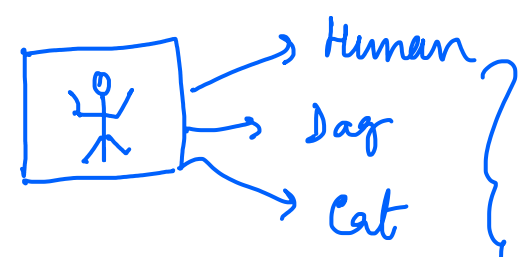
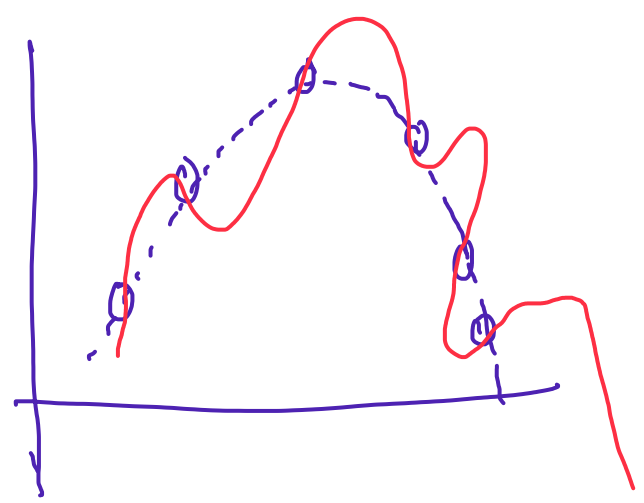
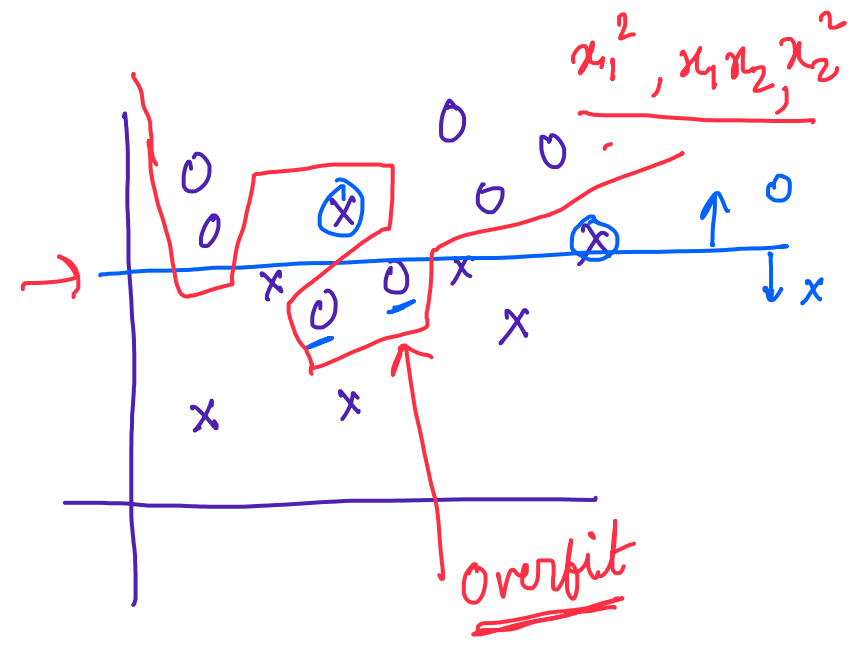
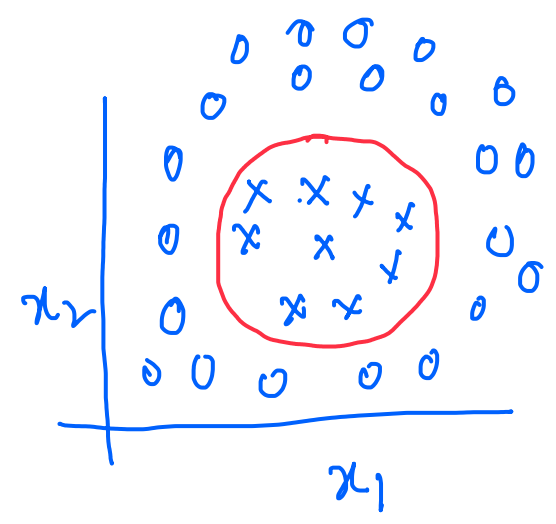
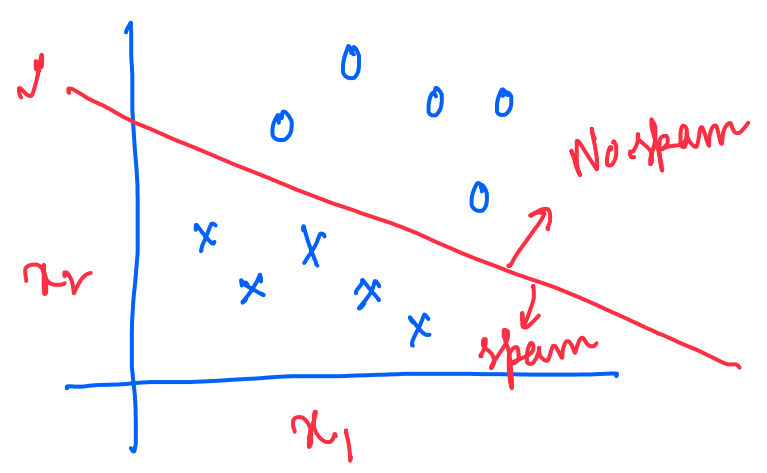


