"hi!!!"

$\vec{x} = \begin{pmatrix} \text{"hi"} : 3 \\ \text{"!!"} : 2 \end{pmatrix}$

2 × 2

#hi #!!

$\vec{x} = (3, 2)$

$\vec{\beta} = (-.5, 2)$

$z = \vec{\beta}^T \vec{x} = -.5 \times 3 + 2 \times 2$

$= -1.5 + 4 = 2.5$

$P_\beta(y=1|x) = \frac{1}{1+e^{-z}} = \frac{1}{1+e^{-2.5}}$

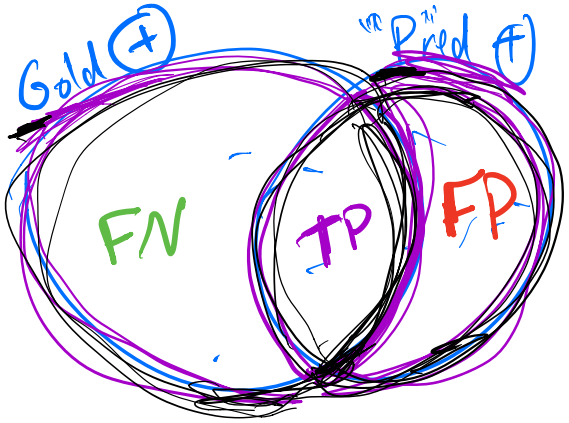
$= \frac{1}{1+e^{2.5}} = .924$

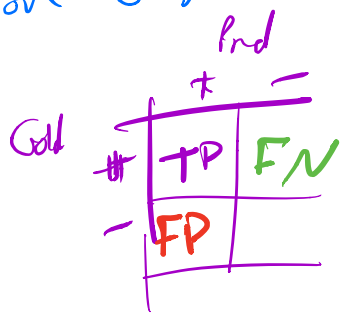
Eval Metrics

Gold	Pred	
+	+	TP ☺
+	−	FN ☹
−	−	TN ☺

$$Acc = \frac{2}{3} = \frac{1}{N}\sum_i 1\{\hat{y}_i = y_i\}$$

Prec, Rec, F1 for one class





$$Prec = \frac{|G \cap P|}{|P|} = \frac{TP}{TP+FP}$$

$$Rec = \frac{|G \cap P|}{|G|} = \frac{TP}{TP+FN}$$

F-Score (F1 score)

Harmonic Mean of P+R

$$F = \frac{2PR}{P+R} = \frac{2}{\frac{1}{P}+\frac{1}{R}} = \frac{1}{\frac{1}{2}\frac{1}{P}+\frac{1}{2}\frac{1}{R}}$$

Multiclass! See J+M 4.7.1

Macro avg: calc P, R, for each class (Balanced) then avg across classes

Cares about rare classes

	A	B	C	Macro Avg
Prec	81	23	74	59
Rec				

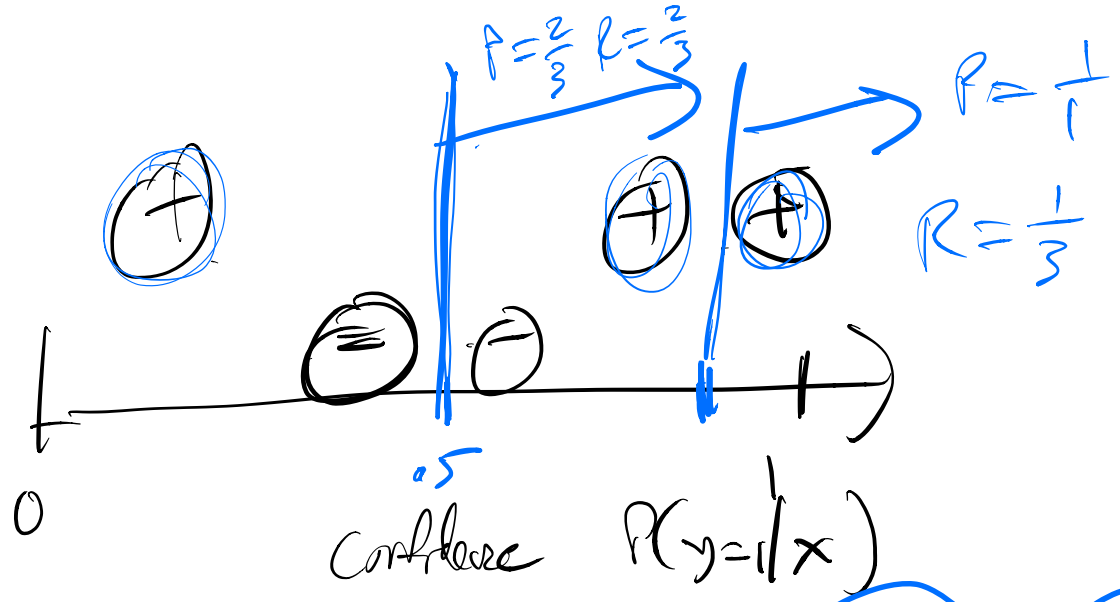
Micro avg: calc TP, FP, FN counts per class

