Classification Metrics

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2017-10-28

目录

Confusion Matrix

	Actual Positive	Actual Negative
Predicted Positive	**TP**	**FP**
Predicted Negative	**FN**	**TN**

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

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

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

$$\frac{1}{F_1} = \frac{1}{2}(\frac{1}{Recall} + \frac{1}{Precision})$$

Metrics Analysis

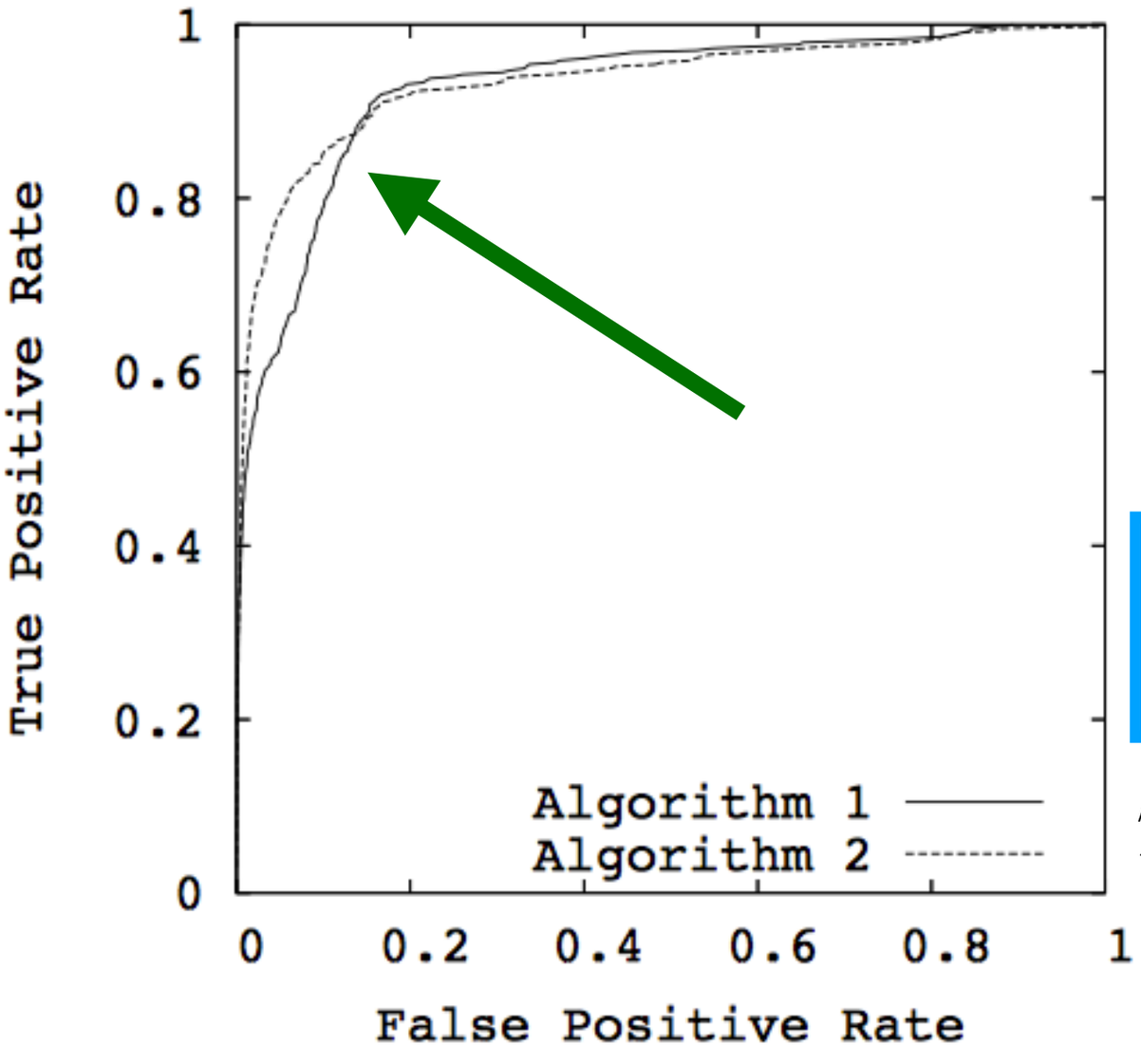
$$\frac{a+b}{2} \geq \sqrt{ab}(a>0, b>0, =) \longrightarrow \frac{a+b}{2} \geq \frac{2ab}{a+b}$$

$$F_\beta = \frac{Precision * Recall}{\frac{\beta^2}{1+\beta^2} * Precision + \frac{1}{1+\beta^2} * Recall}$$

$$G = \sqrt{Precision * Recall} \qquad Precision = Recall + g$$

$$\lim_{g \to \infty} \frac{2}{\frac{1}{Precision} + \frac{1}{Recall}} = 2 * Recall$$