Classification →

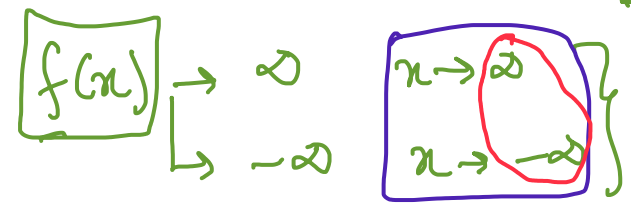
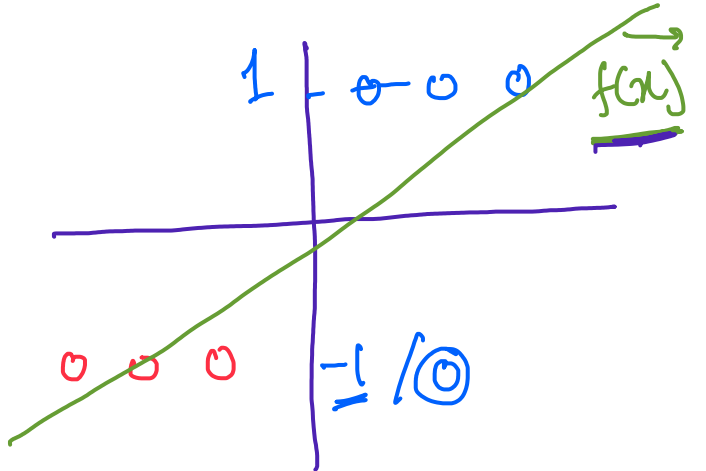
- spam / no-spam 1 — Email → words, style
- pass / fail 1 — Subject
- Male / female 1 — (W, A)



Object identification



$y = ax^2 + bx + c$
 $\checkmark y = \underline{ax^5} + bx^4 + \dots \leftarrow \text{overfit } x$

