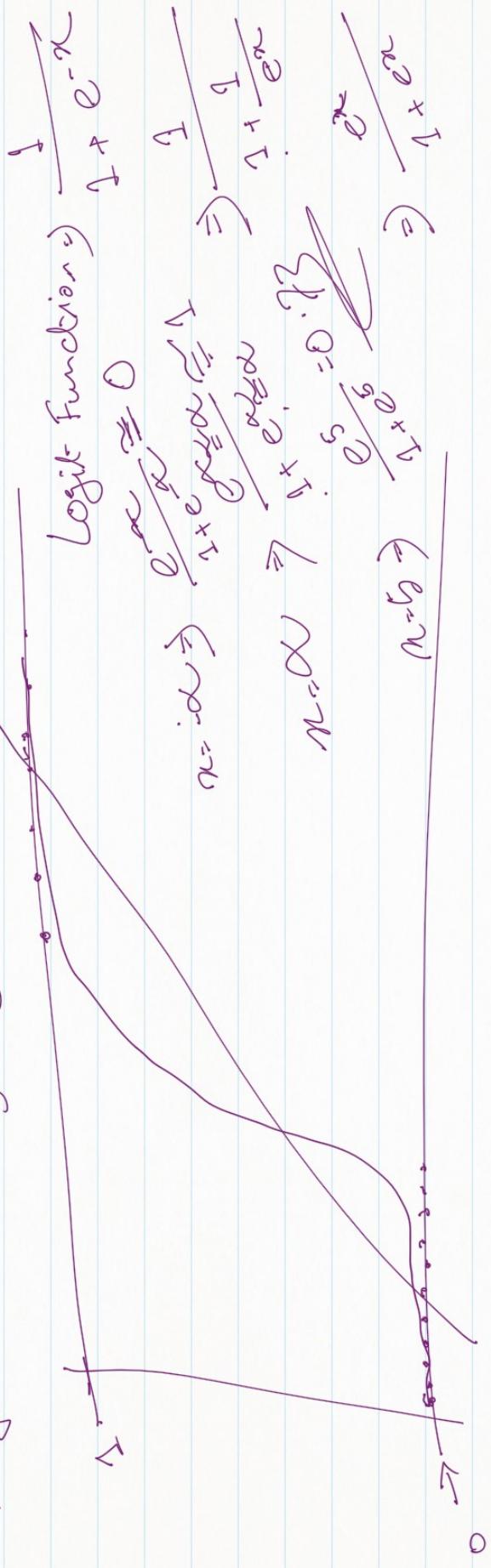


Classification  $\Rightarrow$  Linear methods  
Logistic Regression

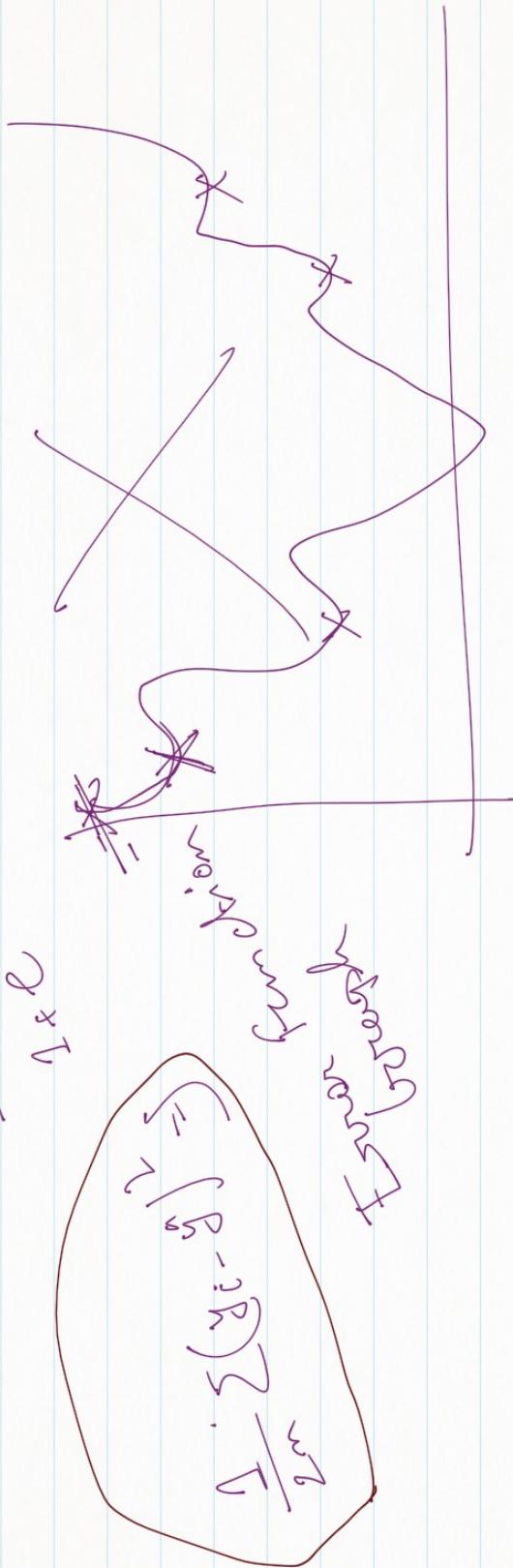
Target Variable  $\Rightarrow$  2 classes  $\Rightarrow$  0, 1

