

# METHOD

## Why we choose CNN?

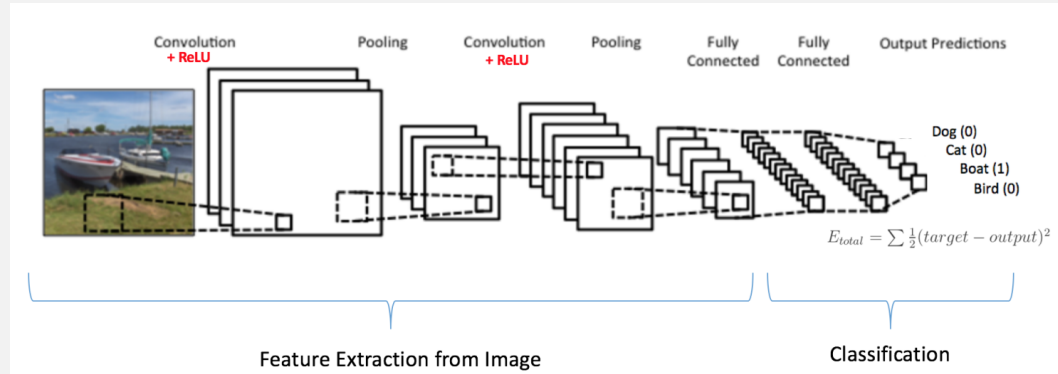
- Traditional approaches need a “dictionary”, like enumeration
- Deep learning is faster and more accurate than traditional approaches

# METHOD

## What is CNN?

- ① Input layer:
  - Thermal images and visual images
- ② Feature Extraction:
  1. Convolutional Layer
  2. Rectify linear units
  3. Maximum pooling
  4. Iterate the above 3 steps
- ③ Classification:

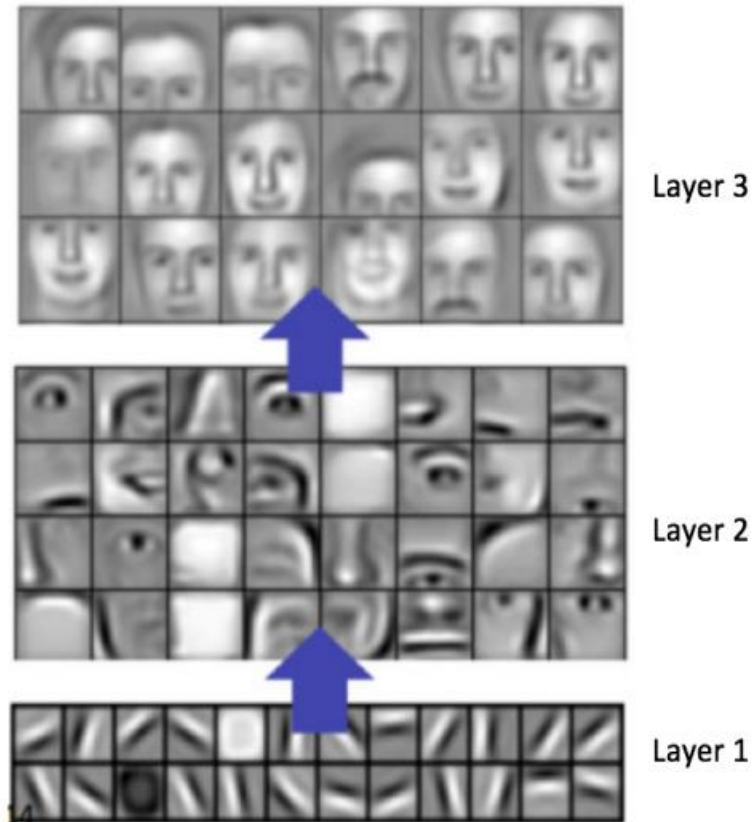
use fully connected layers to generate a vector of class score. then analyze the degree of certainty that this is a human
- ④ Output layer:
  - Make a conclusion that this a human or not
- ⑤ Draw a bounding box on each detected person



