A Brief Introduction to ML 2

credit:https://speech.ee.ntu.edu.tw/~hylee/ml/ml2021-course-data/classification_v2.pdf

Regression

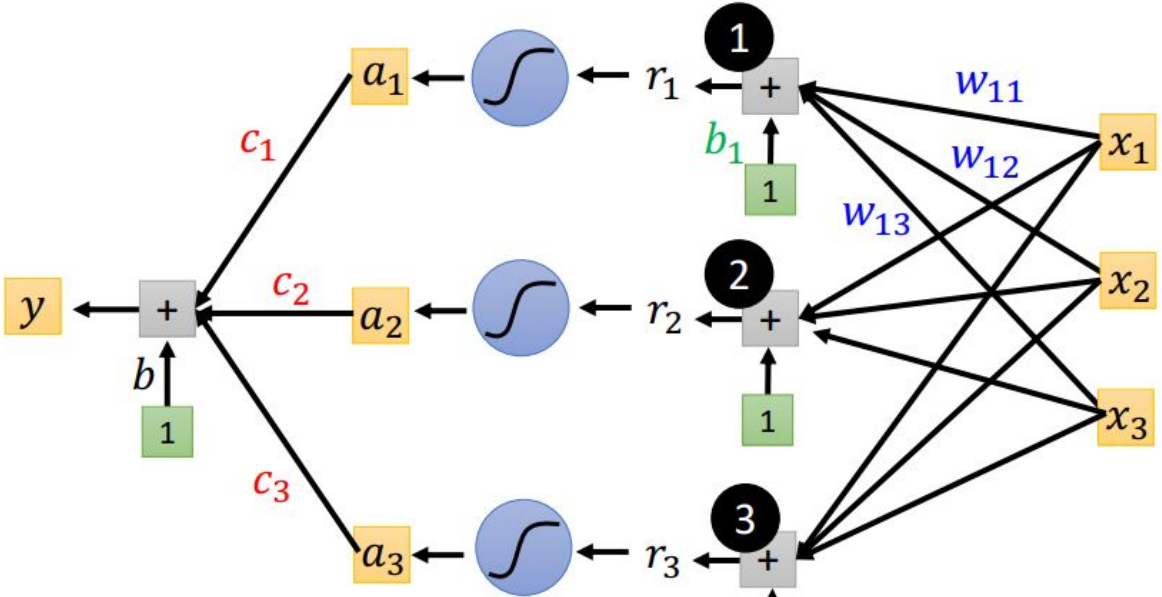
$$y = b + \sum_i c_i \, sigmoid\left(b_i + \sum_j w_{ij} x_j\right)$$

i: 1,2,3

j: 1,2,3

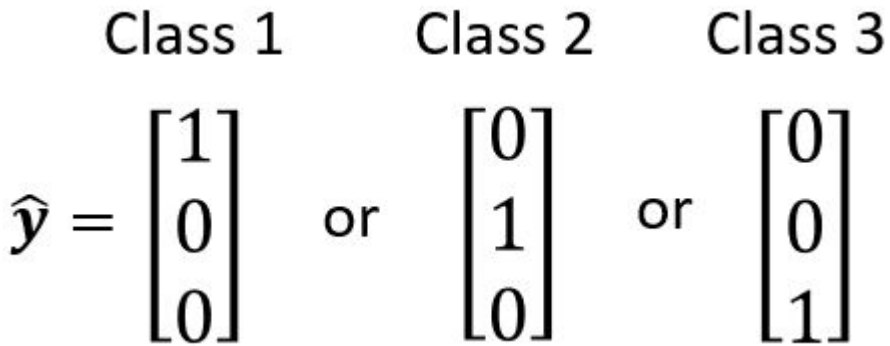
How to do classification?