$h_{\theta}(x) = \frac{e^{\theta^T x}}{1 + e^{\theta^T x}}$   $\rightarrow$  Applying  $\sigma$  logit function  
Sigmoid function =



$$\logit(\pi) = \theta^T x$$

$$\logit(\log(\pi)) = \theta_0 + \theta_1 x_1 + \dots + \theta_n x_n$$



Probability  $\Rightarrow$  0 to 1  $\Rightarrow$  Probability =

7

~~1. (S. O. S.)~~

→  $\text{K}_{\text{catalyst}}$

Concave

Clouds

Logicistic

## Regression

Remember:

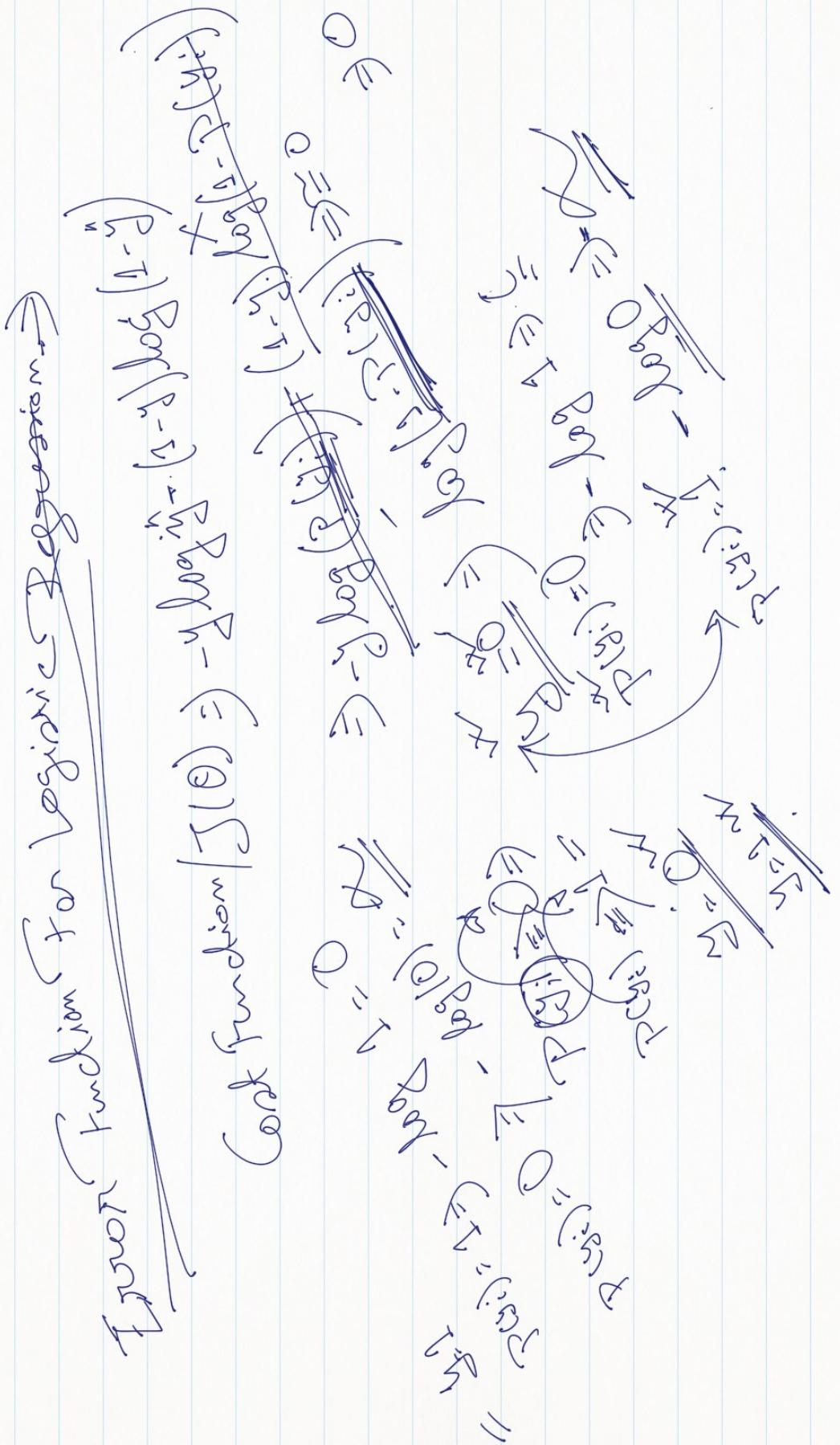
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•

