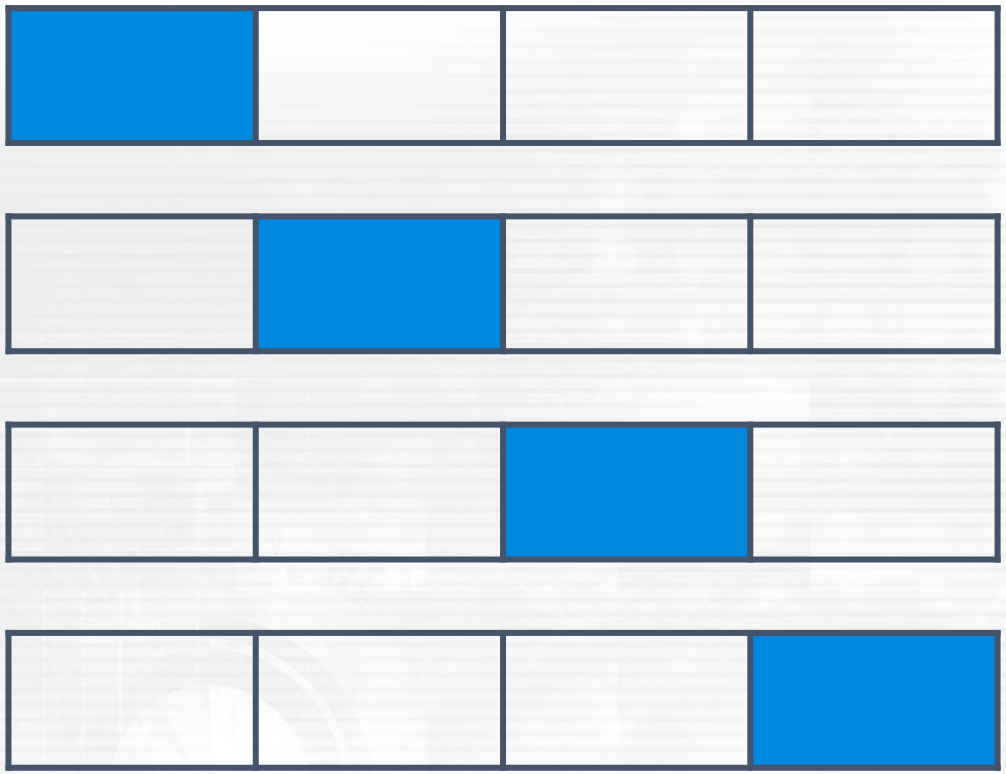
Experimental Settings

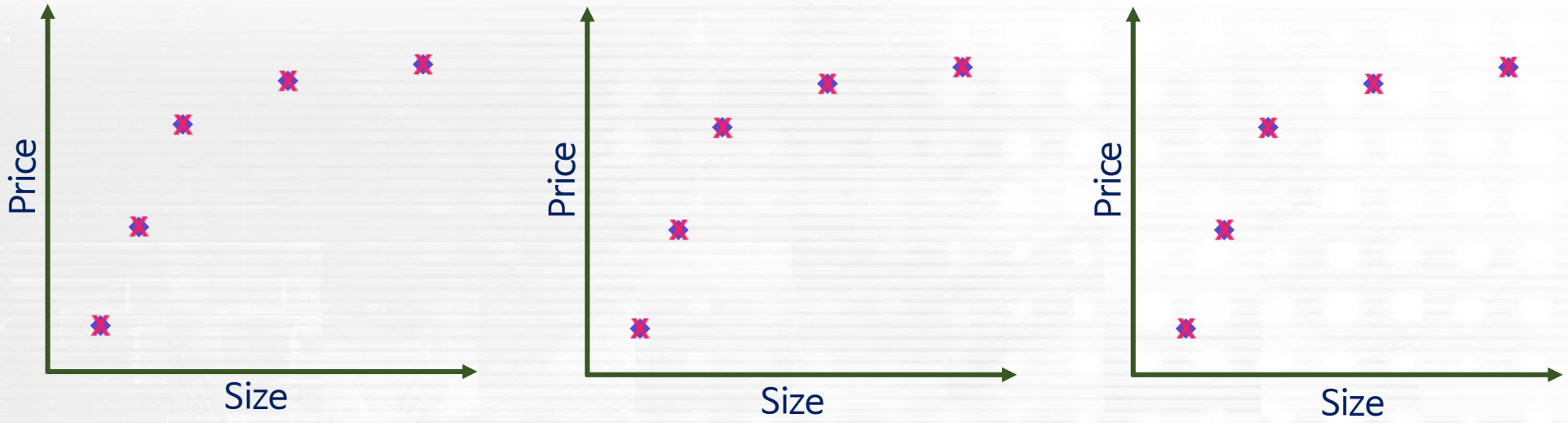
Train / Validation / Test sets

Cross Validation



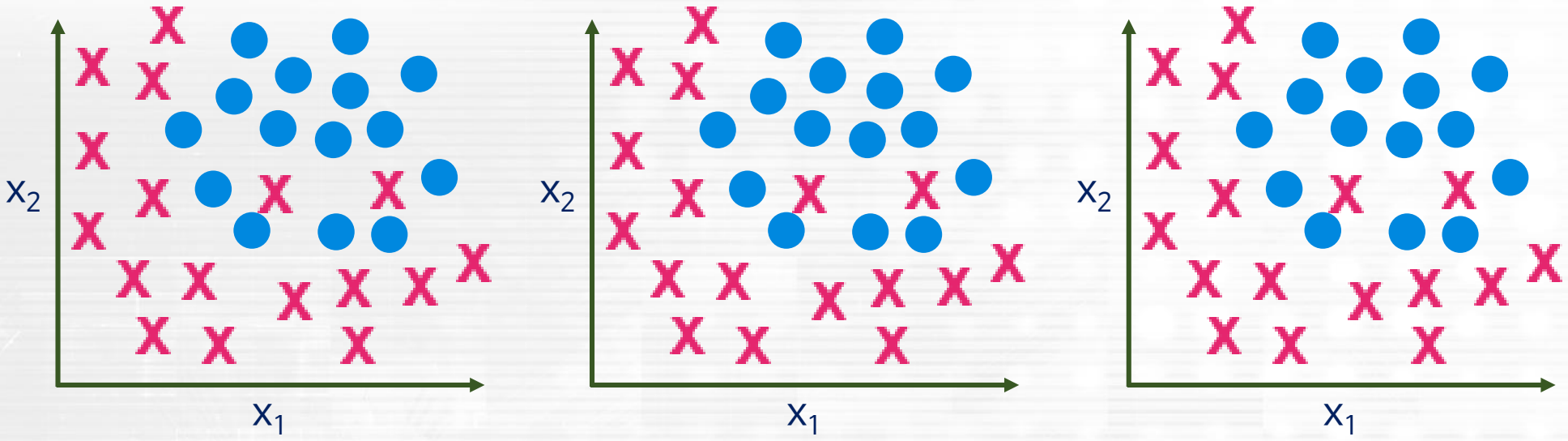
Overfitting

- Linear regression



Overfitting

- Logistic regression



Regularization

Regularization

$$J(w) = \frac{1}{2m}\sum_{i=1}^{m}(h_w(x^{(i)}) - y^{(i)})^2$$

$$J(w) = \frac{1}{2m}\left[\sum_{i=1}^{m}(h_w(x^{(i)}) - y^{(i)})^2 + \lambda\sum_{j=1}^{n} w_j^2\right]$$

$Repeat\ \{$

$$w_j := w_j - \alpha\ \frac{1}{m}\sum_{i=1}^{m}(h_w(x^{(i)}) - y^{(i)})x_j^{(i)}$$

