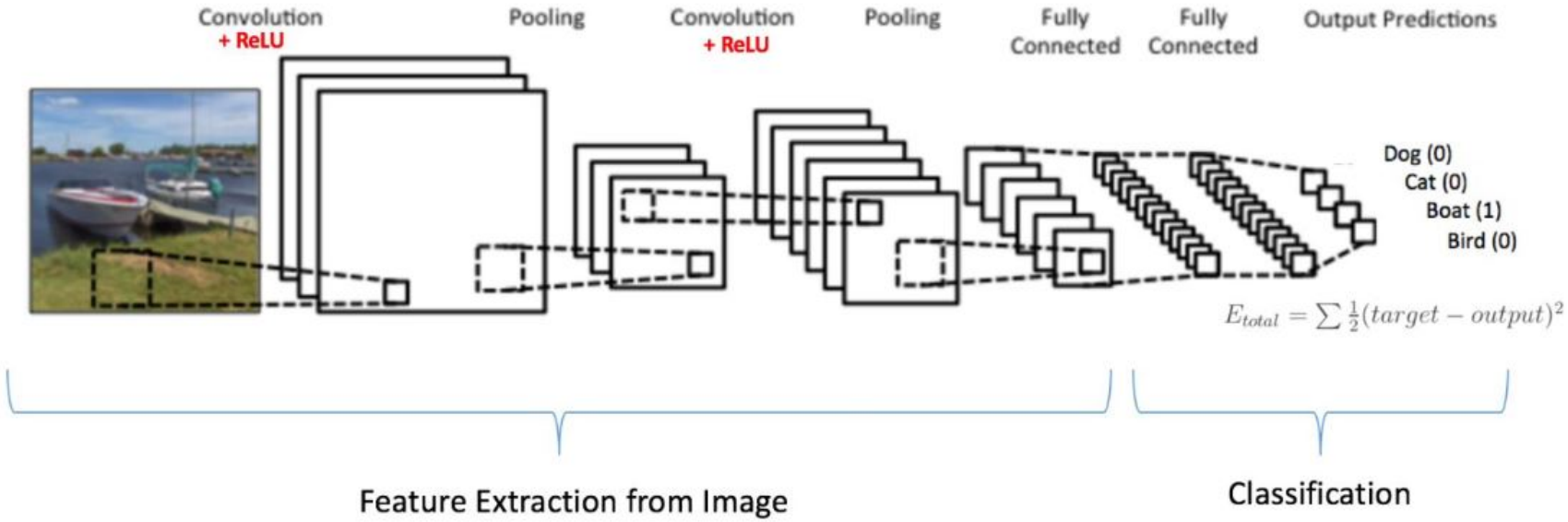
Classification

Support Vector Machine(SVM)



Source: https://miro.medium.com/max/762/1*aqNgiEu0ZBeB-ojoWyryZA.png

Convolutional Neural Networks (CNN)

