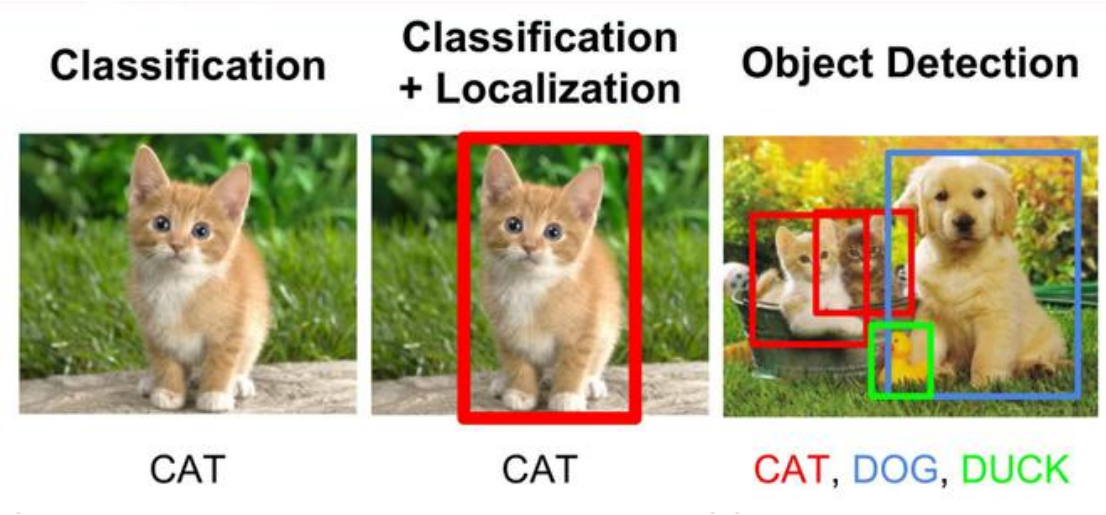
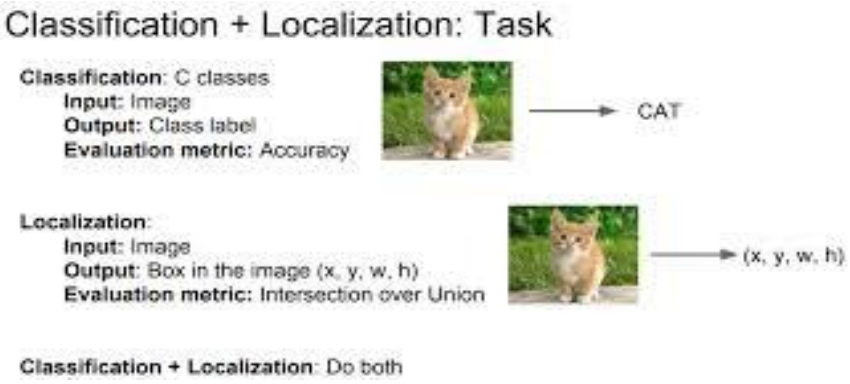
Convolutional neural network "week 3 and part of week 4"

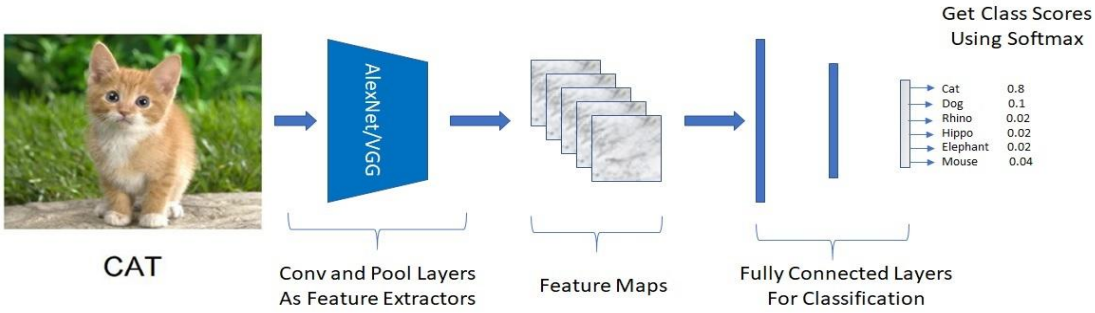
## Object localization:




In object Detection there might be multiple objects in the picture and you have detect them all and localized them

## Classification with localization



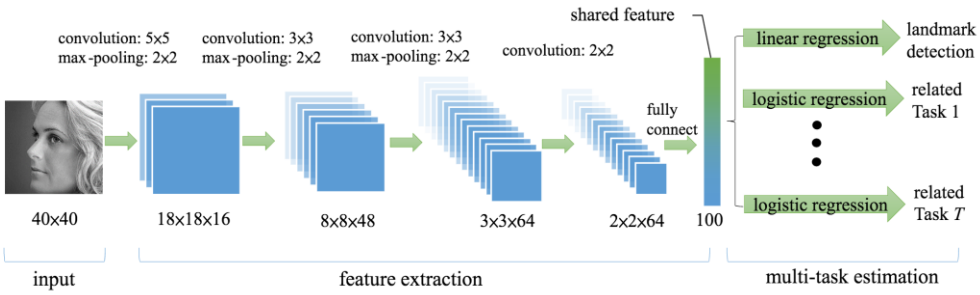



$$Y = \begin{bmatrix} p_1 \\ b_x \\ b_y \\ b_h \\ b_w \\ c_1 \\ c_2 \\ c_3 \end{bmatrix}$$

## Landmark detection

$b_x, b_y, b_h, b_w$

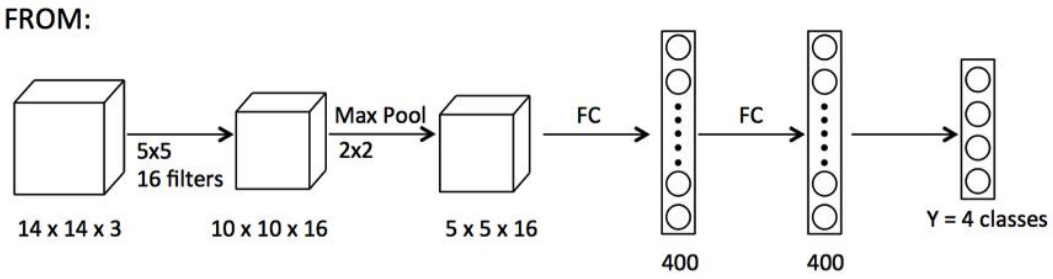
$l_{1x}, l_{1y}, l_{2x}, l_{2y}, l_{3x}, l_{3y}, l_{4x}, l_{4y}, \vdots, l_{64x}, l_{64y}$