$\}$

$(j = 0, 1, 2, 3, \dots, n)$

$Repeat\ \{$

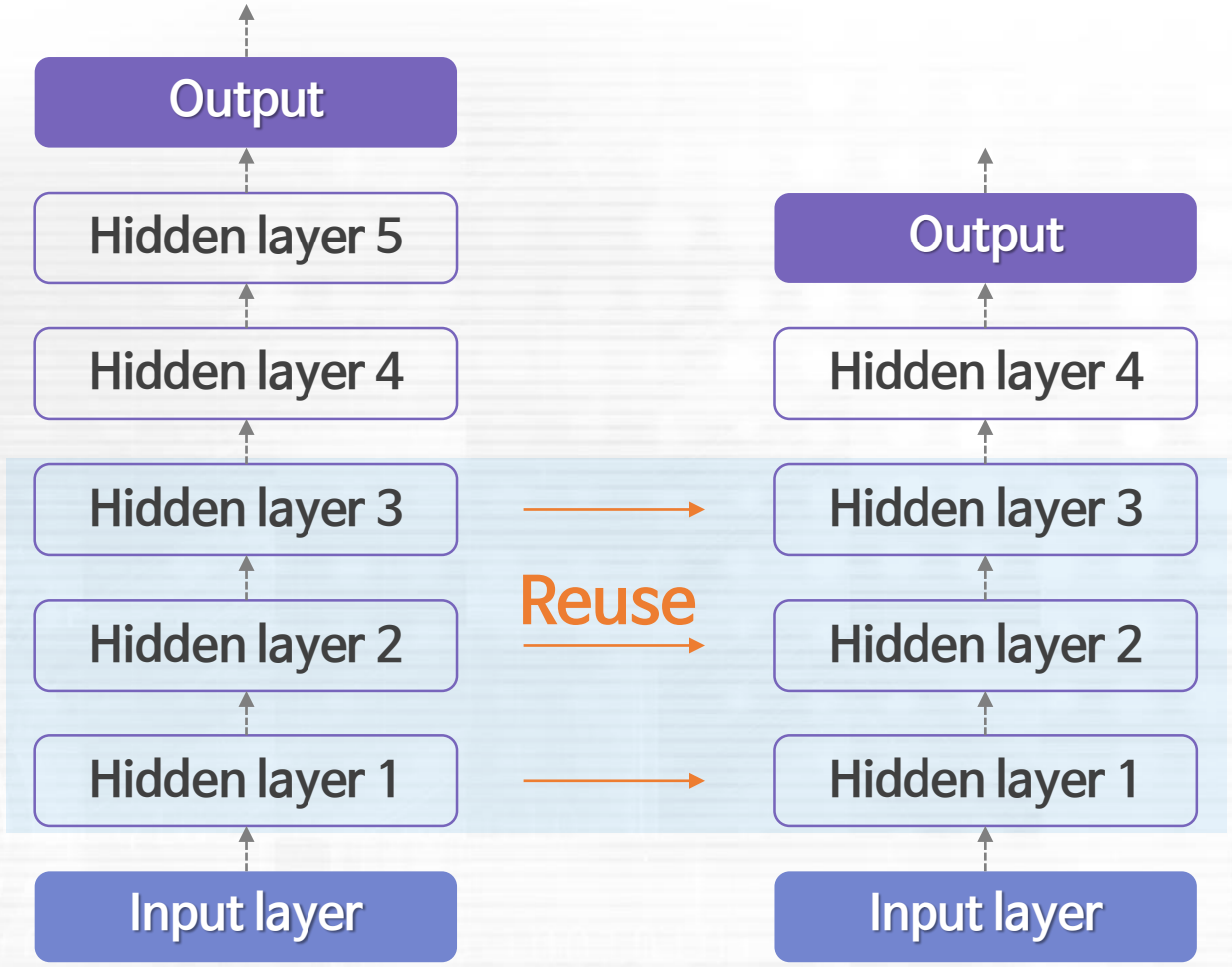
$$w_j := w_j(1 - \alpha\frac{\lambda}{m}) - \alpha\frac{1}{m}\sum_{i=1}^{m}(h_w(x^{(i)}) - y^{(i)})x_j^{(i)}$$