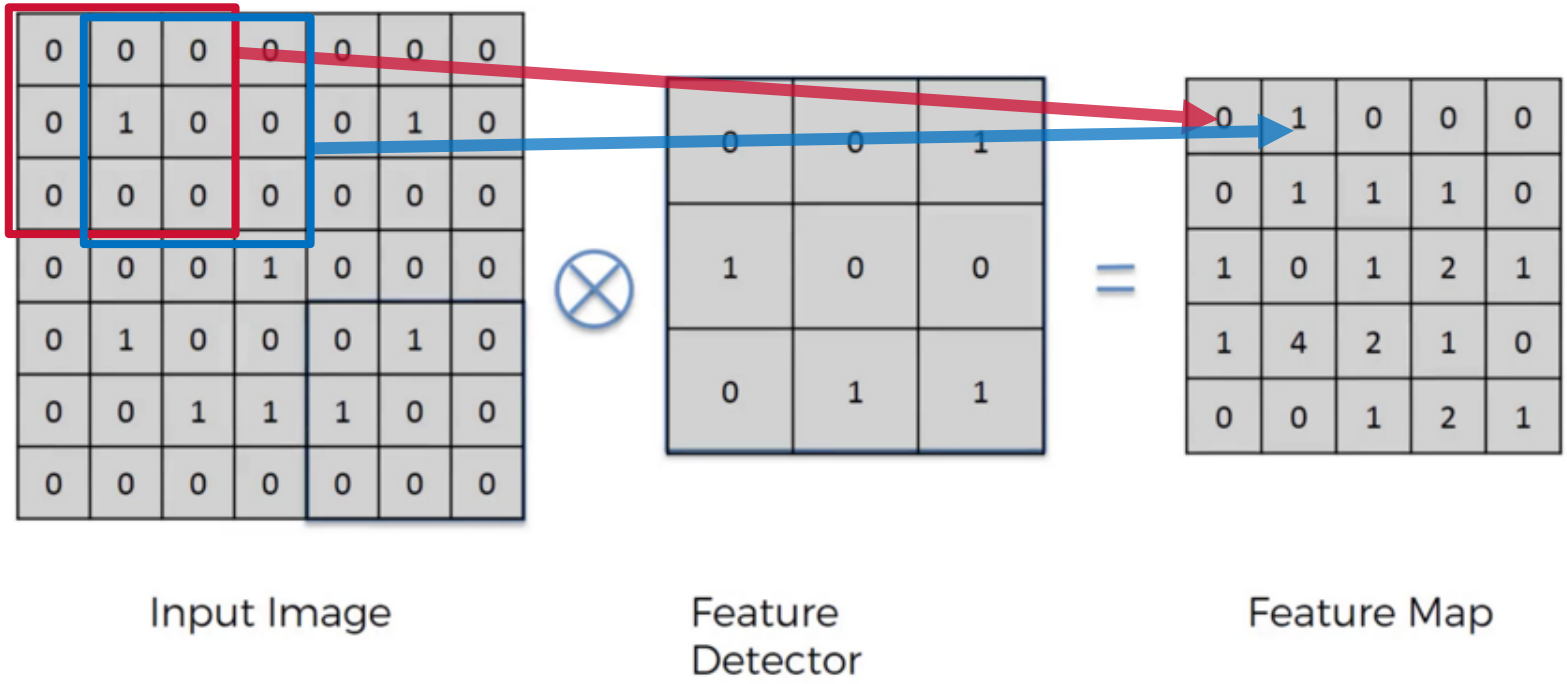


- CNN 通常由以下4種元件構成:
  - Convolution
  - Non Linearity (ReLU)
  - Pooling or Subsampling
  - Classification (Fully Connected Layers)

Source: https://courses.cs.washington.edu/courses/cse484/19sp/files/cse484-guest-lecture-ivan-sp19.pdf