$t_0$

Deutschland ist ein Bunde

Logit Function  
 $y = \ln(x) / (\ln(1+x))$   
 $y' = 1 / (x(1+x))$   
 $y'' = -1 / (x^2(1+x)^2)$   
 $y''' = 2 / (x^3(1+x)^3)$   
 $y^{(4)} = -6 / (x^4(1+x)^4)$   
 $y^{(5)} = 20 / (x^5(1+x)^5)$   
 $y^{(6)} = -72 / (x^6(1+x)^6)$   
 $y^{(7)} = 240 / (x^7(1+x)^7)$   
 $y^{(8)} = -1440 / (x^8(1+x)^8)$   
 $y^{(9)} = 10080 / (x^9(1+x)^9)$   
 $y^{(10)} = -10080 / (x^{10}(1+x)^{10})$   
 $y^{(11)} = 10080 / (x^{11}(1+x)^{11})$   
 $y^{(12)} = -10080 / (x^{12}(1+x)^{12})$   
 $y^{(13)} = 10080 / (x^{13}(1+x)^{13})$   
 $y^{(14)} = -10080 / (x^{14}(1+x)^{14})$   
 $y^{(15)} = 10080 / (x^{15}(1+x)^{15})$   
 $y^{(16)} = -10080 / (x^{16}(1+x)^{16})$   
 $y^{(17)} = 10080 / (x^{17}(1+x)^{17})$   
 $y^{(18)} = -10080 / (x^{18}(1+x)^{18})$   
 $y^{(19)} = 10080 / (x^{19}(1+x)^{19})$   
 $y^{(20)} = -10080 / (x^{20}(1+x)^{20})$   
 $y^{(21)} = 10080 / (x^{21}(1+x)^{21})$   
 $y^{(22)} = -10080 / (x^{22}(1+x)^{22})$   
 $y^{(23)} = 10080 / (x^{23}(1+x)^{23})$   
 $y^{(24)} = -10080 / (x^{24}(1+x)^{24})$   
 $y^{(25)} = 10080 / (x^{25}(1+x)^{25})$   
 $y^{(26)} = -10080 / (x^{26}(1+x)^{26})$   
 $y^{(27)} = 10080 / (x^{27}(1+x)^{27})$   
 $y^{(28)} = -10080 / (x^{28}(1+x)^{28})$   
 $y^{(29)} = 10080 / (x^{29}(1+x)^{29})$   
 $y^{(30)} = -10080 / (x^{30}(1+x)^{30})$   
 $y^{(31)} = 10080 / (x^{31}(1+x)^{31})$   
 $y^{(32)} = -10080 / (x^{32}(1+x)^{32})$   
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 $y^{(34)} = -10080 / (x^{34}(1+x)^{34})$   
 $y^{(35)} = 10080 / (x^{35}(1+x)^{35})$   
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 $y^{(38)} = -10080 / (x^{38}(1+x)^{38})$   
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 $y^{(72)} = -10080 / (x^{72}(1+x)^{72})$   
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 $y^{(74)} = -10080 / (x^{74}(1+x)^{74})$   
 $y^{(75)} = 10080 / (x^{75}(1+x)^{75})$   
 $y^{(76)} = -10080 / (x^{76}(1+x)^{76})$   
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 $y^{(78)} = -10080 / (x^{78}(1+x)^{78})$   
 $y^{(79)} = 10080 / (x^{79}(1+x)^{79})$   
 $y^{(80)} = -10080 / (x^{80}(1+x)^{80})$   
 $y^{(81)} = 10080 / (x^{81}(1+x)^{81})$   
 $y^{(82)} = -10080 / (x^{82}(1+x)^{82})$   
 $y^{(83)} = 10080 / (x^{83}(1+x)^{83})$   
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 $y^{(88)} = -10080 / (x^{88}(1+x)^{88})$   
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 $y^{(90)} = -10080 / (x^{90}(1+x)^{90})$   
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 $y^{(92)} = -10080 / (x^{92}(1+x)^{92})$   
 $y^{(93)} = 10080 / (x^{93}(1+x)^{93})$   
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 $y^{(95)} = 10080 / (x^{95}(1+x)^{95})$   
 $y^{(96)} = -10080 / (x^{96}(1+x)^{96})$   
 $y^{(97)} = 10080 / (x^{97}(1+x)^{97})$   
 $y^{(98)} = -10080 / (x^{98}(1+x)^{98})$   
 $y^{(99)} = 10080 / (x^{99}(1+x)^{99})$   
 $y^{(100)} = -10080 / (x^{100}(1+x)^{100})$