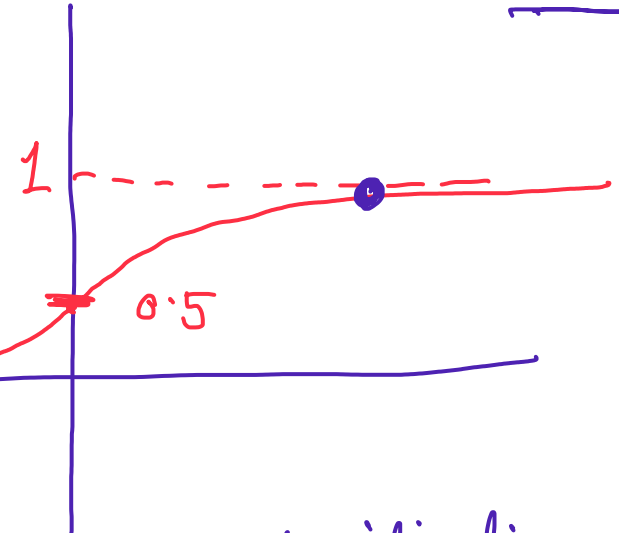


0, 1 → probability

$$f(x) = \frac{1}{1 + e^{-x}} \text{ (Sigmoid)}$$

$f(w) = w_0 + w_1 x_1 + w_2 x_2 + \dots$

Unnormalized probability



Quiz-3
 31.3.2022
 2 PM

Classification

$h(w) = \frac{1}{1 + e^{-f(w)}}$

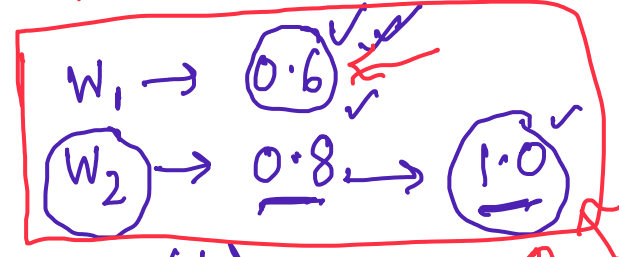
p

0 - 1

binary classification

Prob

Class - 1



Class-0: $1-p$

Cost($w, y_i=0$)

$= -\log(1-p)$

$(y_i - \hat{y}_i)^2$
 $\rightarrow f(x_i, w)$

Cost($w, y_i=1$) = $-\log(p)$

$h(w_j x_i) \rightarrow$ probability

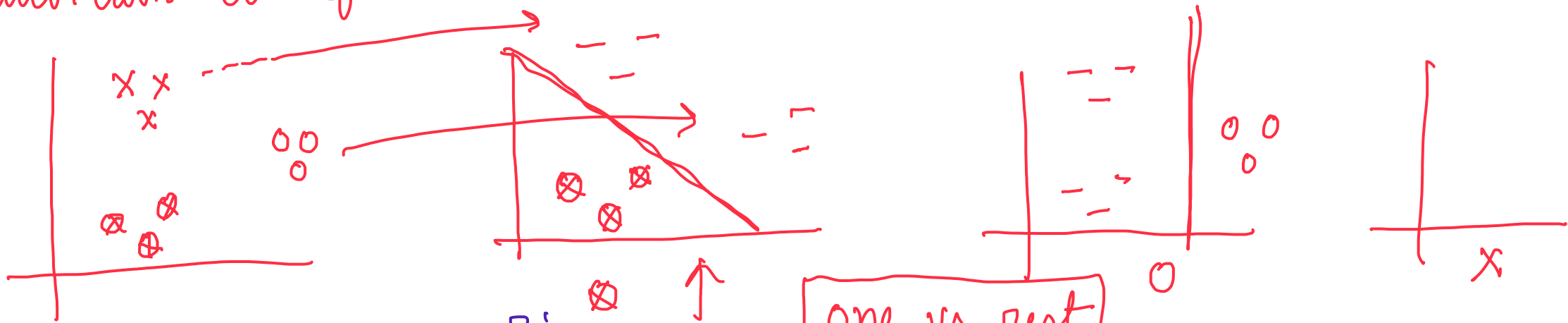
$J(w) = 2$

Cost($h(w_i, x_i), y_i$) = $y_i \times \log h(w_i, x_i) + (1-y_i) \log(1-h(w_i, x_i))$

$\rightarrow \begin{cases} h(w, x_i) & \text{prob for example } x_i \\ h(w, x_j) & \text{--- --- --- } x_j \end{cases}$

$\left(\prod_{i=1}^k h(w, x_i) \prod_{i \notin I} (1 - h(w, x_i)) \right) \leftarrow$
 $\underbrace{\quad}_{\text{class } I}$