ROC(Receiver Operator Characteristic Curve)



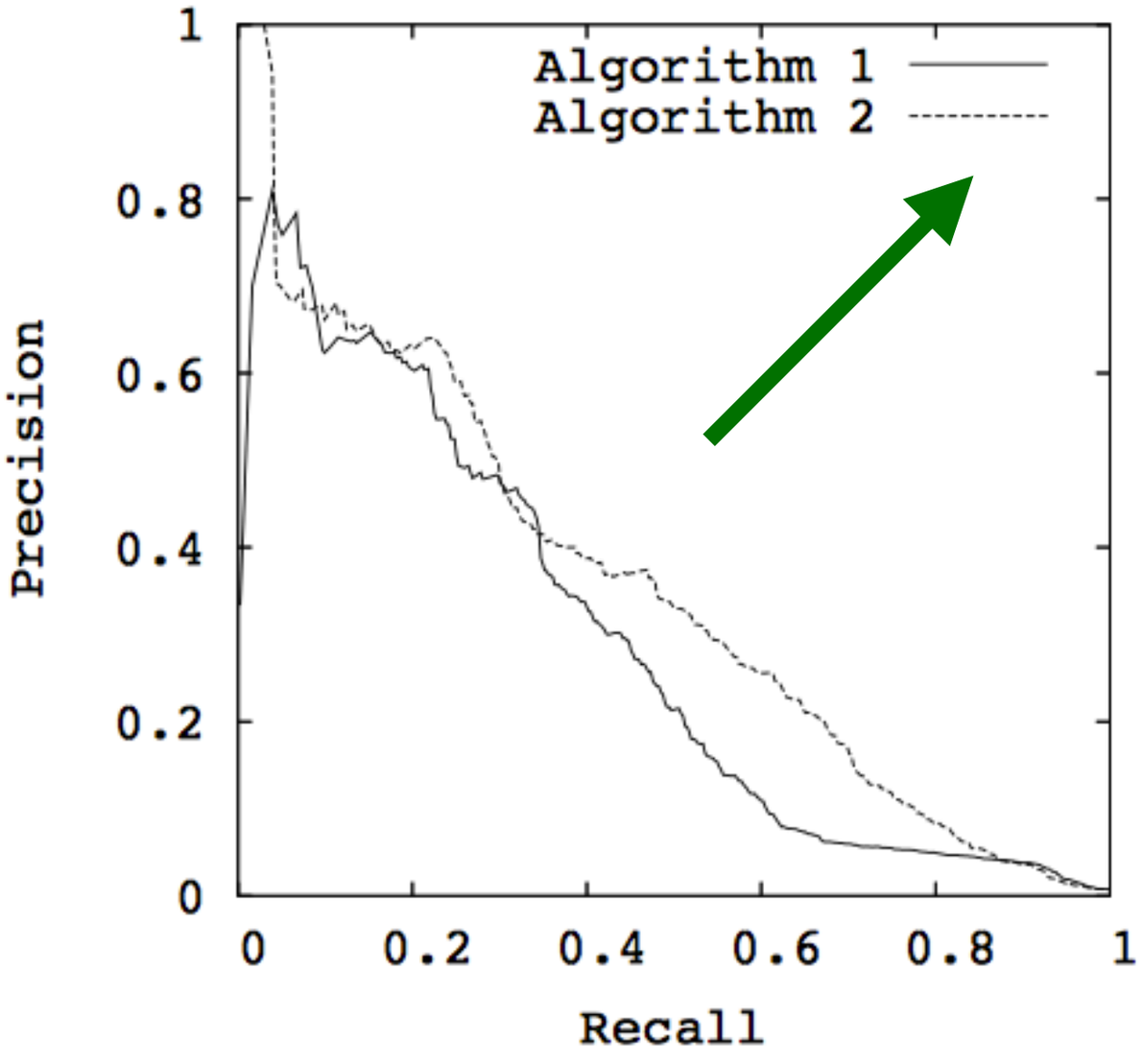
	Actual Positive	Actual Negative
Predicted Positive	TP	FP
Predicted Negative	FN	TN

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

$$True\ Positive\ Rate = \frac{TP}{TP + FN}$$

$$False\ Positive\ Rate = \frac{FP}{FP + TN}$$

PR(Precision Recall)



	Actual Positive	Actual Negative
Predicted Positive	TP	FP
Predicted Negative	FN	TN

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

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

How to get PR/ROC curve?