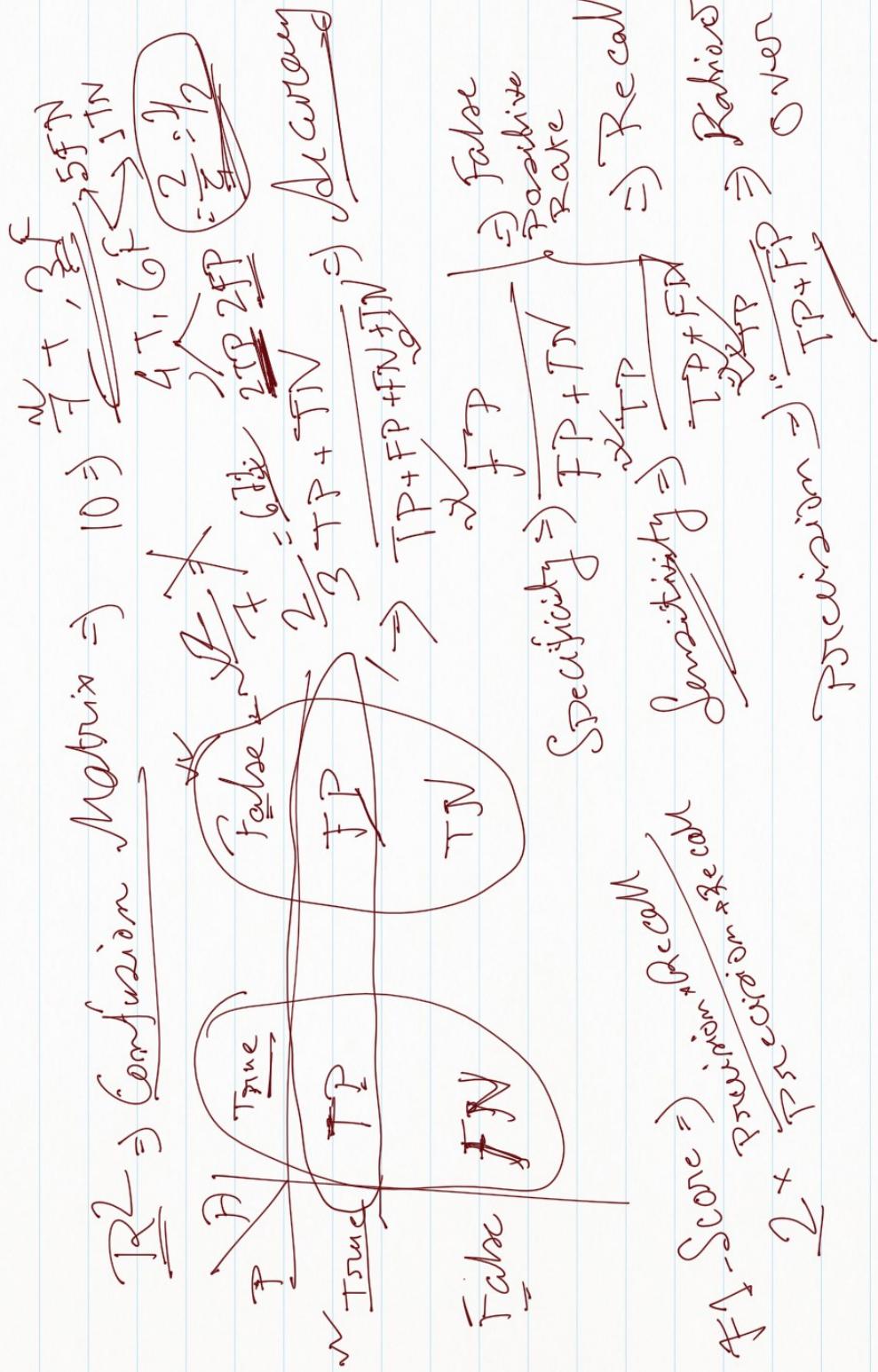


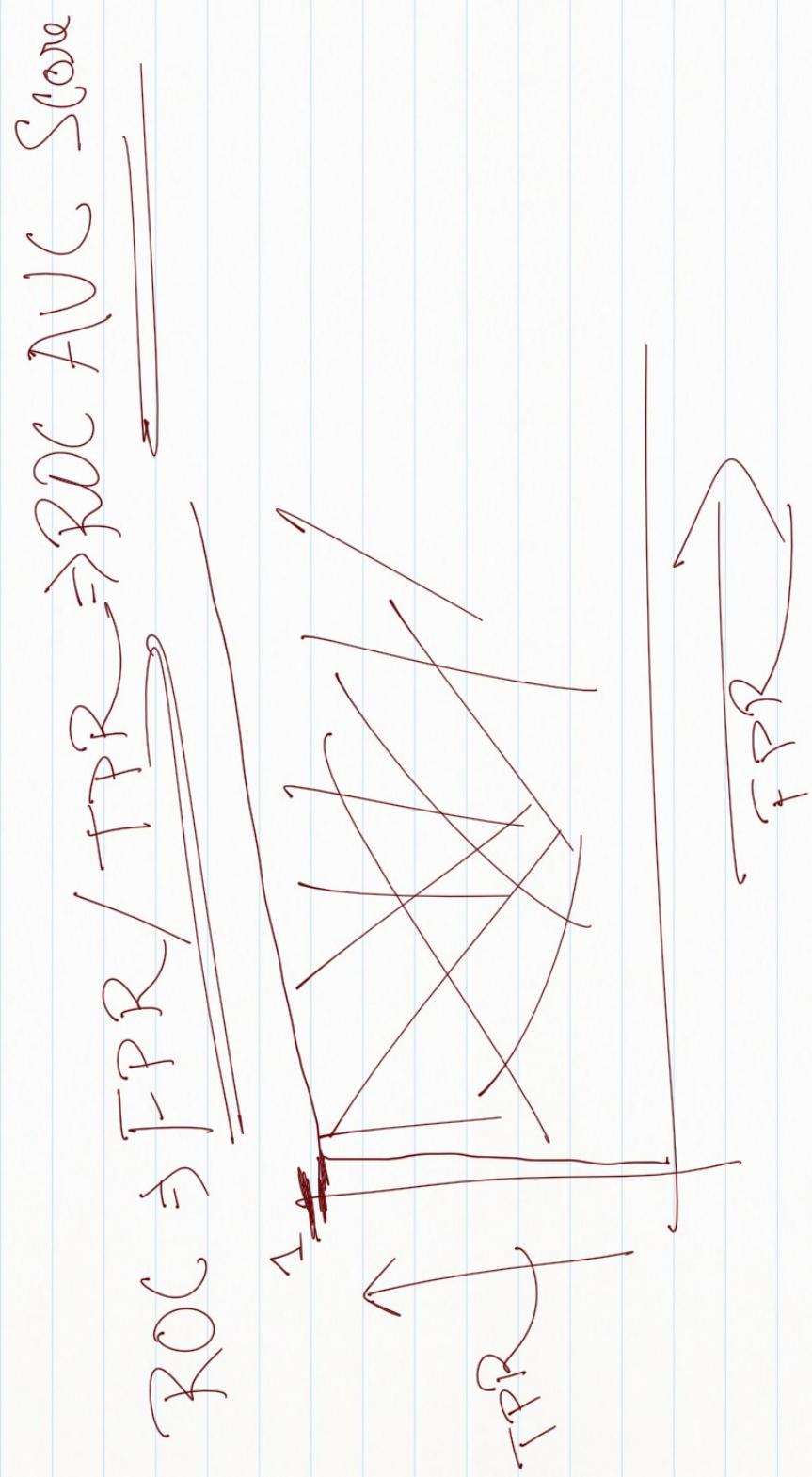
Logistic Regression  $\Leftrightarrow$  Probability  $\Rightarrow$  Decision Boundary.