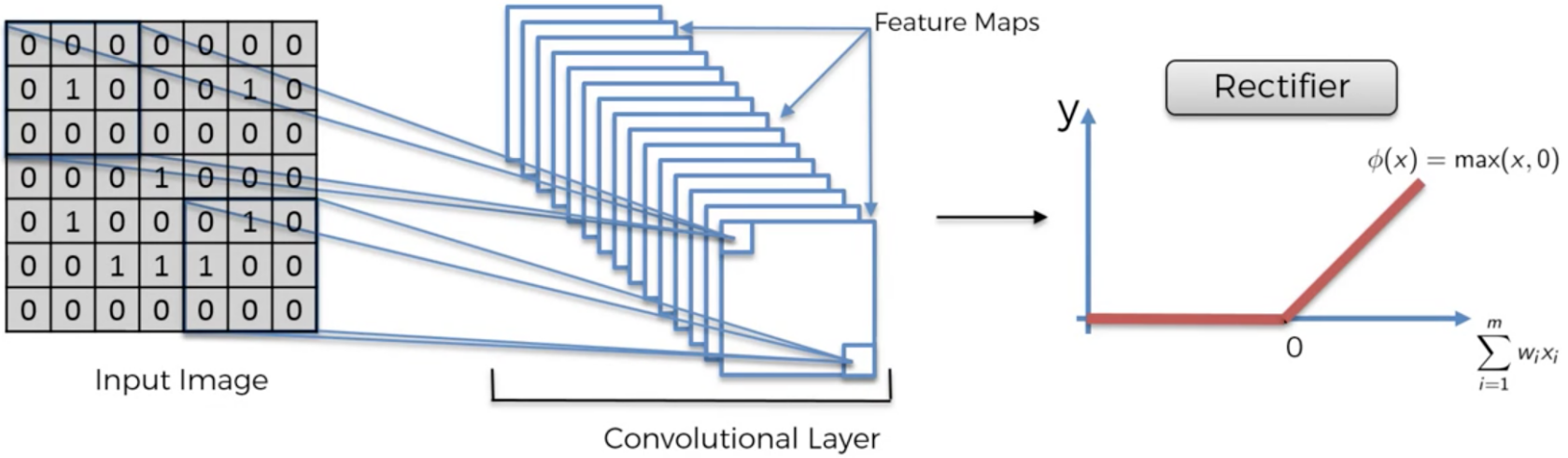
Convolution卷積層

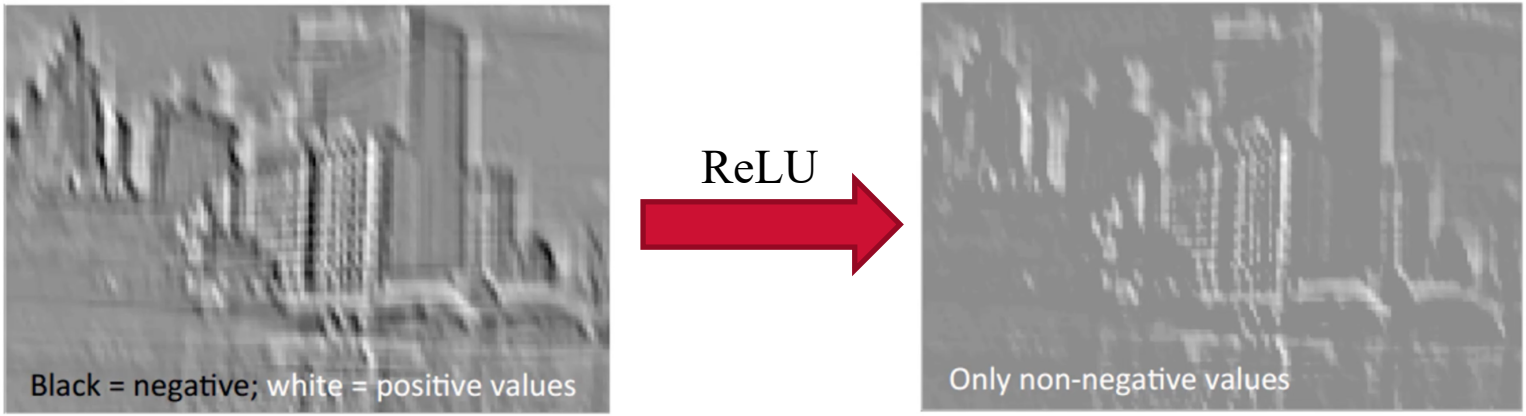
- 將原始圖片的與特定的Feature Detector(filter)做卷積運算
- 卷積運算就是將下圖兩個3x3的矩陣作相乘後再相加
- Feature Detector(Filter)會隨機產生好幾種，其目的就是萃取出影像當中的一些特徵



Source: https://reurl.cc/ObLLzR

Rectified Linear Unit(ReLU)

