

mAP: 各类AP的平均值

AP: PR曲线下面积

PR曲线: Precision-Recall 曲线

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

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

TP: IOU > 0.5 数量 (同-Ground Truth 计算一次)

FP: IOU < 0.5 检测框或是检测到的同-GT 多余检测框数量

FN: 没有检测到 GT 数量

○ VOC2010 之前, 选取当 Recall ≥ 0, 0.1, 0.2 ... 共 11 个点时 Precision 最大值, 然后 AP 就是这 11 个 precision 平均值

★ ○ VOC2010 之后, 针对每个 recall 值, 选取其大于等于这个 Recall 值时的 Precision 最大值, 然后计算 PR 曲线下面积作为 AP 值

mAP 举例: 对 Aeroplane 类别, 网络有以下输出, (BB 表示 Bounding Box 序号, IOU > 0.5 时, GT = 1)

BB	confidence	GT
✓ BB1	0.9	1
✓ BB2	0.9	1
✓ BB1	0.8	1
✓ BB3	0.7	0
✓ BB4	0.7	0
✓ BB5	0.7	1
✓ BB6	0.7	0
✓ BB7	0.7	0
✓ BB8	0.7	1
✓ BB9	0.7	1

TP = (BB1, BB2, BB5, BB8, BB9)

FP = (BB1, BB3, BB4, BB6, BB7) BB1 重复检测

FN = 2 (除表里检测到 5 个 GT 外, 我们还有 2 个 GT 没被检测到)

✓  
IOU = 0.5 时, GT = 0

按 Confidence 顺序计算 PR

2 个 GT, 还有 6 个 GT 没

rank=1 precision=1.00 and recall=0.14  
-----  
rank=2 precision=1.00 and recall=0.29  
-----  
rank=3 precision=0.66 and recall=0.29  
-----  
rank=4 precision=0.50 and recall=0.29  
-----  
rank=5 precision=0.40 and recall=0.29  
-----  
rank=6 precision=0.50 and recall=0.43  
-----  
rank=7 precision=0.43 and recall=0.43  
-----  
rank=8 precision=0.38 and recall=0.43  
-----  
rank=9 precision=0.44 and recall=0.57  
-----  
rank=10 precision=0.50 and recall=0.71  
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Rank=1, TP=1 FP=0 FN=6  
pre =  $\frac{1}{1+0} = 1$  recall =  $\frac{1}{1+6} = 0.14$

Rank=2, TP=2 FP=0 FN=5  
pre =  $\frac{2}{2+0} = 1$  recall =  $\frac{2}{2+5} = 0.29$

Rank=3, TP=2 FP=1 FN=5  
pre =  $\frac{2}{2+1} = 0.66$  recall =  $\frac{2}{2+5} = 0.29$

Rank=4, TP=2 FP=2 FN=5  
pre =  $\frac{2}{2+2} = 0.5$  recall =  $\frac{2}{2+5} = 0.29$

Rank=5, TP=2 FP=3 FN=5

pre =  $\frac{2}{2+3} = 0.4$  recall =  $\frac{2}{2+5} = 0.29$

Rank=6, TP=3 FP=3 FN=4

pre =  $\frac{3}{3+3} = 0.5$  recall =  $\frac{3}{3+4} = 0.43$

针对上述PR值, VOC 2010及以后方法, Recall >= 0, 0.14, 0.29, 0.43, 0.57, 0.71, 1

best precision最大值: 1 1 1 0.5 0.5 0.5 0

此时, Aeroplane类别 AP:

$(0.14 - 0) \times 1 + (0.29 - 0.14) \times 1 + (0.43 - 0.29) \times 0.5 + (0.57 - 0.43) \times 0.5 +$

$(0.71 - 0.57) \times 0.5 + (1 - 0.71) \times 0 = 0.5$