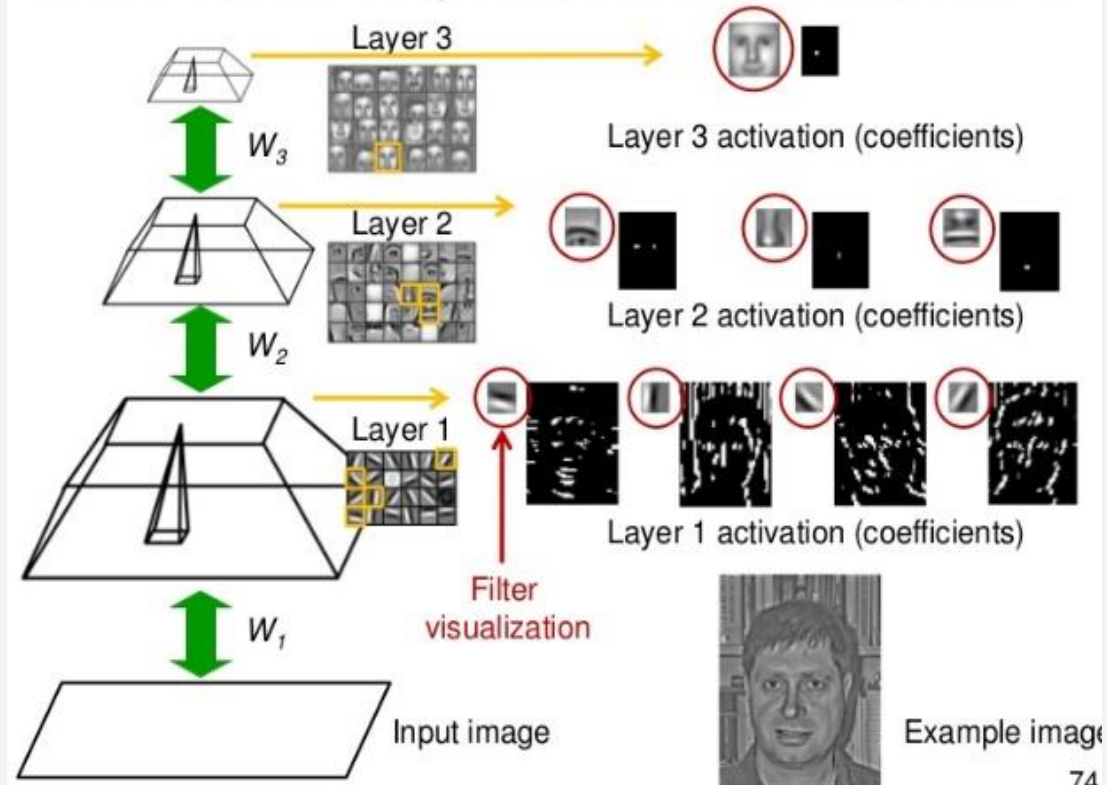
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## What is CNN?

- ① Input layer:
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- ② Feature Extraction:



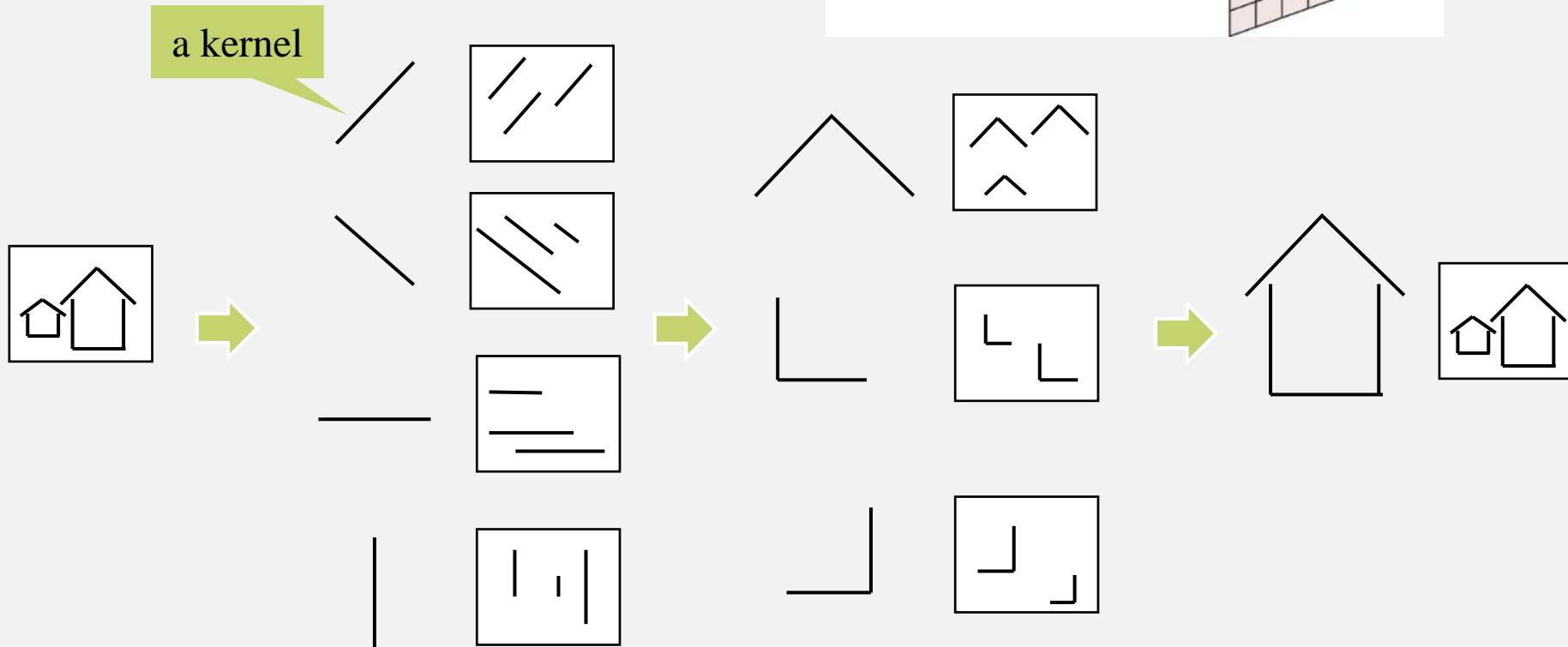
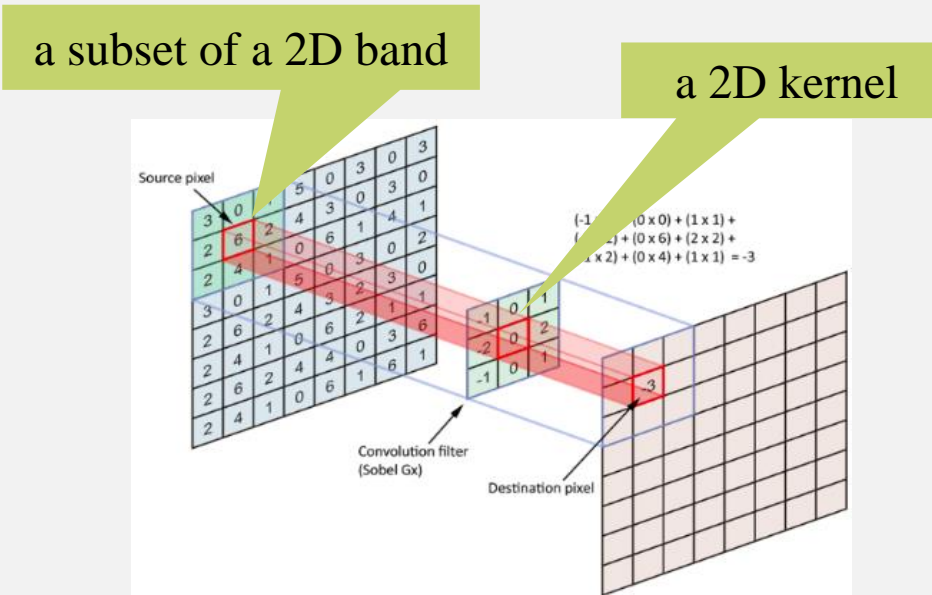
## Convolutional deep belief networks illustration