$\}$

$(j = 0, 1, 2, 3, \dots, n)$

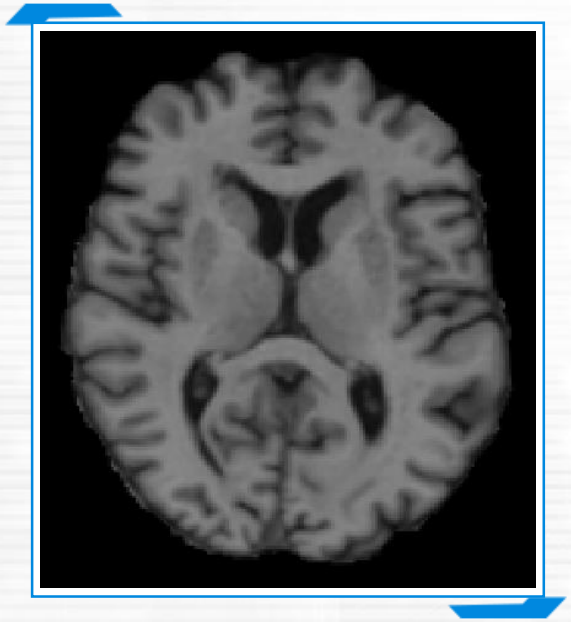
Transfer Learning

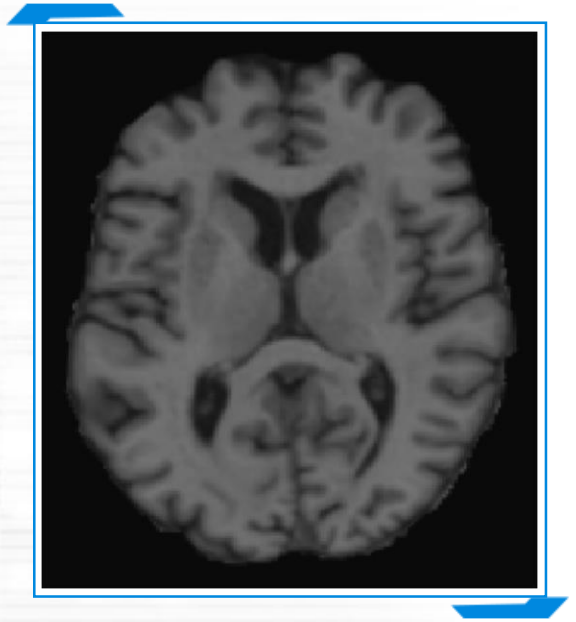
Transfer Learning



Data Augmentation

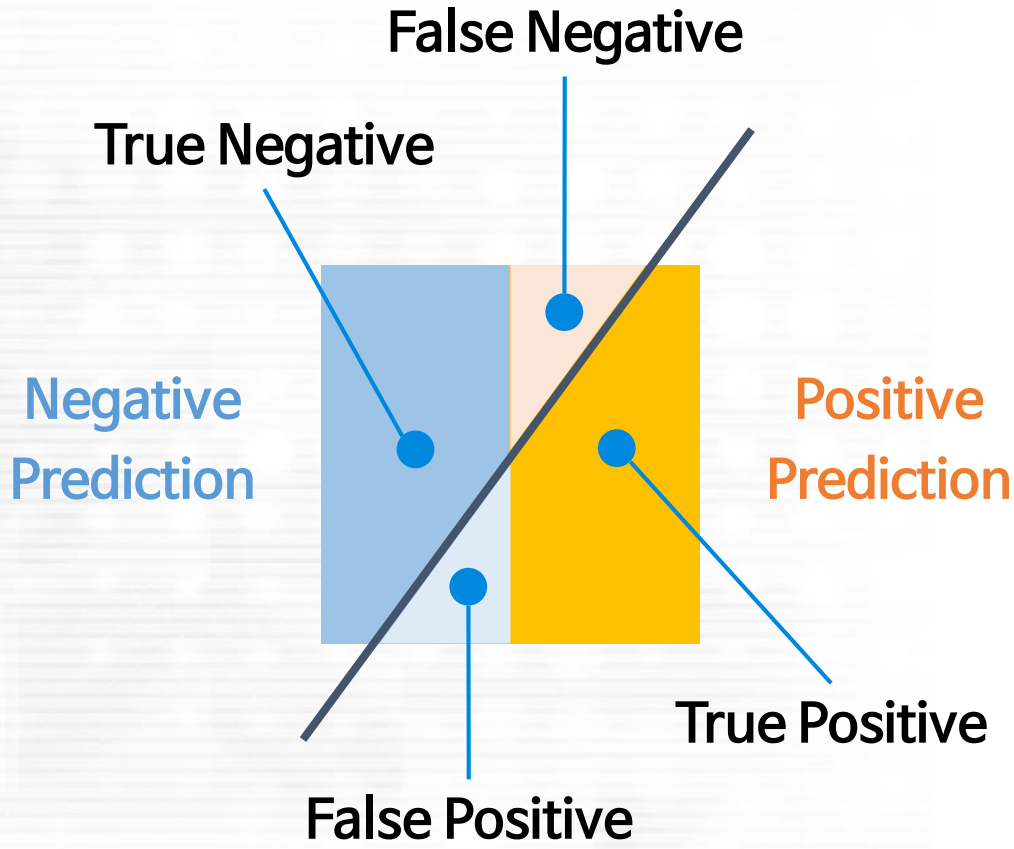
- Mirroring
- Rotation
- Shearing
- Local warping
- Intensity change





출처 http://adni.loni.usc.edu/data-samples/

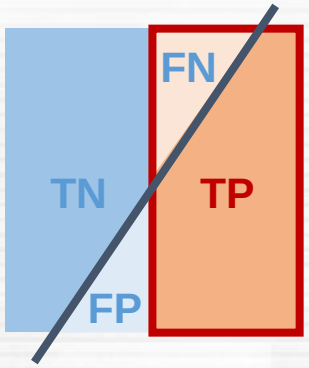
