



**Capacidad de aprender**



**Esto sí es Inteligencia Artificial**

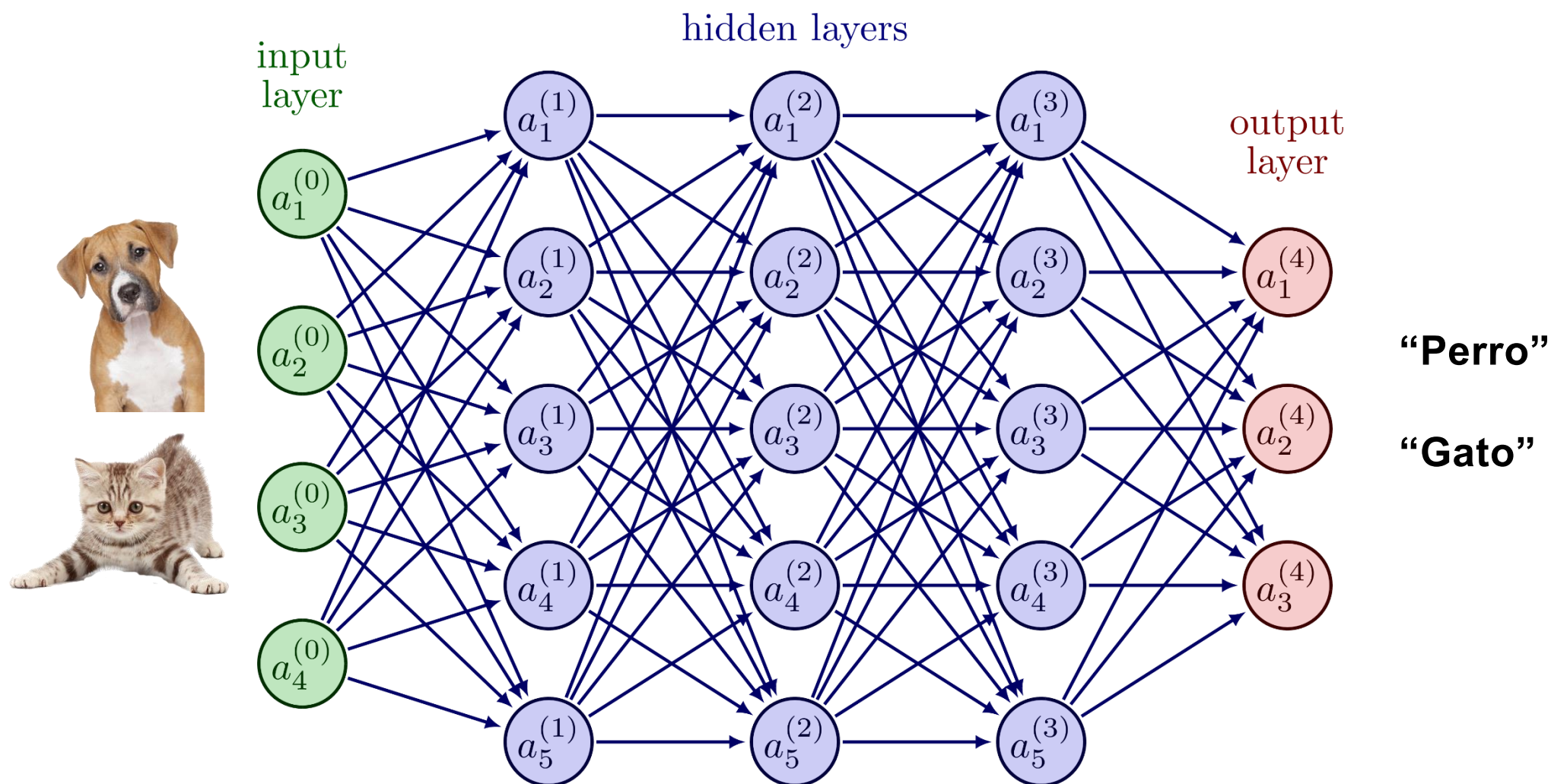
**Esto NO es Machine Learning**



**Esto sí es Inteligencia Artificial**

**Esto sí es Machine Learning**

# Redes neuronales

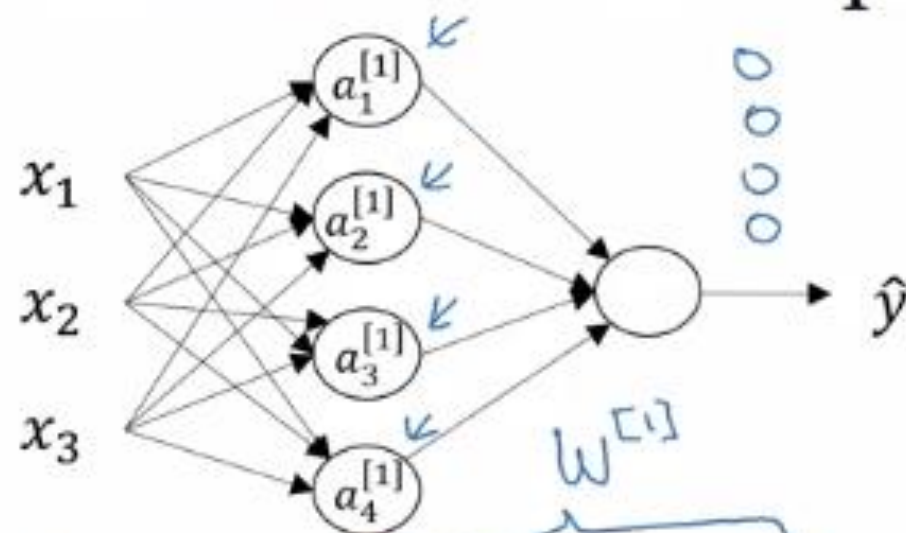




# Redes neuronales



# Neural Network Representation



$$\begin{aligned}
 z_1^{[1]} &= w_1^{[1]T} x + b_1^{[1]} & a_1^{[1]} &= \sigma(z_1^{[1]}) \\
 z_2^{[1]} &= w_2^{[1]T} x + b_2^{[1]} & a_2^{[1]} &= \sigma(z_2^{[1]}) \\
 z_3^{[1]} &= w_3^{[1]T} x + b_3^{[1]} & a_3^{[1]} &= \sigma(z_3^{[1]}) \\
 z_4^{[1]} &= w_4^{[1]T} x + b_4^{[1]} & a_4^{[1]} &= \sigma(z_4^{[1]})
 \end{aligned}$$

Handwritten notes:  $(w_1^{[1]})^T x$  and  $a^{[1]}$  are circled in red. A blue arrow points from the  $a^{[1]}$  column to the  $z^{[1]}$  column.

$$z^{[1]} = \begin{bmatrix} w_1^{[1]T} \\ w_2^{[1]T} \\ w_3^{[1]T} \\ w_4^{[1]T} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} b_1^{[1]} \\ b_2^{[1]} \\ b_3^{[1]} \\ b_4^{[1]} \end{bmatrix} = \begin{bmatrix} w_1^{[1]T} x + b_1^{[1]} \\ w_2^{[1]T} x + b_2^{[1]} \\ w_3^{[1]T} x + b_3^{[1]} \\ w_4^{[1]T} x + b_4^{[1]} \end{bmatrix} = \begin{bmatrix} z_1^{[1]} \\ z_2^{[1]} \\ z_3^{[1]} \\ z_4^{[1]} \end{bmatrix}$$