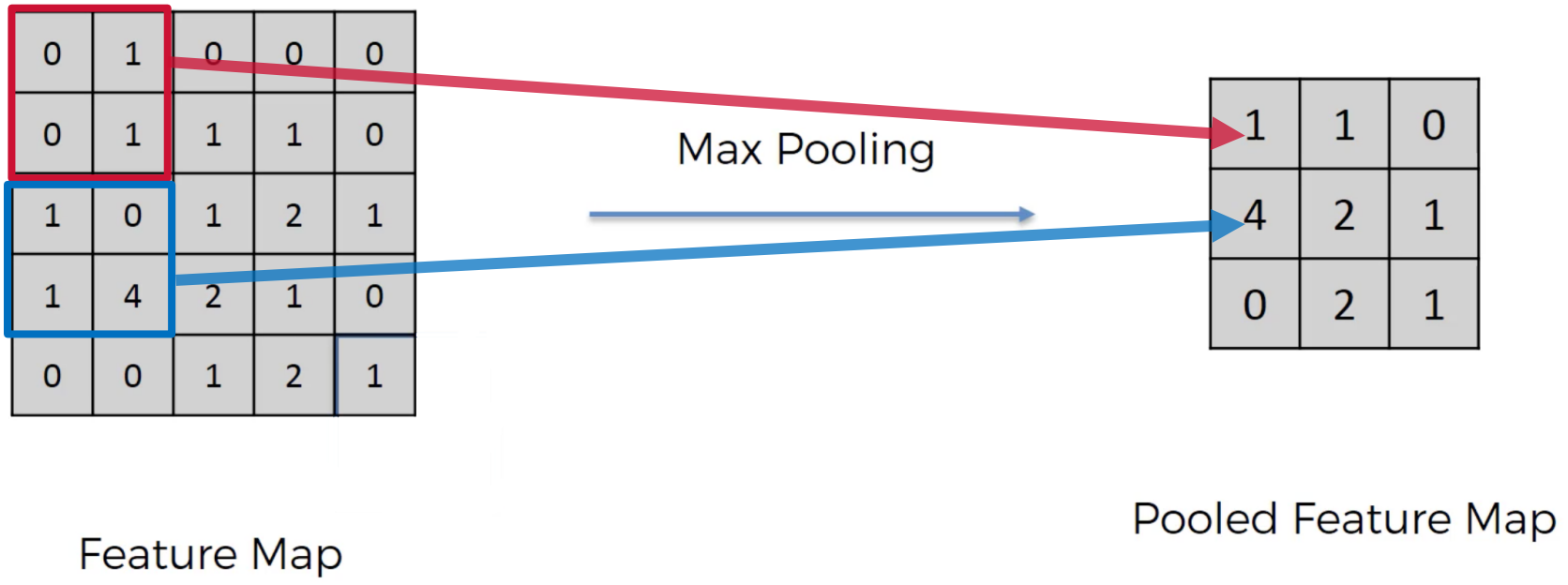




Source: https://reurl.cc/ObLLzR

Pooling 池化