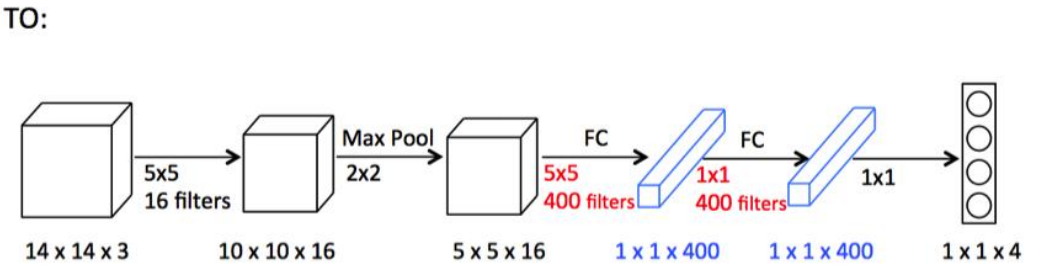



Make object detection by sliding window and change the square size and repeat

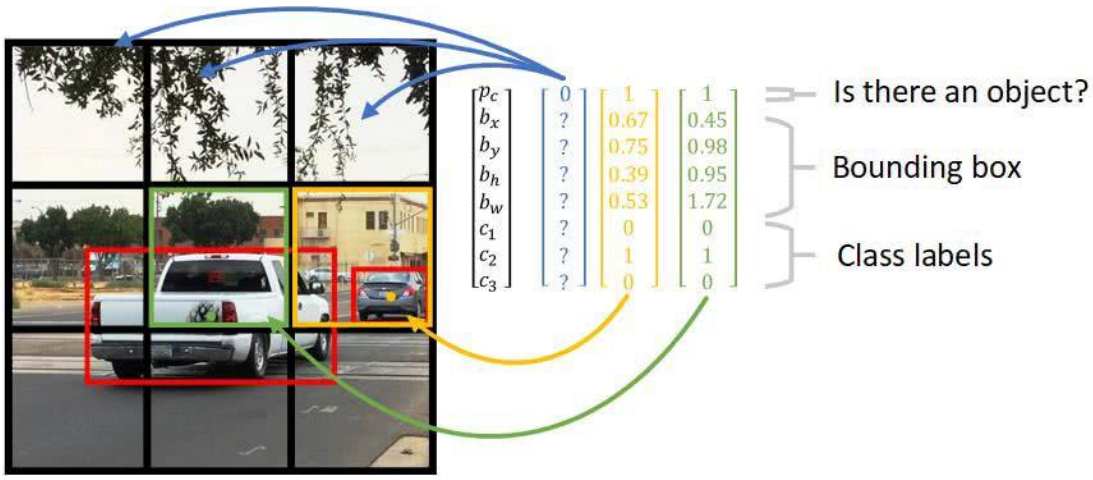
## Convolutional implementation of sliding window