$$\log \text{Loss}_{\text{PI}} = -\frac{1}{T} \sum_{i=1}^T \log(\text{PI}(y_i))$$

$$\text{Class} = \text{O}_1 \Rightarrow \overline{\log(\frac{P(O_1)}{P(O_2)})}$$

$$\text{Glossy} \Rightarrow -(\pi_1 \pi_2) \log(1 - \pi_1 \pi_2) + \pi_1 \log(\pi_1) + \pi_2 \log(\pi_2)$$





Binary Classification =  $\{0, 1\}$ ,  $\{\text{True}, \text{False}\}$

Classification - Target  $\Rightarrow$  Discrete

Multinomial Classification  $\{0, 1, 2, \dots\}$

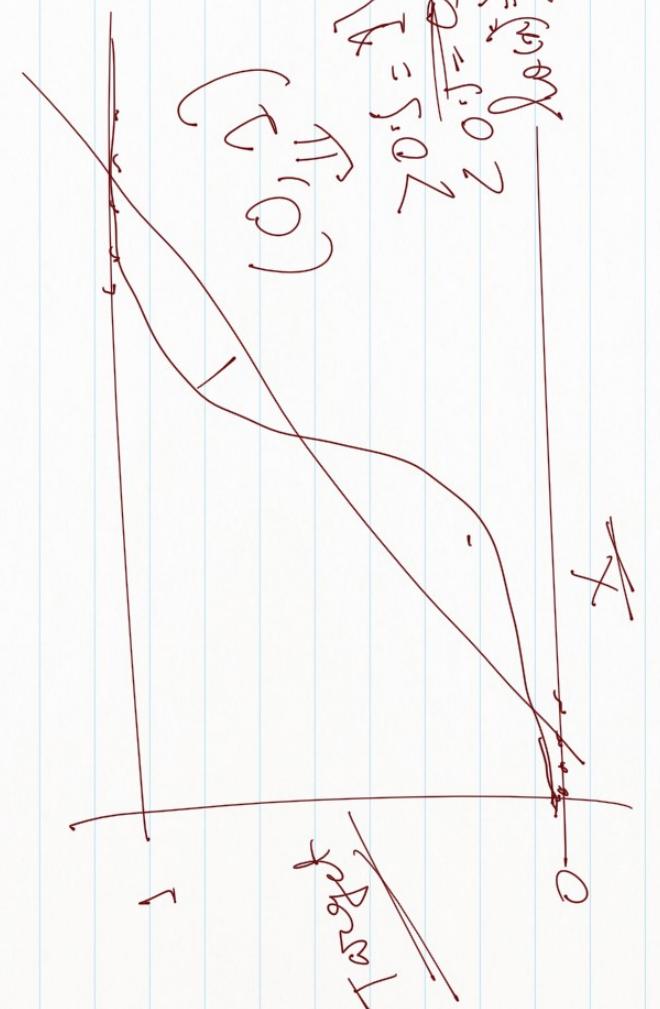
$\{A, A^c, B, B^c, C, C^c\}$

$- \infty \Rightarrow \infty \Rightarrow \{0, 1\}$   $f_{\theta}(x) \Rightarrow \text{logit} \frac{1}{1 + e^{-\theta(x)}}$