Evaluation of Classification Model



Evaluation of Classification Model

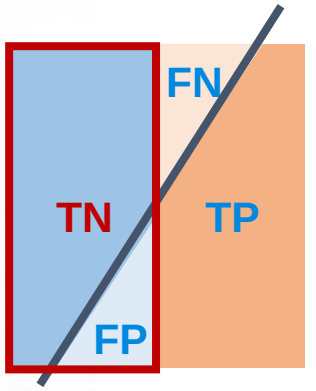
Sensitivity (True positive rate, recall)

$$Sensitivity = \frac{TP}{TP + FN}$$



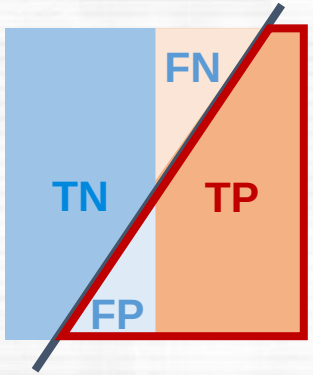
Specificity (True negative rate)

$$Specificity = \frac{TN}{TN + FP}$$



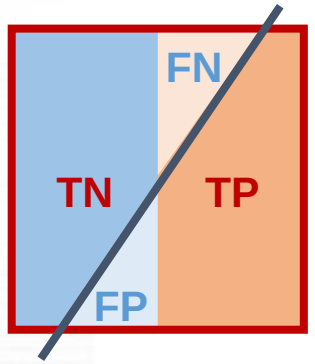
Positive predictive value (PPV, Precision)