Turning fc layers into convolutional layers and change the soft max layer




## Bounding box prediction

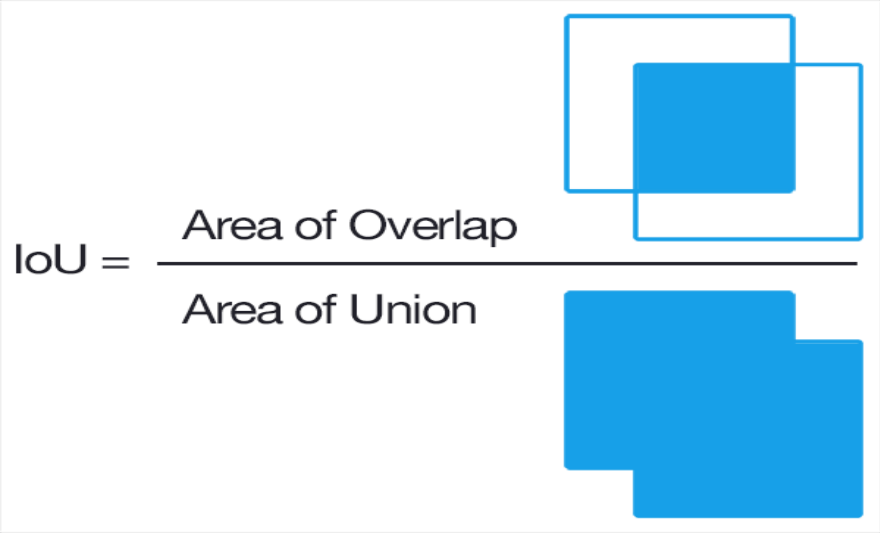



bx,by between 0&1

bH,bw could be>1

## Intersection over union "IOU"

IOU is a measure of the overlap between two bounding boxes




## Non-max Suppression

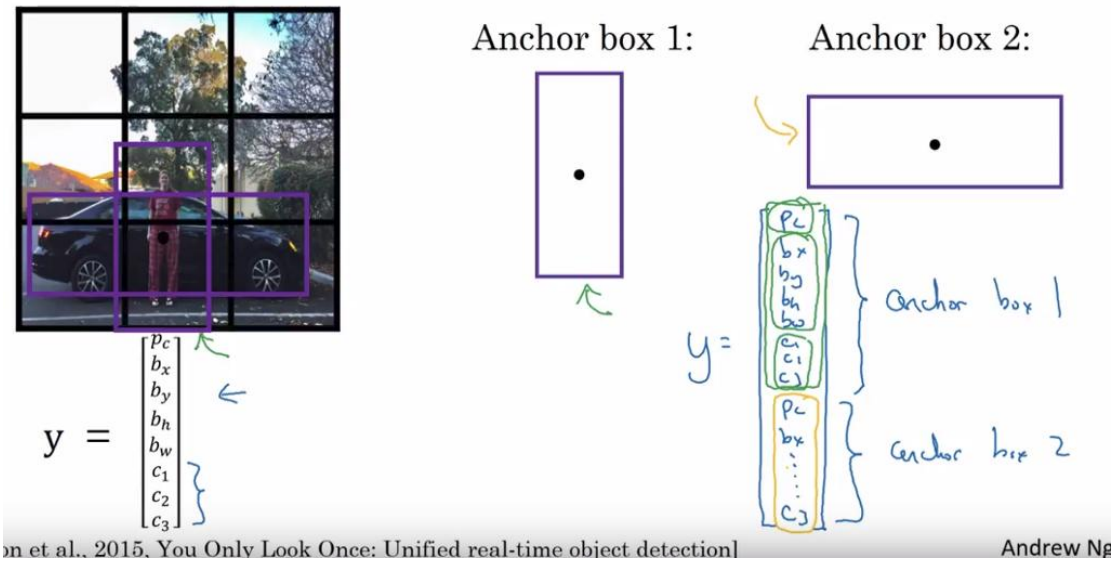
Non-max means that you are going to o/p your maximal probability classification but suppress the close by ones that are non maximal

While the rear any remaining boxes

- Pick box with the largest pc o/p that as prediction
- Discard any remaining box with IOU ≥0.5 with box o/p in the previous step

## Anchor boxes

One of the problem with object detection is each of the grid cells can detect only one objects so we use the idea of anchor boxes



Week-4 (face recognition)

# Face recognition

Demoed both face recognition as well as livens detection ,the latter meaning making sure that you are a live human

## Face verification VS face recognition

### Verification

- I/P image ,name ID
- O/P wither the I/P image is that of the claimed person

### Recognition

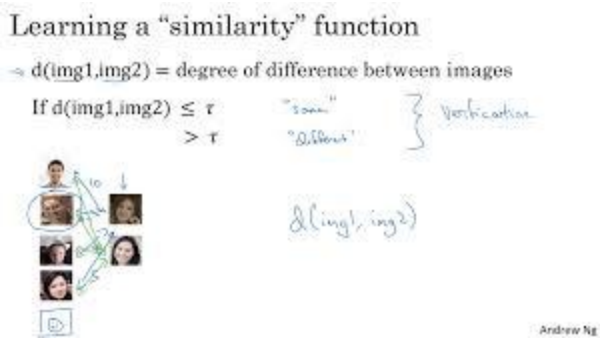
- Has a data base of K persons
- Get an I/P image
- o/p if the image is any of the K person or not recognized

- Face Authentication/Verification (1:1 matching)

- Face Identification/Recognition (1:N matching)

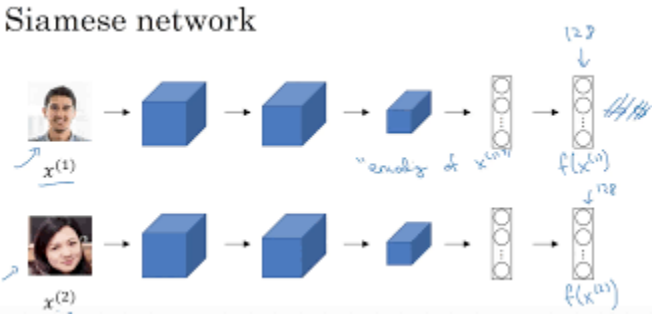
### One shot learning:

Learning from one example to recognize the person a gain




**Siamese Network**

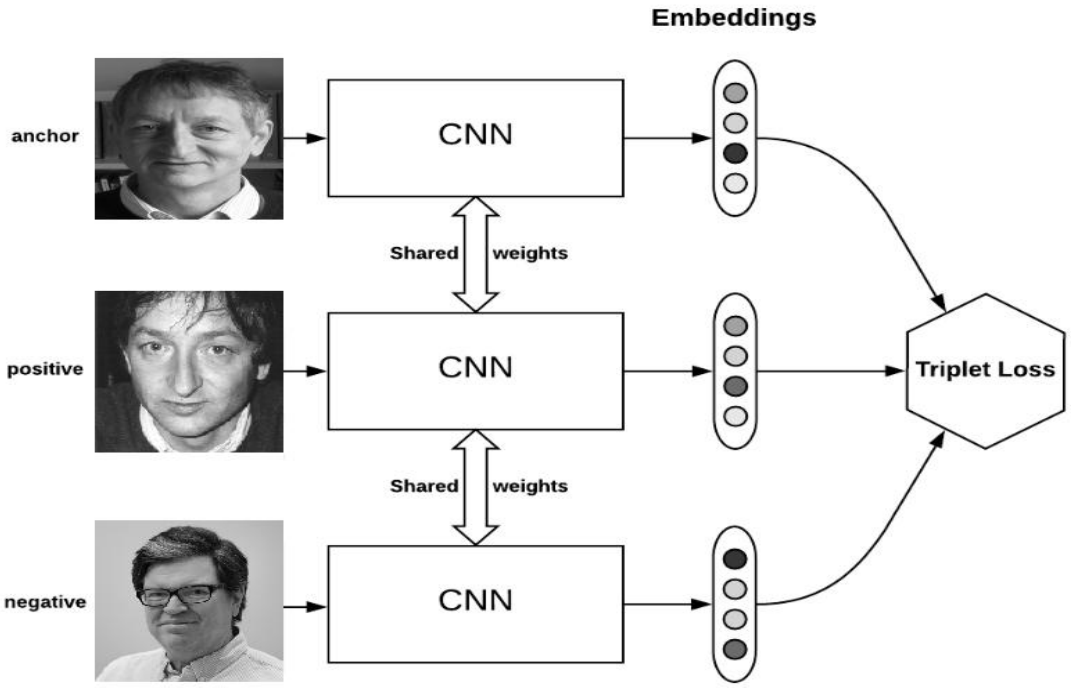
Use to tell us how different is between I/p of two faces




**Triplet loss**

Learning objective:

You well be looking at anchor image, positive image as well as negative image



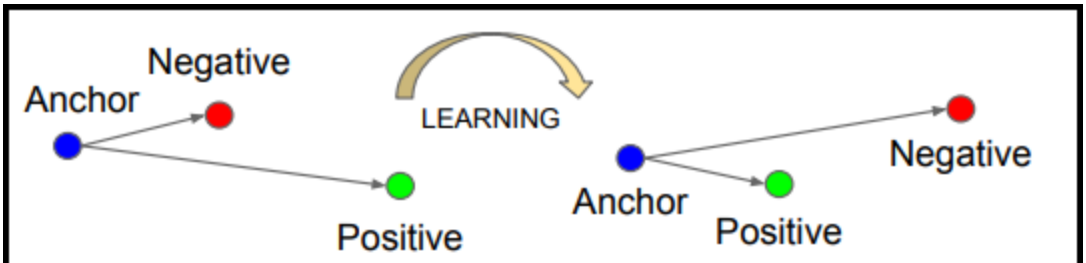



Figure 3. The **Triplet Loss** minimizes the distance between an *anchor* and a *positive*, both of which have the same identity, and maximizes the distance between the *anchor* and a *negative* of a different identity.

We use gradient decent to minimize the cost function J

## Face verification and Binary classification

Binary classification gives output as 0 or 1

And the same face verification if both these are the same persons and zero if both of these are for different persons

$$\hat{y} = \sigma\left(\sum_{k=1}^{128} w_k \left| f(x^{(i)})_k - f(x^{(j)})_k \right| + b\right)$$