Confusion Matrix

Gold \ Pred	1	0
1	TP 8	FN 2
0	FP 5	TN 200

Gold	Pred	
1	1	TP
0	0	TN
1	0	FN
0	1	FP

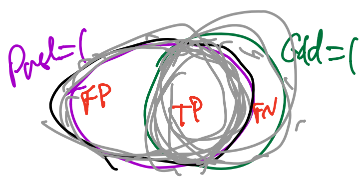
$N = TP + TN + FN + FP$

$$\text{Accuracy} = \frac{TP + TN}{N}$$

Bad for rare classes

$$\text{Precision} = P(\text{correct} \mid \text{pred}=1) = \frac{TP}{TP+FP}$$ Rewards conservativeness

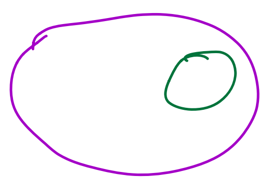
$$\text{Recall} = P(\text{correct} \mid \text{gold}=1) = \frac{TP}{TP+FN}$$ Rewards comprehensiveness



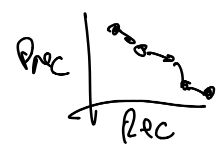
$$F_1 = \text{Harmonic mean of } P \,\&\, R = \frac{2 \cdot P \cdot R}{P+R} = \frac{2}{1/P + 1/R} = \left[\frac{1}{2}\left(\frac{1}{P}+\frac{1}{R}\right)\right]^{-1}$$

wants both P, R high

Pred=1 for WHOLE test set



Prec = low
Recall = 100%

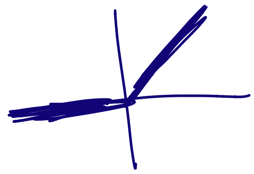


Sensitivity = Recall

Specificity ≠ Precision

F-score for binary classif: measures accuracy of "pos" class

F-score for multiclass: Fscore for each class

$\mathrm{ReLU}(x) =$  $= \begin{cases} 0 & \text{if } x < 0 \\ x & \text{if } x \geq 0 \end{cases}$

$$\frac{d\,\mathrm{ReLU}(x)}{dx} = \begin{cases} 0 & \text{if } x < 0 \\ +1 & \text{if } x > 0 \end{cases}$$

Interaction. F1

	Person 2: 1	Person 2: 0
Person 1: 1		
Person 1: 0		

Q.2 $\mathrm{softmax}(Az)[0]$

→ first item in array (Python-style 0-indexing)

$z \in \mathbb{R}^N$ input dim

Softmax: $\mathbb{R}^2 \to \mathbb{R}^2$

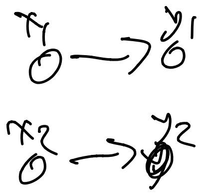
$A \in \mathbb{R}^{2 \times N}$

$\sigma(\theta^T z)$ $\sigma(x) = \frac{1}{1+e^{-x}} = \frac{e^x}{1+e^x}$

$\sigma(\cdot): \mathbb{R} \to \mathbb{R}$

$\theta^T z: \mathbb{R}$

$\theta \in \mathbb{R}^N$



$$P(y_i, y_j \mid x_i, x_j) = P(y_i \mid x_i)\,P(y_j \mid x_j)$$

Cond. indep. assumption

(2.57) $$p(y_1 \cdots y_n \mid x_1 \cdots x_n) = \prod_{i=1}^{n} p(y_i \mid x_1 \cdots x_n) = \prod_{i=1}^{n} p(y_i \mid x_i)$$

$$\log(\quad) = \sum_i \log p(y_i \mid x_i)$$

(2.57) $$p(y \mid x) = \frac{e^{\theta^T f(x,y)}}{\sum_{y'} e^{\theta^T f(x,y')}}$$

$$\log p(y \mid x) = \theta^T f(x,y) - \log \sum_{y'} \exp \theta^T f(x,y')$$