deeplearning.ai

Multi-class classification

Softmax regression

(classify more than 2 objects)

Recognizing cats, dogs, and baby chicks, other (0)

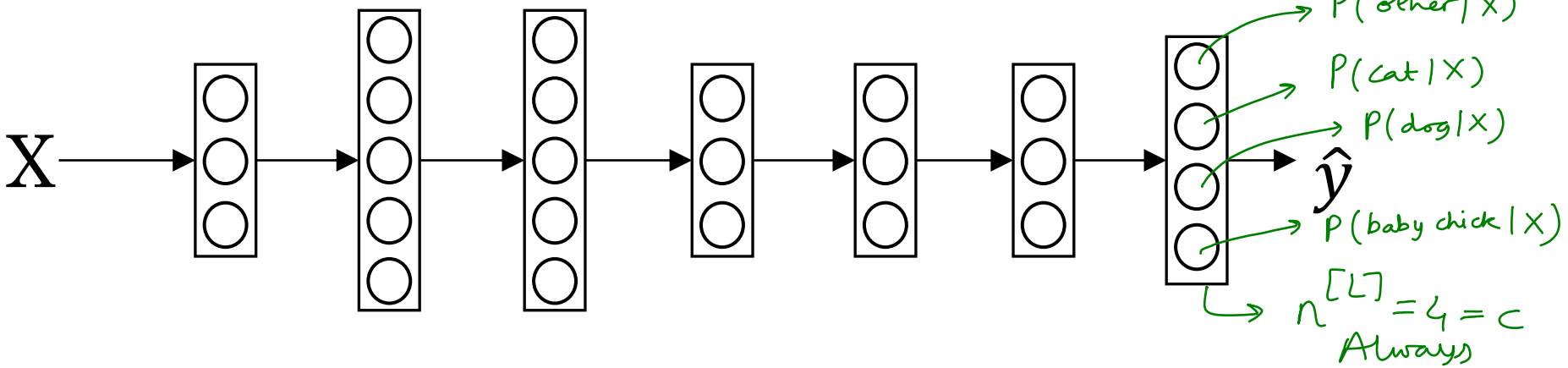
↳1 ↳2 ↳3

3 1 2 0 3 2 0 1

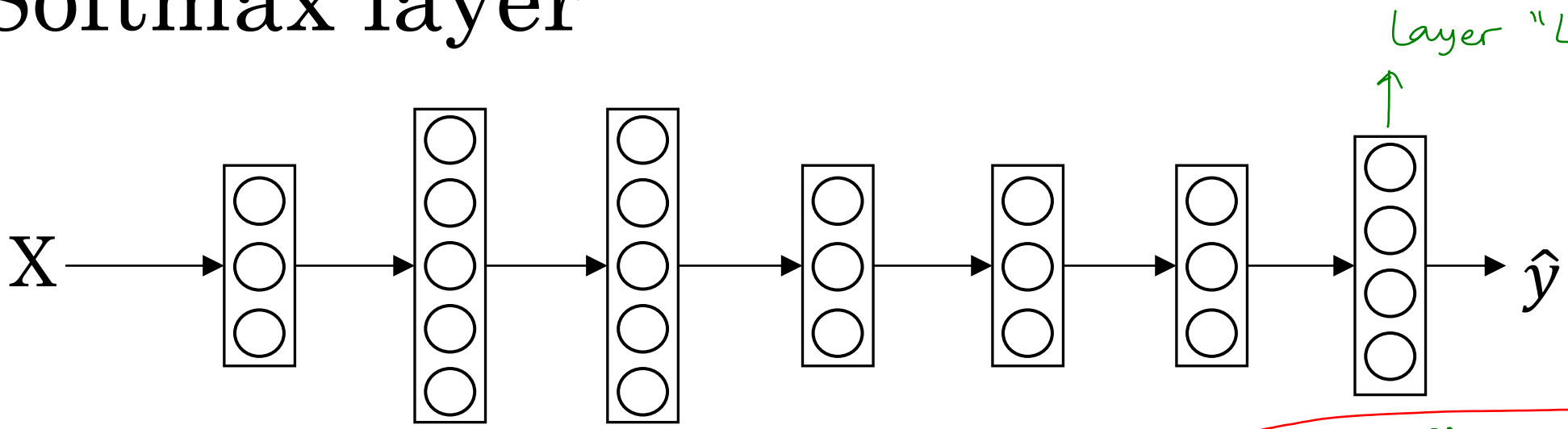
C = # classes = 4 [0, 1, 2, 3]