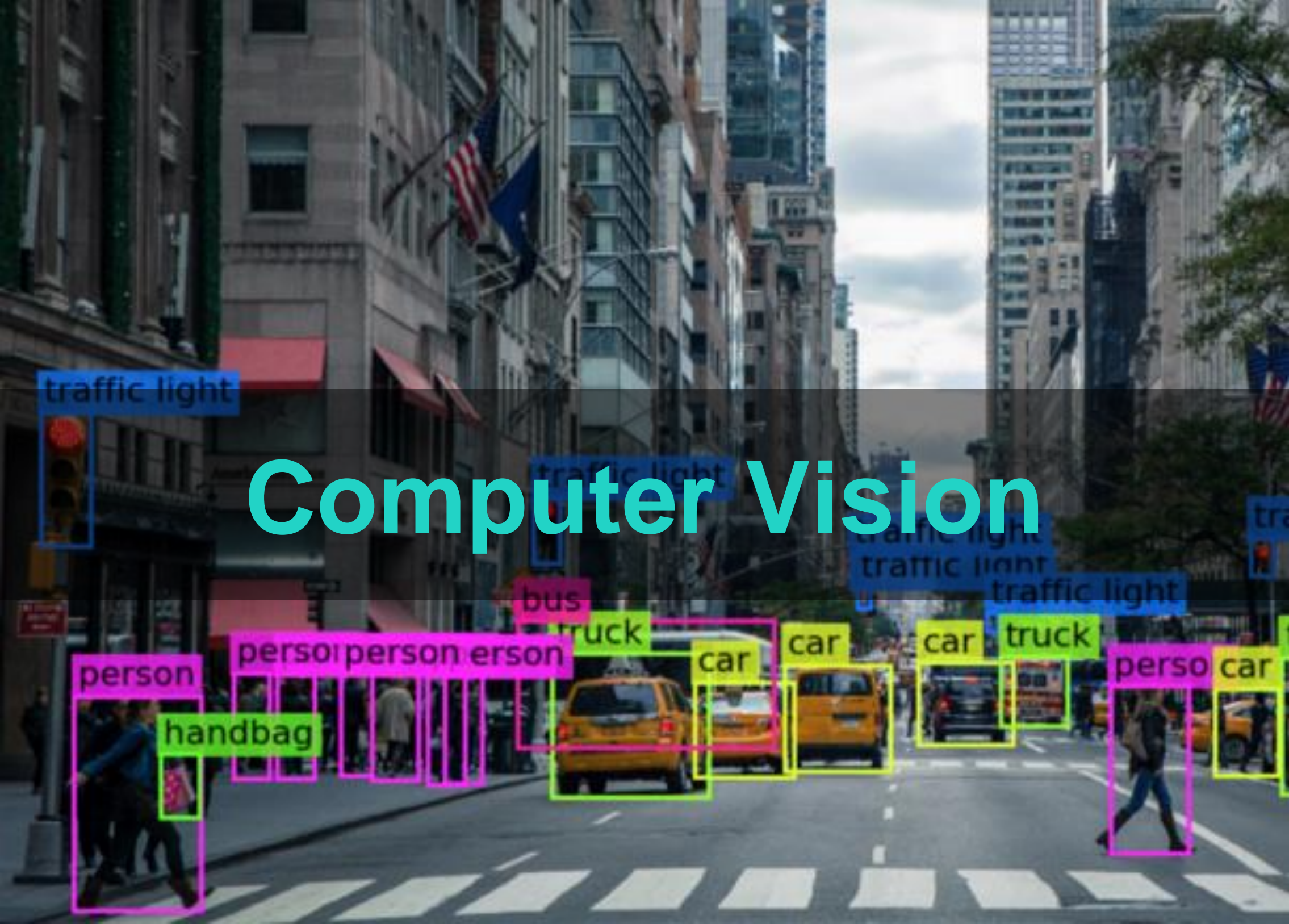
$$a^{[1]} = \begin{bmatrix} a_1^{[1]} \\ \vdots \\ a_4^{[1]} \end{bmatrix} = \sigma(z^{[1]})$$