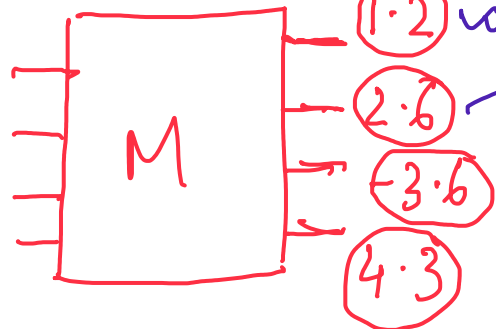
Multi class classification



Softmax

w

I



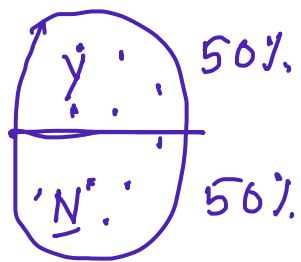
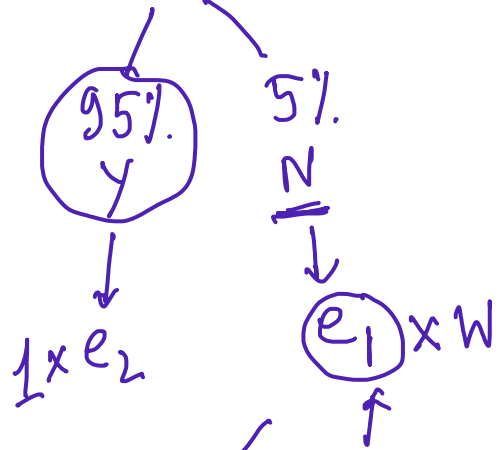
one vs rest

$$\frac{e^{1.2}}{e^{1.2} + e^{2.6} + e^{-3.6} + e^{4.3}}$$

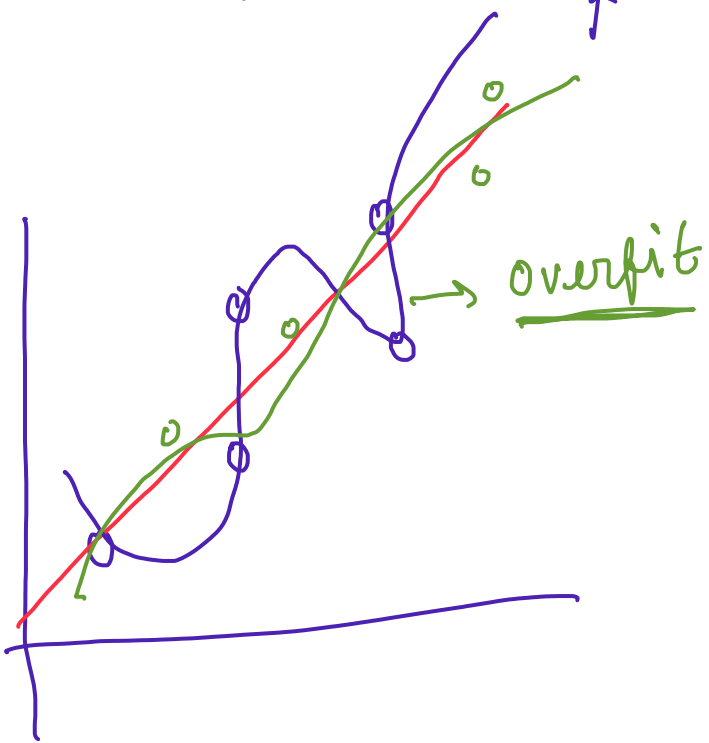
$0 < v < 1$

$$\frac{e^{z_i}}{\sum e^{z_i}}$$

Imbalanced class



- discard some 'y' examples
- Replicate / Augmentation



$$y = w_0 + w_1 x$$

$$\rightarrow y = w_0 + w_1 x + \dots + w_4 x^4$$

Regularization

$$J(w) + \lambda |w|^2$$

$0 < \lambda < 1$

w

$$J(w) + \lambda |w|$$