sum them; $TP_{all} = TP_A + TP_B + TP_C$

$FP_{all} =$

$FN_{all} =$

⇒ Prec, Rec from global counts



$\beta = (.5, .25, 1)$

$x = (1, 4, 0)$

$z = \beta^T x = .5 + 1 + 0 = 1.5$

$P(y=1|x) = \frac{1}{1+e^{-1.5}} = .818$

1/(1+np.exp(-1.5))

$$g(x) = \frac{1}{1+e^{-x}} = \frac{e^x}{1+e^x}$$

$$\left(\frac{1}{1+e^{-x}}\right)\left(\frac{e^x}{e^x}\right)$$

3.6 & 3.4

we know y = AUTHOR_HAPPY

~~done~~

can we infer prob $x = (1,1,3)$

$$P(x=(1,1,3) \mid y = A\_H) \; ?$$

NB: Yes $P(x|y) = \prod_{w \in V} \left[P(w|y)\right]^{x_w}$

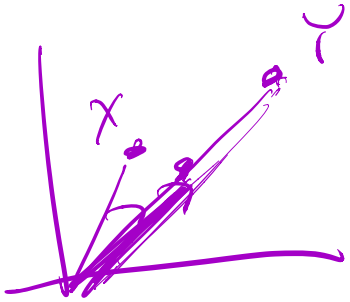
"Gener. Model"

LR: No only defines $P(y|x)$

"Discrim. Model"

No CI assumed!

Vectors & Cos. rel!



$x \cdot y$

$\langle x, y \rangle$

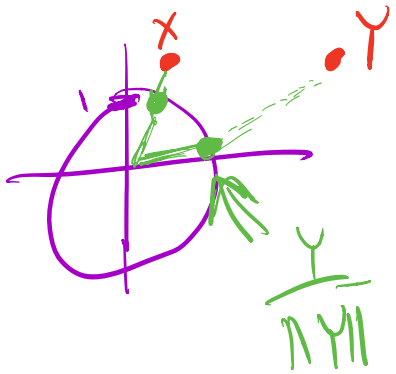
$$\cos(x,y) = \frac{x^T y}{\|x\| \, \|y\|} = \frac{\sum_i x_i y_i}{\sqrt{\sum_i x_i^2}\,\sqrt{\sum_i y_i^2}}$$

$$\cos(x,x) = \frac{x^T x}{\|x\| \, \|x\|} = \frac{\sum_i x_i^2}{\sqrt{\sum_i x_i^2}\,\sqrt{\sum_i x_i^2}}$$

$$= \frac{\sum_i x_i^2}{\sum_i x_i^2} = 1$$

$$\cos(x,y) = \left\langle \frac{x}{\|x\|}, \frac{y}{\|y\|} \right\rangle$$

dot prod of unit vectors



6.1

Soooo

Kaaaaha

[a-z]*(ooo+|aaa+|eee+|iii+|uuu+)[a-z]*

a* = 0 or more "a" seq.

a+ = 1 or more "a" seq.

So so (a-2)*0 + (a-2)*