$\hat{y}$ = (4 × 1)

$\sum$ all prob = 1



Softmax layer



$$z^{[L]} = W^{[L]} \cdot a^{[L-1]} + b^{[L]}$$

Activation func for softmax

$$temp = e^{z^{[L]}}$$ element wise

ie, $temp = \begin{bmatrix} e^{z_1^{[L]}} \\ e^{z_2^{[L]}} \\ e^{z_3^{[L]}} \\ e^{z_4^{[L]}} \end{bmatrix}$ (4×1)

$$a_i^{[L]} = \frac{e^{z_i^{[L]}}}{\sum_{j=1}^{4} temp_j} = \frac{temp_i}{\sum_{j=1}^{4} temp_4}$$

eg $z^{[L]} = \begin{bmatrix} 5 \\ 2 \\ -1 \\ 3 \end{bmatrix} \Rightarrow temp = \begin{bmatrix} e^5 \\ e^2 \\ e^{-1} \\ e^3 \end{bmatrix}$

$\sum temp = 176.3$

$a^{[L]} = \frac{temp}{\sum temp} =$

$a_1^{[L]} = \frac{e^5}{176.3} = .842$

$a_2^{[L]} = \frac{e^2}{176.3} = .042$

$a_3^{[L]} = \frac{e^{-1}}{176.3} = .002$

$a_4^{[L]} = e^3/176.3 = 0.14$

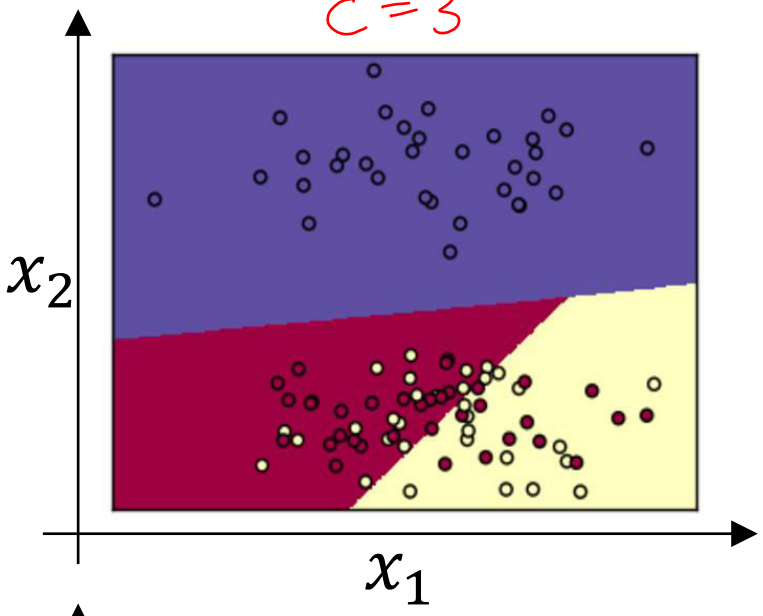
Note that the prob sums to 1

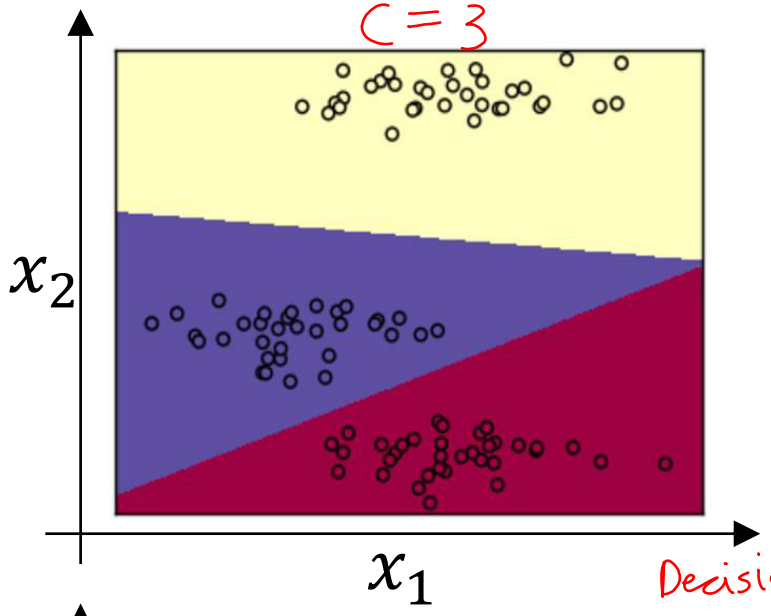
Softmax examples

$z^{[1]} = W^{[1]}X + b^{[1]}$

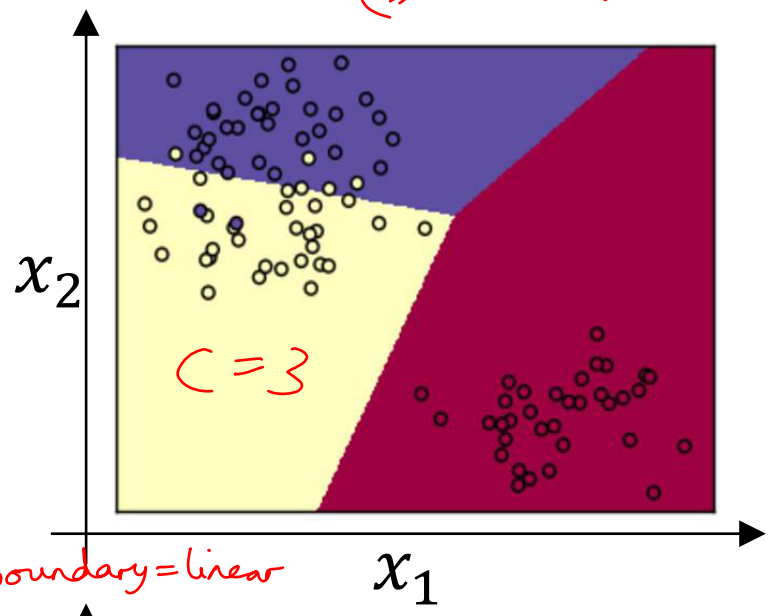
$a^{[1]} = \hat{y} = g(z^{[1]}) = \text{Softmax}(z^{[1]})$

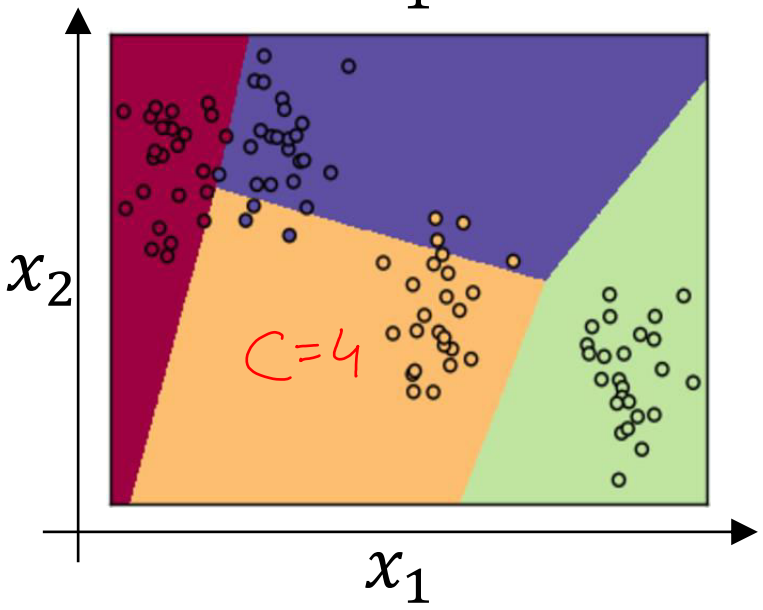
Here we are predicting multiclass ification problem (≥ 2 classification)