$$\text{Linear Model} \Rightarrow h_{\theta}(x) = \underline{\theta^T X} \Rightarrow X^T \underline{\theta}.$$

$$= \theta_0 + \theta_1 x_1 + \theta_2 x_2 + \dots + \theta_m x_m$$

$$\text{Sigmoid} \Delta \rightarrow \frac{1}{1+e^{-x}}$$



$$\text{Logistic} \rightarrow \frac{1}{1+e^{-h_{\theta}(x)}}$$

True      False

$$\rightarrow \frac{1}{1+e^{-0}} = 0 \quad \rightarrow \frac{1}{1+e^{-1}} = 0.27$$

$$\rightarrow \frac{1}{1+e^{-2}} = 0.11 \quad \rightarrow \frac{1}{1+e^{-3}} = 0.05$$

$$\rightarrow \frac{1}{1+e^{-4}} = 0.02 \quad \rightarrow \frac{1}{1+e^{-5}} = 0.01$$

$$A, B, C \Rightarrow P(A) + P(B) + P(C) = 1$$

~~$\sum P(E) \leq 1$~~

~~$\frac{N_i}{N} \rightarrow K - \text{Classes}$~~

~~$\frac{N_i}{N} \rightarrow q$~~

~~$P(A) + P(B) + P(C) = 1$~~

~~$P(A) + P(B) + P(C) = 1 \quad K^{\text{th}} \text{ class fixed}$~~

~~$P(E) \leq 1 \quad \text{A} \Rightarrow \text{logistic Reg model.}$~~

~~$\beta =$~~

~~$\gamma =$~~

~~$x_i \rightarrow K \text{-classes}$~~

~~$\frac{x_i}{1+x_i}$~~

~~$P_n(x_i) =$~~

~~$C=1 \quad \text{Baseline 1 class}$~~

~~$K \Rightarrow (K-1) \text{ classes}$~~

~~$\frac{1}{1+e^{-\beta_i x_i}}$~~

~~$P(A) =$~~

~~$P(B) =$~~

~~$P(C) =$~~

~~$P(A) + P(B) + P(C) = 1$~~

~~$P(A) = \frac{P(A)}{P(A)+P(B)+P(C)}$~~

~~$P(B) = \frac{P(B)}{P(A)+P(B)+P(C)}$~~

~~$P(C) = \frac{P(C)}{P(A)+P(B)+P(C)}$~~

~~$\beta_1, \beta_2, \dots, \beta_K$~~

~~$y_1, y_2, \dots, y_N$~~

~~$x_{11}, x_{12}, \dots, x_{1N}$~~

~~$x_{21}, x_{22}, \dots, x_{2N}$~~

~~$\vdots$~~

~~$x_{K1}, x_{K2}, \dots, x_{KN}$~~

~~$\text{Column } m =$~~

~~$\{x_{1m}, x_{2m}, \dots, x_{Nm}\}$~~

~~$\text{Column } m =$~~

~~$\{y_{1m}, y_{2m}, \dots, y_{Nm}\}$~~

11 (E) 12

It is a very good  
example of the  
use of the  
rule of three.

دیگر نیست  
که اینجا

$\text{H}_2\text{O} \rightarrow \text{H}_2 + \text{O}_2$

Problematik  $\rightarrow$  Dinge, die es zu lösen gilt.

A large, hand-drawn red circle with several intersecting lines and arrows, suggesting a complex diagram or a large number.

$$= \eta k \sqrt{k}$$

Emotions

Geographie

monday

~~B Black~~

Good morning 3rd grade.

fours

• Learn first

Principles of Economics