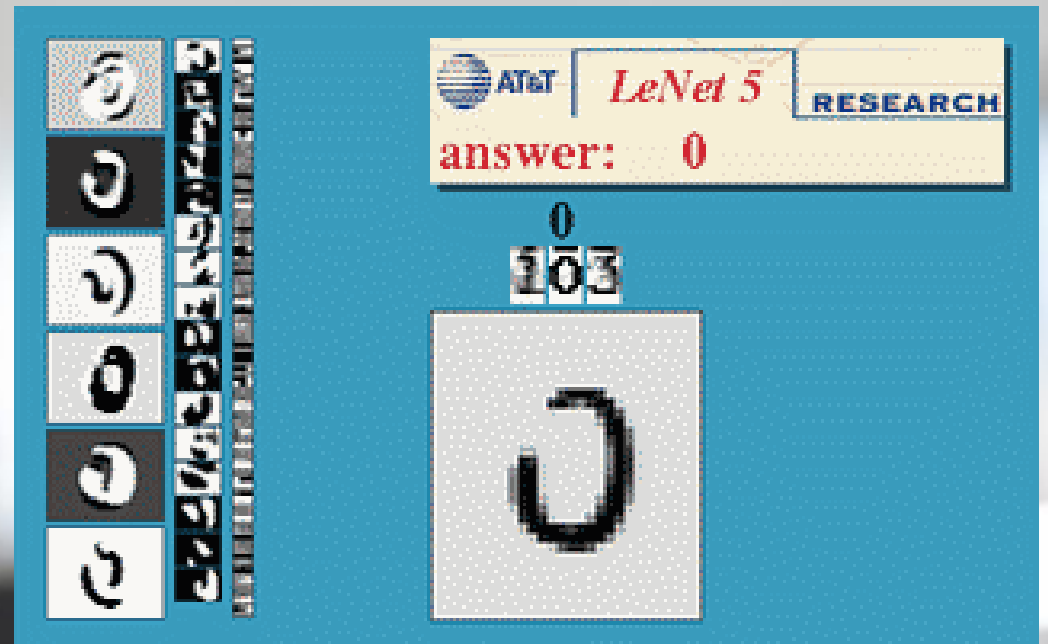
Handwritten notes:  $(4, 3)$  is written below the weight matrix, and  $(4, 1)$  is written below the bias vector.