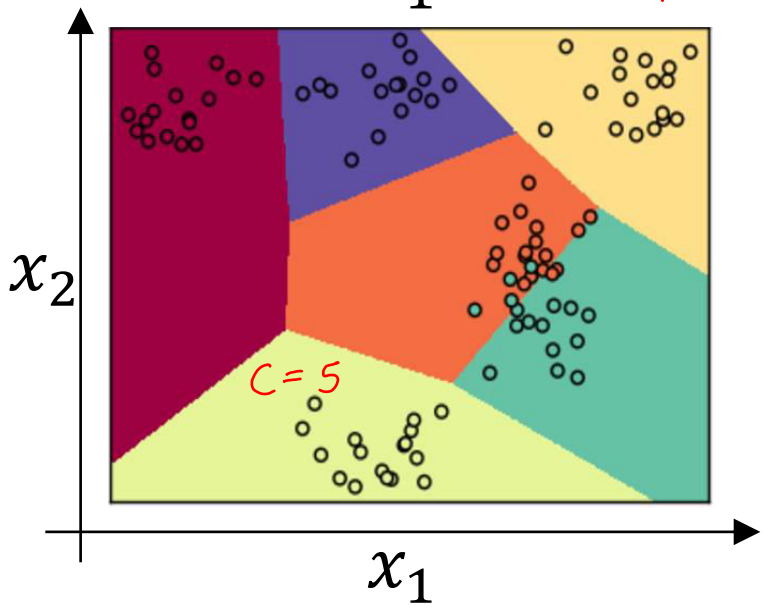


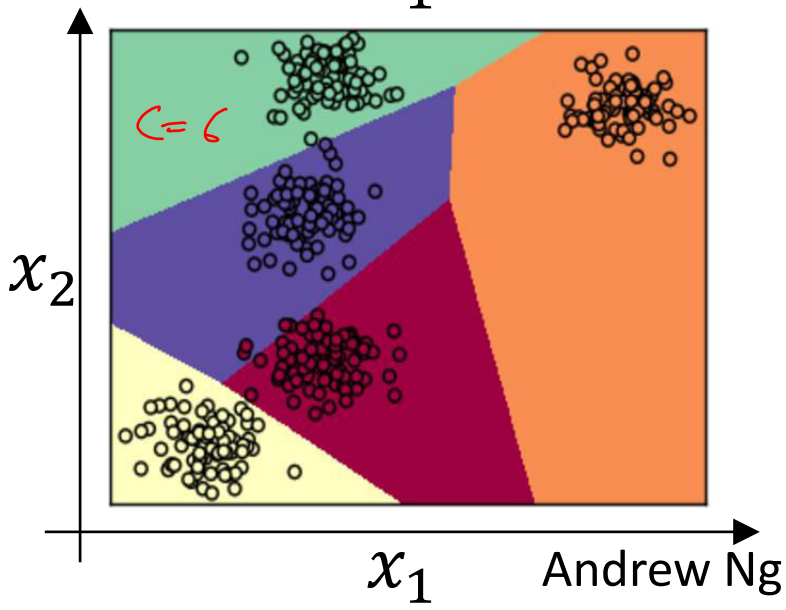


Decision boundary = linear









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