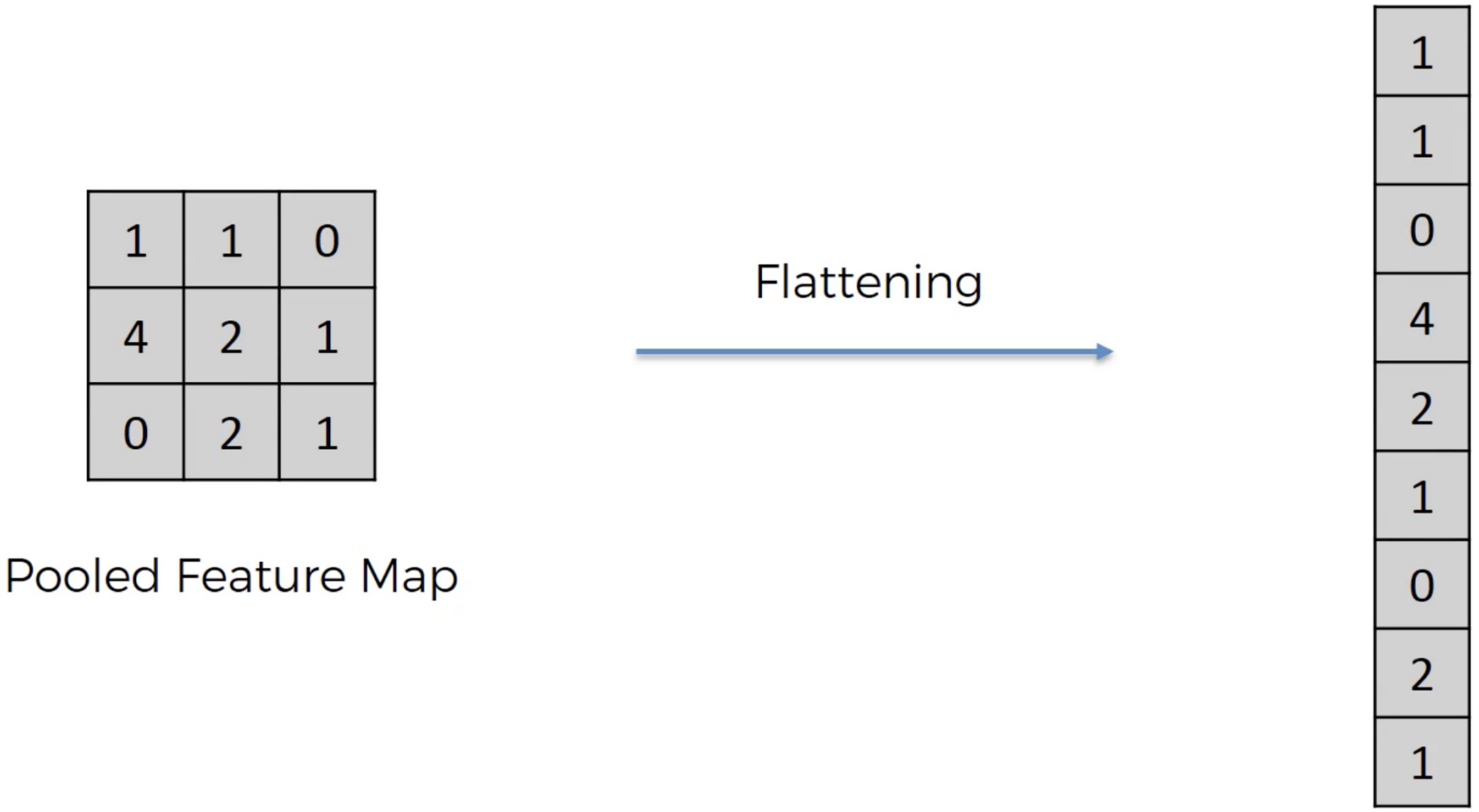
- 這邊主要是採用Max Pooling
- 概念很簡單只要挑出矩陣中的最大值就好
- 其目的是降低維度，並且保留重要特徵