How to indicate the output class?



$$y = b + \boldsymbol{c}^T \boldsymbol{a}$$

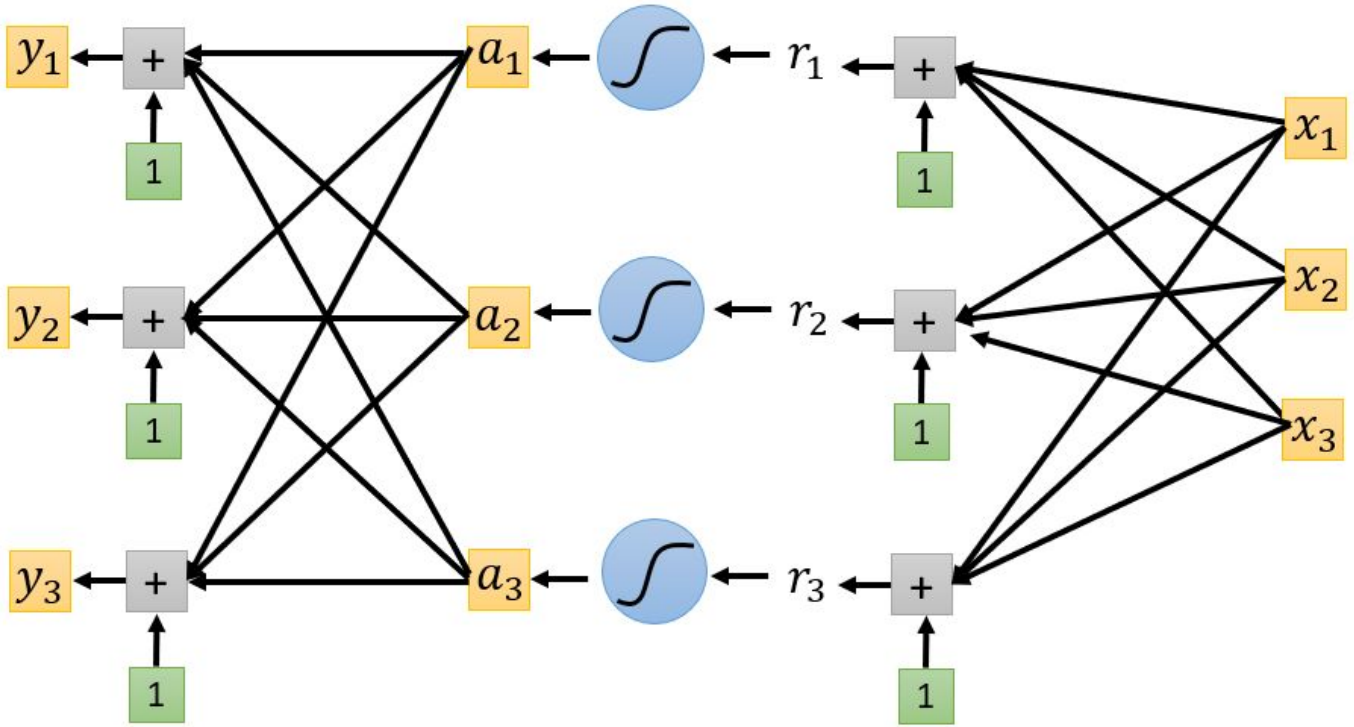
One-hot Vector



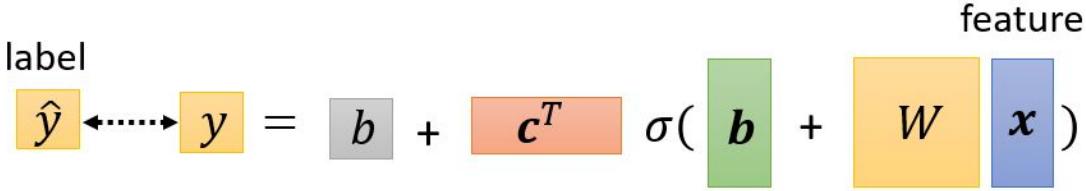
Classification

y=[y1,y2,y3]