# METHOD

## What is CNN?

- ① Input layer:
  - Thermal images and visual images
- ② Feature Extraction:
  1. Convolutional Layer

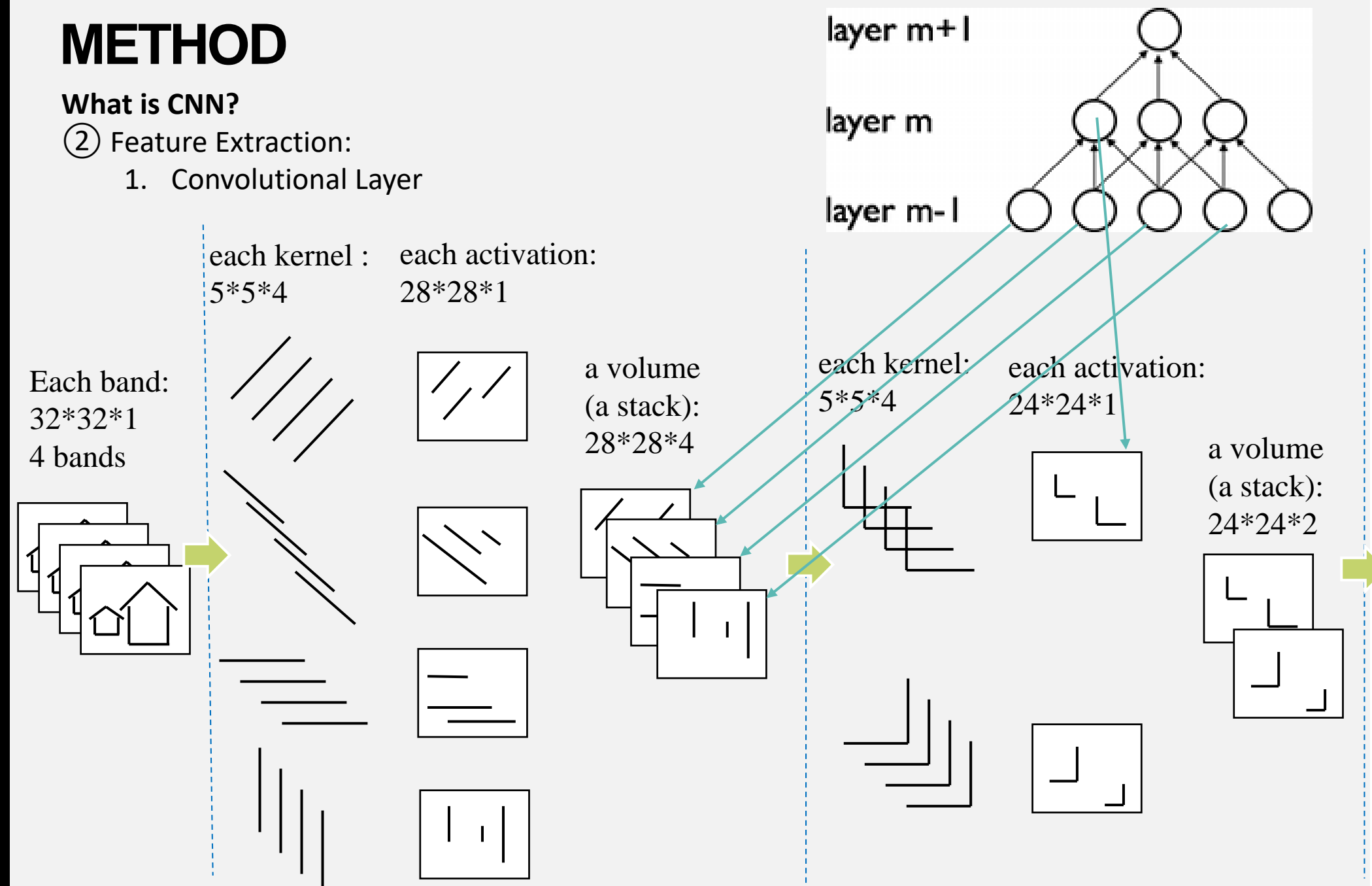


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## What is CNN?