Sample_No	Label	Threshold_0	Threshold_1	Threshold_2
0	P	Y	…	Y
1	P	Y	…	Y
2	P	Y	…	N
3	P	Y	…	N
4	P	Y	…	N
5	P	N	…	N
6	N	N	…	N
7	N	N	…	Y
8	N	N	…	N
9	N	N	…	Y

Relationships(ROC&PR)

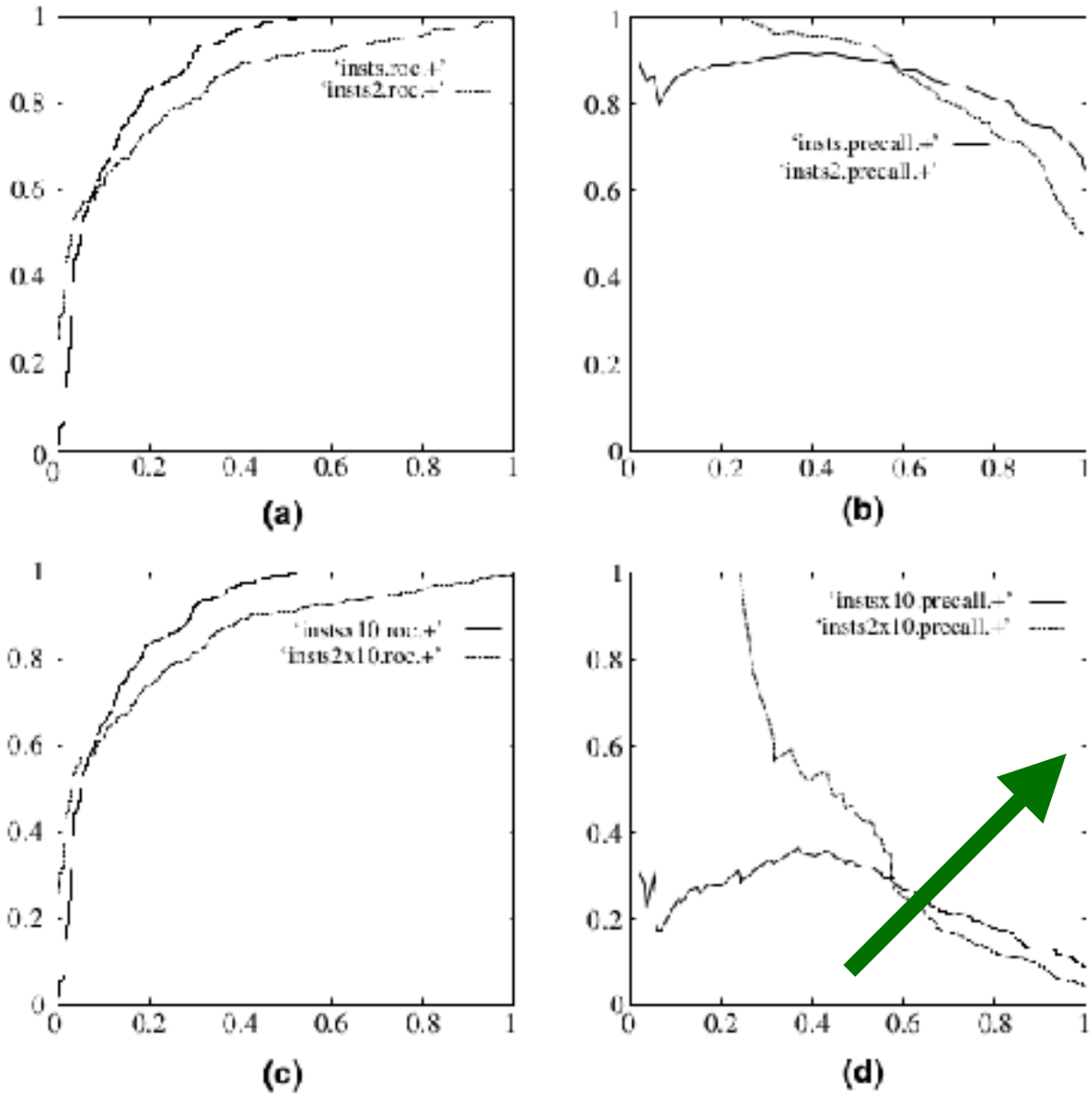
- ROC $\xleftrightarrow{Recall \neq 0}$ PR