Andrew Ng



# Computer Vision





Yann Lecun



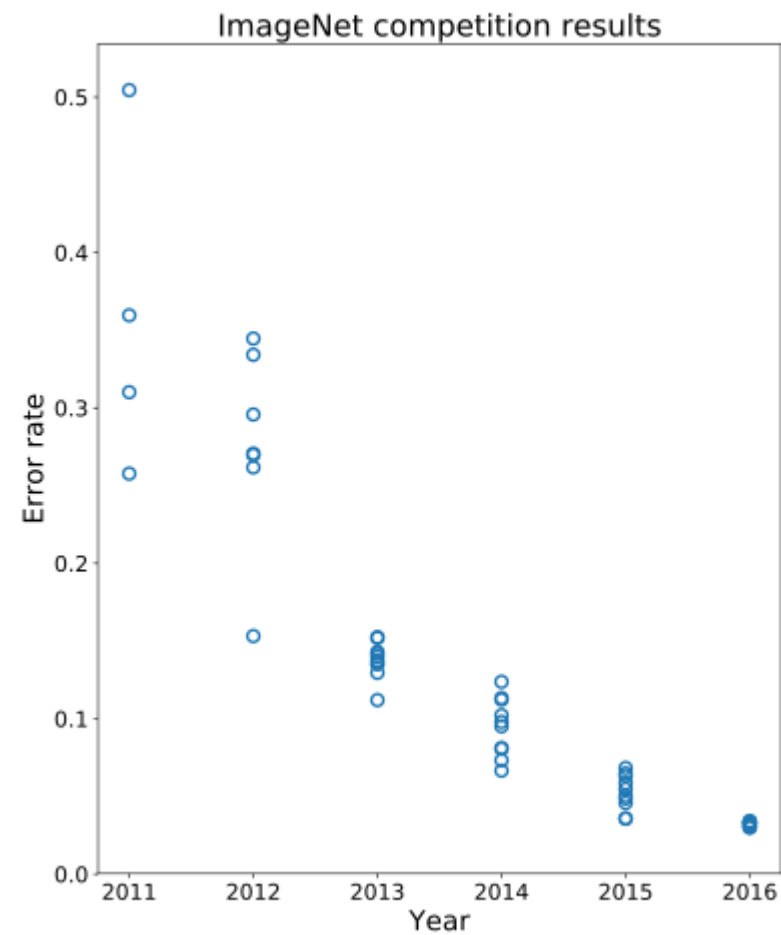


# ImageNet

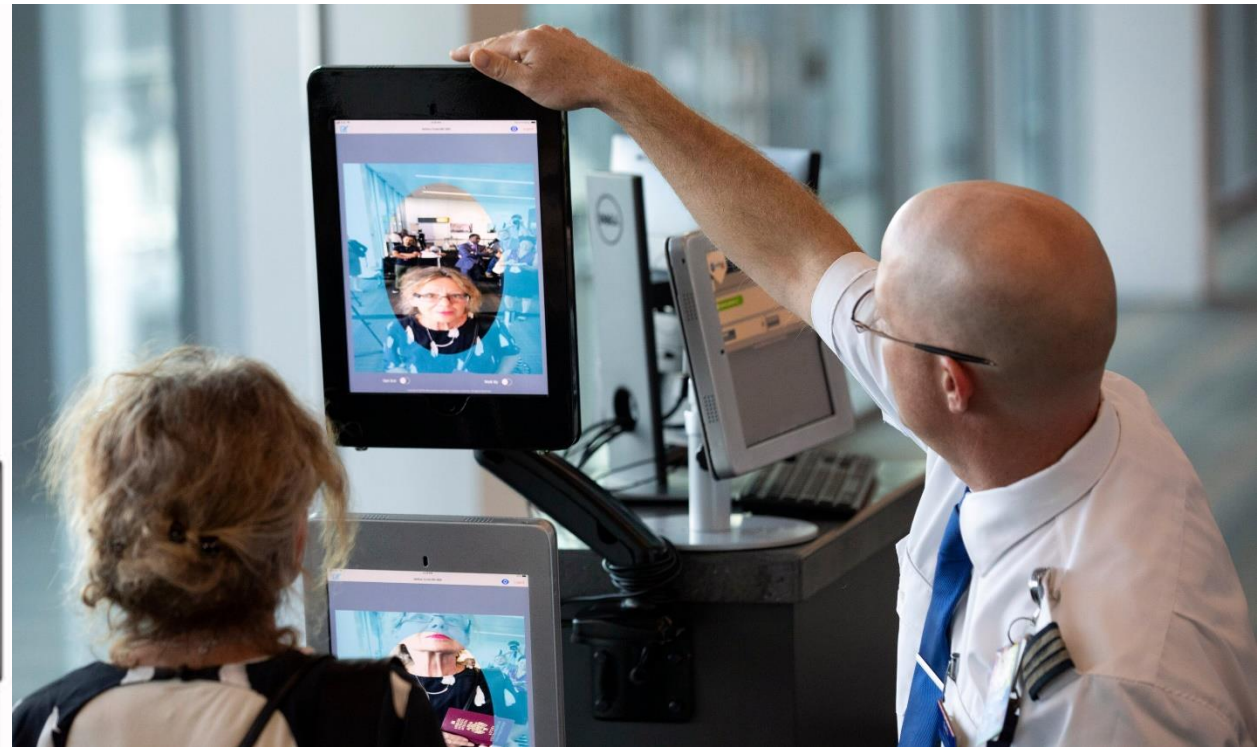
+14.000.000 imágenes (+20.000 clases)



# Redes neuronales



# Sistemas de seguridad biométricos





Camera 1

1

Vehicle 23

Cycle 41

Ped 29

Alert 0

100%



# Videovigilancia con IA



# Coches autónomos







red.es



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