### ② Feature Extraction:

#### 1. Convolutional Layer

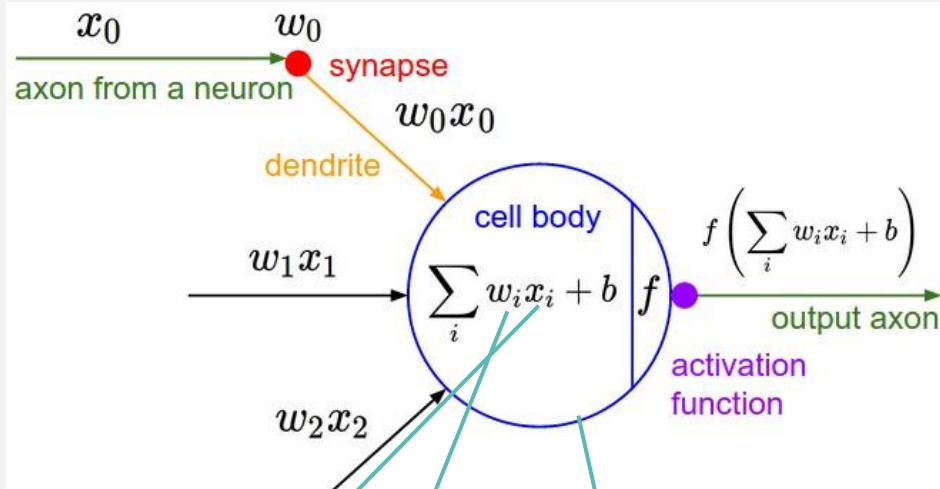


# METHOD

## What is CNN?

### ② Feature Extraction:

#### 1. Convolutional Layer



Each band:  
 $32*32*1$   
4 bands

each kernel :  
 $5*5*4$

each activation:  
 $28*28*1$

kernel  $w_0$

kernel  $w_1$

kernel  $w_2$

kernel  $w_3$

a volume  
(a stack):  
 $28*28*4$

each kernel:  
 $5*5*4$

each activation:  
 $24*24*1$

kernel  $w_0$