Source: https://reurl.cc/ObLLzR

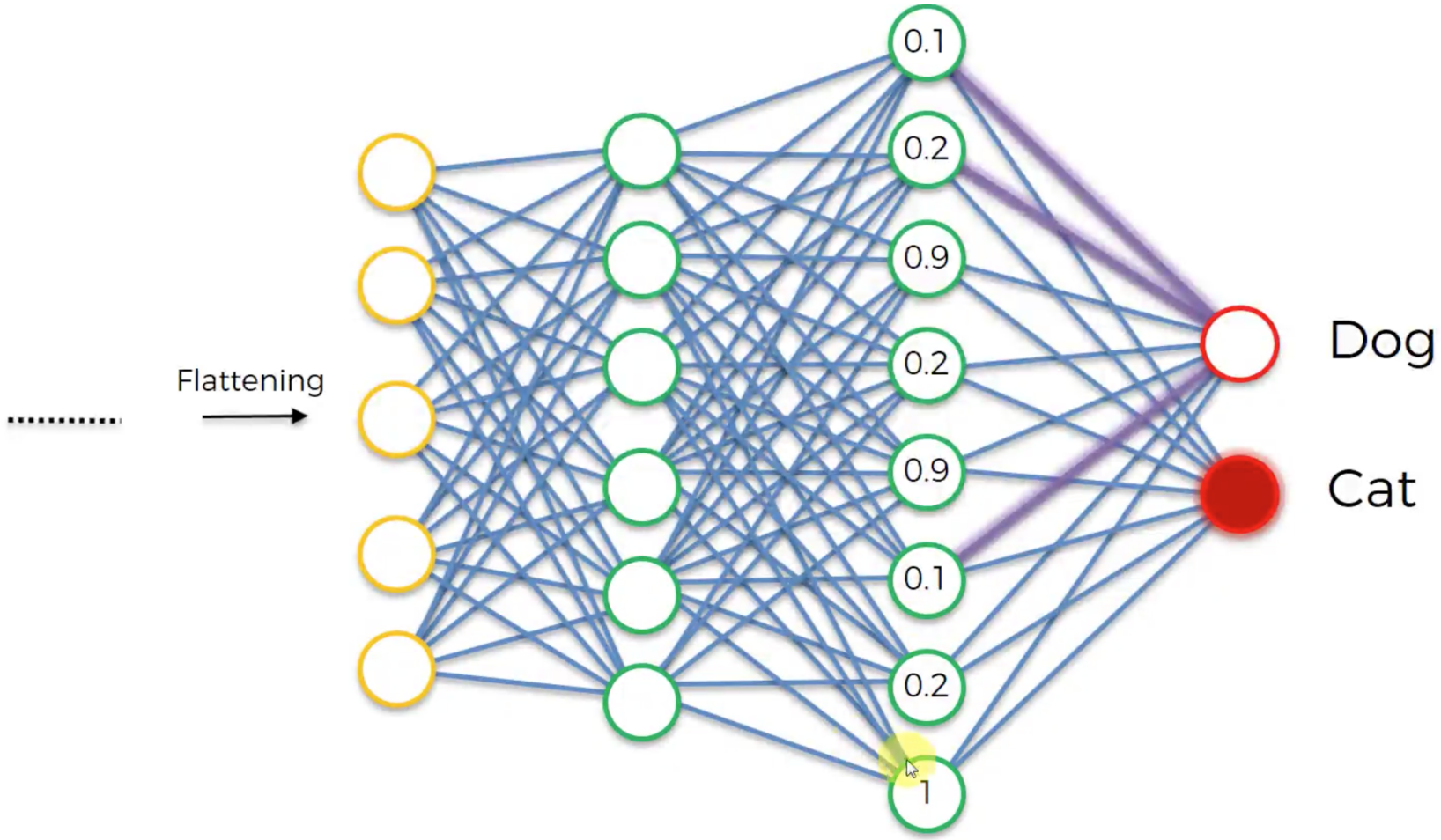
Fully Connected Layer 全連接層

- 全連接層是將前面運算的結果攤平後接到神經網絡



Source: https://reurl.cc/ObLLzR

Fully Connected Layer 全連接層



Source: https://reurl.cc/ObLLzR

IMAGENET Large Scale Visual Recognition Challenge

Year 2010

NEC-UIUC

Dense descriptor grid: HOG, LBP

Coding: local coordinate, super-vector

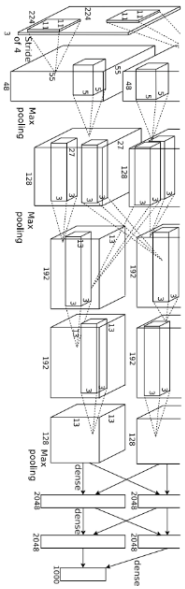
Pooling, SPM

Linear SVM

[Lin CVPR 2011]

Year 2012

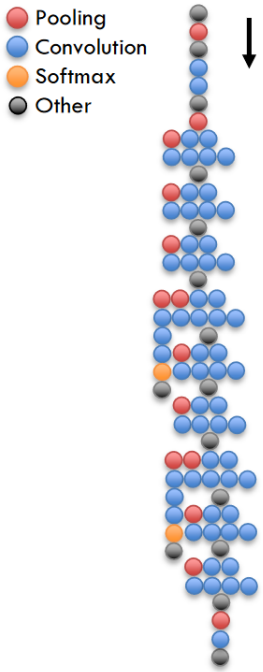
SuperVision



[Krizhevsky NIPS 2012]

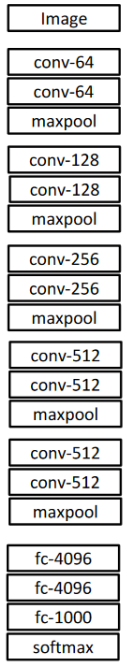
Year 2014

GoogLeNet



[Szegedy arxiv 2014]

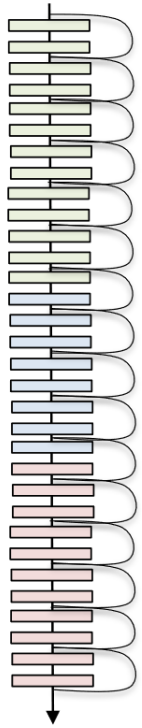
VGG



[Simonyan arxiv 2014]

Year 2015

MSRA



[He ICCV 2015]