



deeplearning.ai

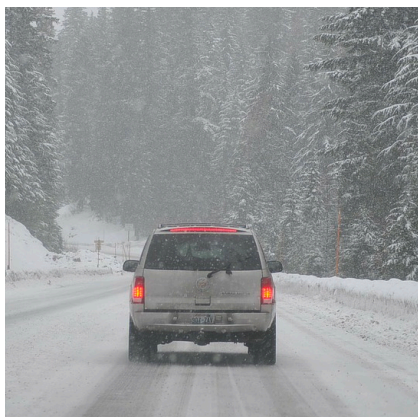
# Object Detection

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Object  
localization

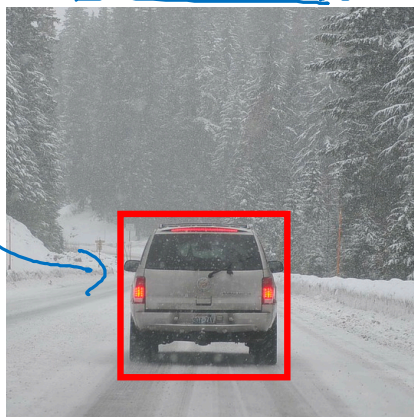
# What are localization and detection?

Image classification



"Car"

Classification with  
localization



"Car"

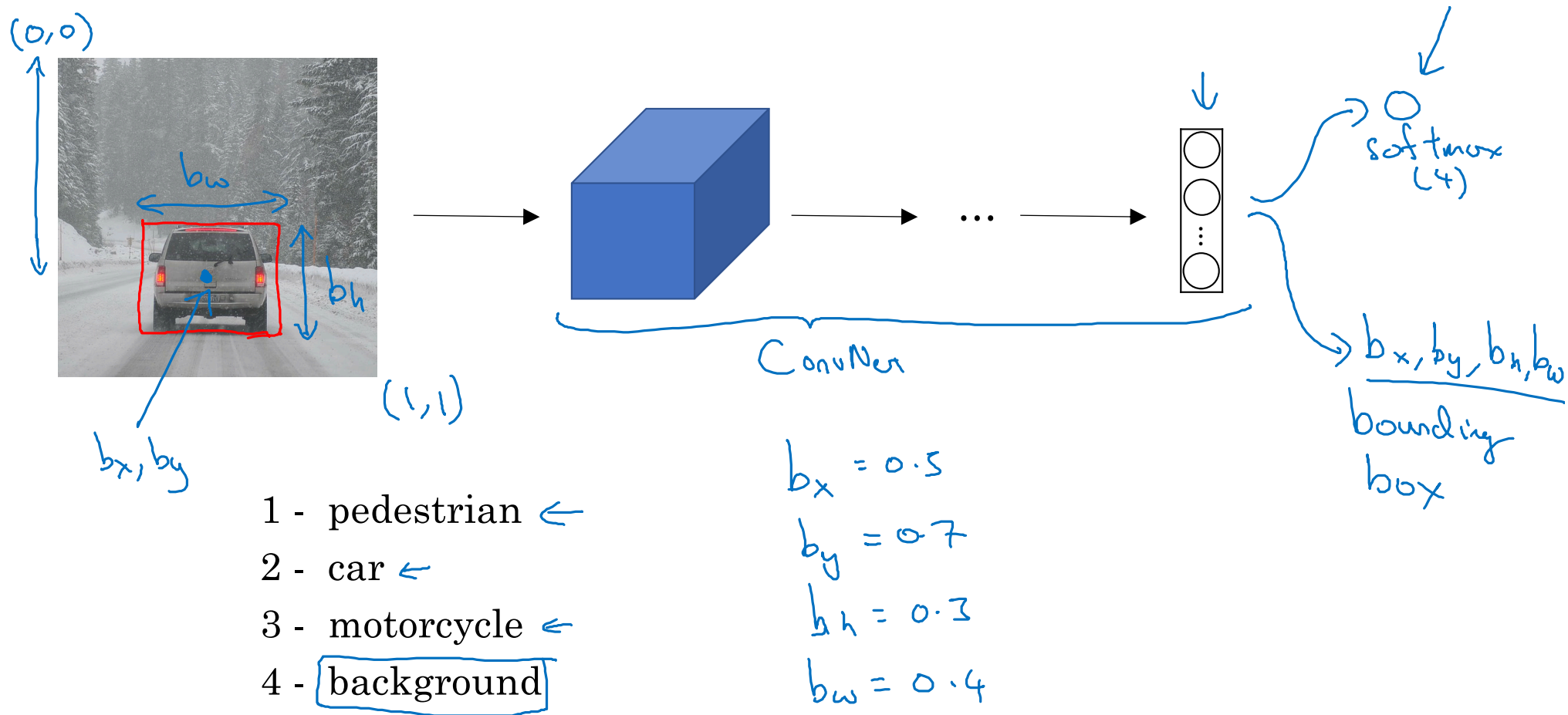
1 object

Detection



multiple  
objects

# Classification with localization



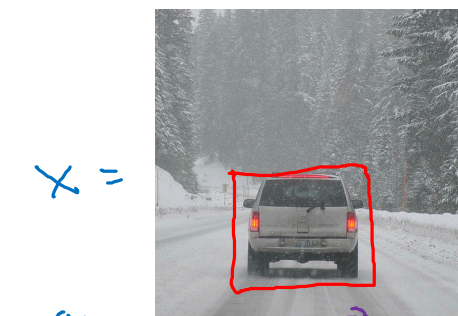
# Defining the target label $y$

- 1 - pedestrian
- 2 - car ←
- 3 - motorcycle
- 4 - background ←

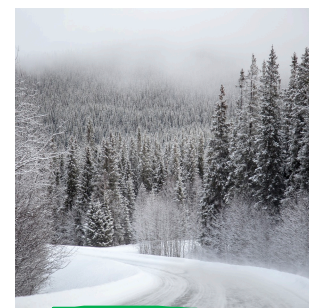
Need to output  $b_x, b_y, b_h, b_w$ , class label (1-4)

$$L(\hat{y}, y) = \begin{cases} (\hat{y}_1 - y_1)^2 + (\hat{y}_2 - y_2)^2 + \dots + (\hat{y}_8 - y_8)^2 & \text{if } \underline{y_1 = 1} \\ (\hat{y}_1 - y_1)^2 & \text{if } \underline{y_1 = 0} \end{cases}$$

$$y = \begin{bmatrix} p_c \\ b_x \\ b_y \\ b_h \\ b_w \\ c_1 \\ c_2 \\ c_3 \end{bmatrix} \quad \left. \begin{array}{l} \text{is there any} \\ \text{object?} \end{array} \right\}$$



$$(x, y) \quad \begin{bmatrix} 1 \\ b_x \\ b_y \\ b_h \\ b_w \\ 0 \\ 0 \\ 0 \end{bmatrix}$$



$$\begin{bmatrix} 0 \\ \vdots \\ \vdots \\ \vdots \\ \vdots \\ \vdots \\ \vdots \\ \vdots \end{bmatrix} \quad \left. \begin{array}{l} p_c \\ \text{"don't care"} \end{array} \right\}$$