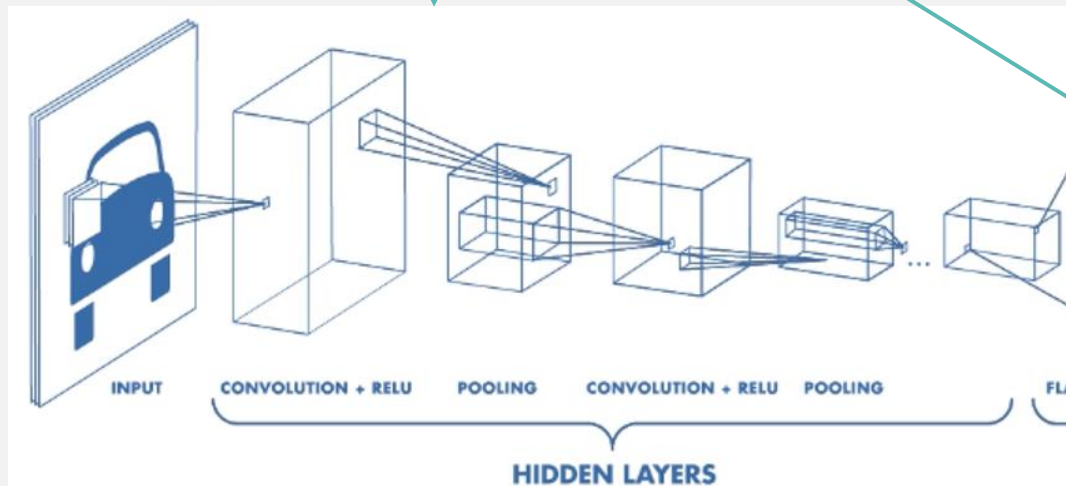
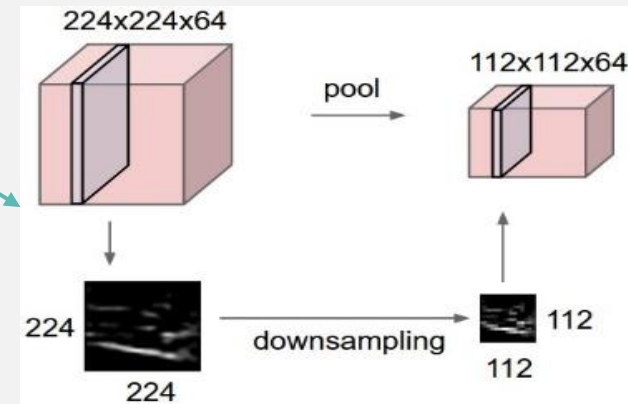
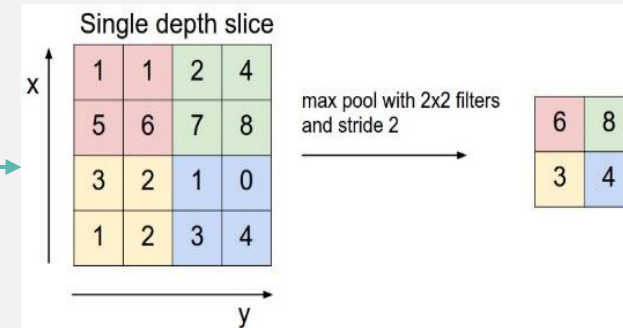
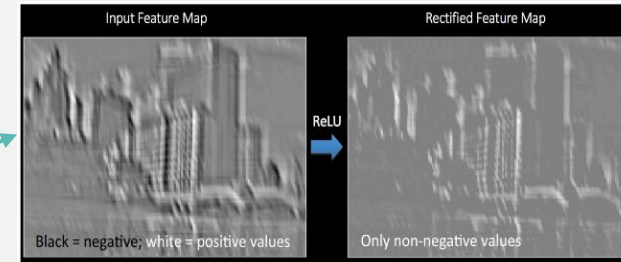
kernel  $w_1$

a volume  
(a stack):  
 $24*24*2$

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Dog (0)  
Cat (0)  
Boat (1)  
Bird (0)



car  
truck  
airplane  
ship  
horse

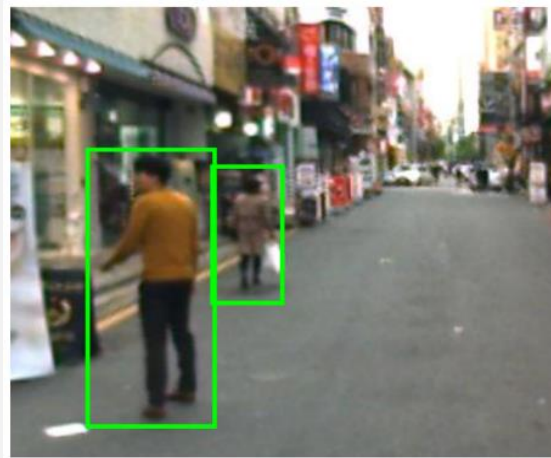


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How to apply CNN in this project?