$$PPV = \frac{TP}{TP + FP}$$



Accuracy

$$Acc = \frac{TP + TN}{TP + TN + FP + FN}$$



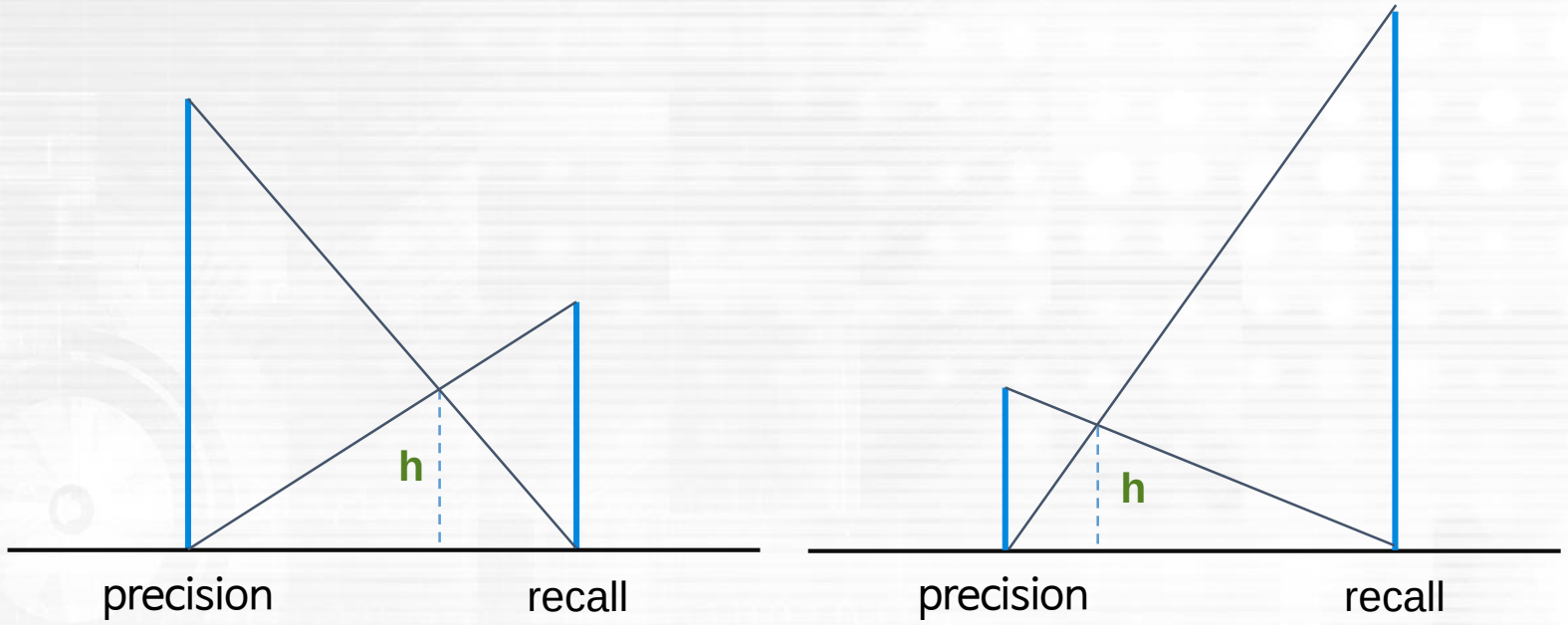
Evaluation of Classification Model

- ROC Curve (Receiver Operating Characteristics Curve)
- AUC (Area Under a ROC Curve)

Evaluation of Classification Model

- F1 score: Harmonic mean of recall and precision

$$F1\ score = 2 \times \frac{Precision \times Recall}{Precision + Recall}$$



Evaluation for Multi-Labels

Confusion Matrix

Prediction

Real class	A	B	C	D
A	10	1	0	0
B	1	20	10	1
C	4	0	24	8
D	0	4	1	16

Evaluation for Multi-Labels

Imbalanced data

Prediction

Real class	A	B	C	D
A	100	50	10	10
B	0	10	0	0
C	0	0	10	0
D	0	0	0	10

Acc: (100 + 10 + 10 + 10) / 200 = **0.65**

Prediction

Real class	A	B	C	D
A	170	0	0	0
B	10	0	0	0
C	10	0	0	0
D	10	0	0	0

Acc: (170 + 0 + 0 + 0) / 200 = **0.85**