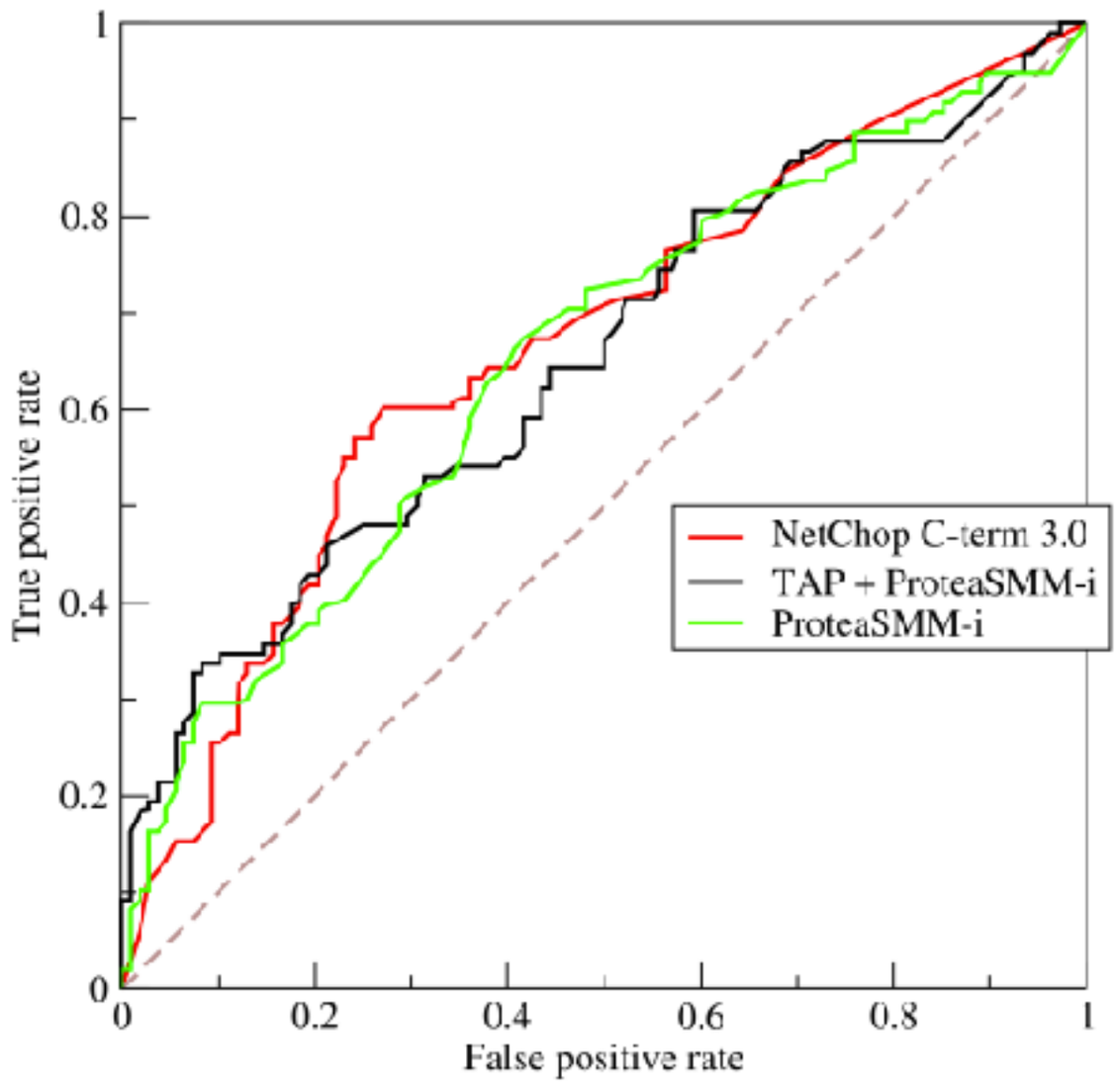
- Curve dominates in ROC

  $\Updownarrow$

  Curve dominates in PR

Imbalanced&AUC(Area Under Curve)

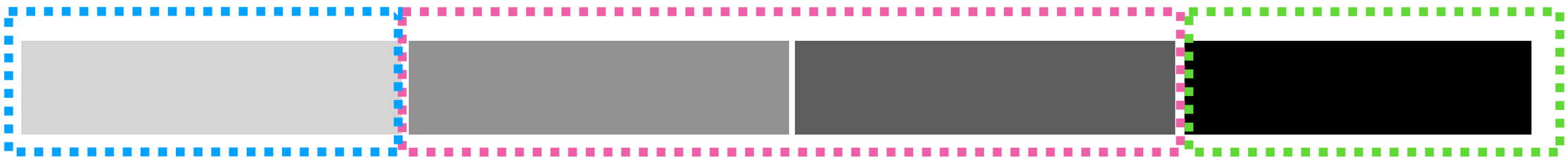




Binary2Multi Classification

(A)

(B)



(C)

参考文献

1.如何理解与应用调和平均数? https://www.zhihu.com/question/23096098

2.精确率，召回率，F1值，ROC，AUC各自的优缺点是什么？https://www.zhihu.com/question/30643044/answer/48955833

3.Receiver Operating Characteristic: https://en.wikipedia.org/wiki/Receiver_operating_characteristic

4.《The Relationship Between Precision-Recall and ROC Curves》

5.《An introduction to ROC anaysis》

6.《支持向量机在多类分类问题中的推广》

TKS

有啥问题需要探讨的吗?