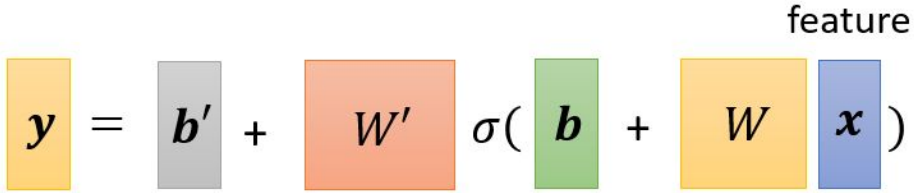
ŷ=[1,0,0]

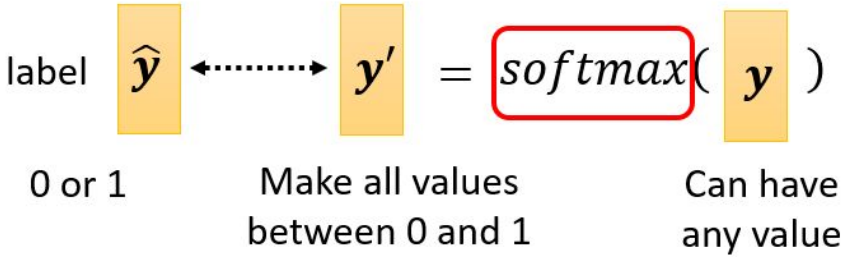


Regression



Classification



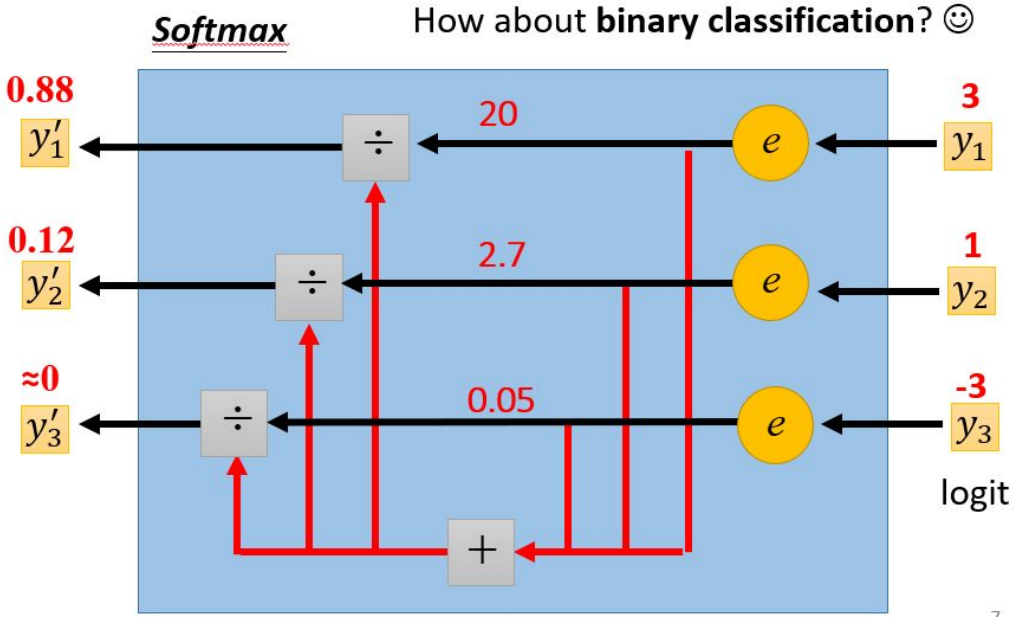


softmax

y=[0.88,0.12,0]
ŷ=[1,0,0]

Soft-max $y_i' = \frac{exp(y_i)}{\sum_j exp(y_i)}$

- $1 > y_i' > 0$
- $\sum_i y_i' = 1$



Loss Functions

Mean Square Error (MSE) $e = \sum_i (\hat{\boldsymbol{y}}_i - \boldsymbol{y}'_i)^2$

Cross-entropy $e = -\sum_i \hat{\boldsymbol{y}}_i ln \boldsymbol{y}'_i$

ln(1)=0, ln(0.1)=-2.30258…, ln(0.5)=-0.69314…