Homework mAP (mean Average Precision) Calculation

Given the Following Data Set, find mAP.

Rank	P (Precision)	R (Recall)
0	1.0	0.2
1	1.0	0.4
2	0.67	0.4
3	0.5	0.4
4	0.5	0.6
5	0.57	0.8
6	0.3	0.8
7	0.5	1.0

Ans: AP = 0.682 //

MAP Homework Key
Mean Average Precision

HL

Example: Given the Following Data set, find MAP:

Rank	P(Precision)	R(Recall)
0	1.0	0.2
1	1.0	0.4
2	0.67	0.4
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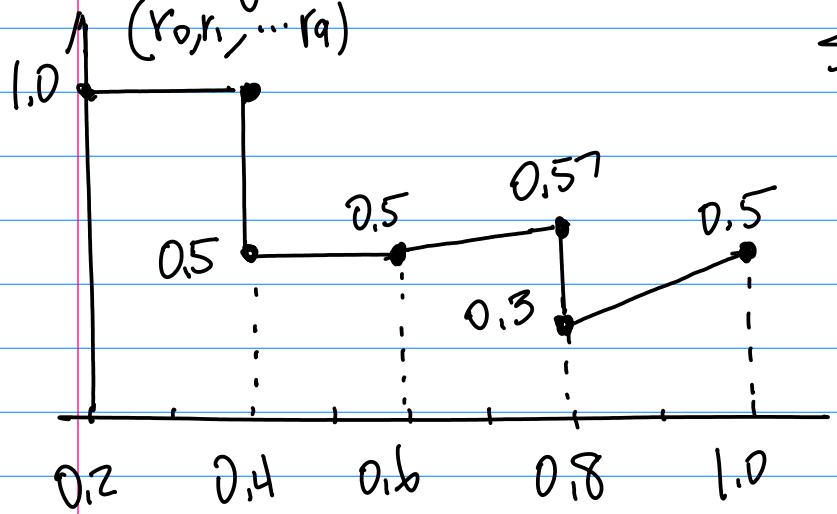
Step 1. Plot R-P Chart as x-y chart, N=10



Note: for [0.4, 1.0), [0.4, 0.67) (0.4, 0.5), Choose (0.4, 1.0) the max, and (0.4, 0.5) the min, in the plot, Similarly for (0.8, 0.57), (0.8, 0.3), Choos the first as max, and the 2nd as min in the plot.

Note: Insert $r_i = 0.3$ between $[0.2, 0.4]$, and $r_i = 0.5$ between $[0.4, 0.6]$, and $r_i = 0.7$ between $[0.6, 0.8]$, as well as 0.9 between $[0.8, 1.0]$.

Step 2.

Since $AP = \int_0^1 P(r)\,dr$

$\simeq \frac{1}{N} \sum_{i=0}^{N-1} P(r_i)$ for $N = 10$

$AP \simeq \frac{1}{11} \sum_{i=0}^{10} P(r_i)$ ... (1)

$= \frac{1}{11} \left(P(r_0) + P(r_1) + P(r_2) + \cdots + P(r_{10}) \right)$

$= \frac{1}{11} \left(P(0.2) + P(0.3) + P(0.4) + P(0.5) + \cdots\cdots + P(1.0) \right)$ ... (2)

From the plot,
$P(r_0)=1.0, P(r_1)=1.0, P(r_2)=1.0$
and for Sloped line of P value we use

$$\tilde{P}(r_i)=\max_{i\le K\le u}\tilde{P}(r_K) \quad \dots(3)$$

where $i=3, r_3=0.5, u=7$

$$\tilde{P}(r_i)=\tilde{P}(r_3)=\max_{3\le K\le 7}\tilde{P}(r_K)$$

$$\tilde{P}(r_3)=\max\{\tilde{P}(r_3),\tilde{P}(r_4),\tilde{P}(r_5),\tilde{P}(r_6),\tilde{P}(r_7)\}$$

$$=\max\{0.5,\tilde{P}(r_4),\tilde{P}(r_5),\tilde{P}(r_6),0.57\}$$

$$=0.57 \quad \dots(4)$$

Where $\tilde{P}(r_4),\tilde{P}(r_5),\tilde{P}(r_6)\le 0.57$

Similarly, On the Same Slopped line segment

$\tilde{P}(r_4)=\tilde{P}(r_7)$
$\tilde{P}(r_5)=\tilde{P}(r_7)$
$\tilde{P}(r_6)=\tilde{P}(r_7)$

Now, for $\tilde{P}(r_8), \tilde{P}(r_9)$, we are on A New Slopped Line Segment, from Eqn(3),

$$\tilde{P}(r_8)=\max_{8\le K\le 9}\tilde{P}(r_K)$$

$$=\max\{\tilde{P}(r_8),\tilde{P}(r_9)\}$$

from the line segment, $\tilde{P}(r_8)\le\tilde{P}(r_9)$

So, $\tilde{P}(r_8)=\tilde{P}(r_9)=0.5$

Now, Substitute the Above into the following Equation

$$AP\simeq\frac{1}{10}\left(\tilde{P}(r_0)+\tilde{P}(r_1)+\dots+\tilde{P}(r_9)\right)$$

$$=\frac{1}{10}\left(\tilde{P}(r_0)*3+\tilde{P}(r_7)*5+\tilde{P}(r_9)*2\right)$$

$$=\frac{1}{10}\left(1.0*3+0.57*5+0.5*2\right)$$

$$=\frac{685}{11}=0.685$$

(END)

$r=0.8$, $P(0.8)=P(1.0)$, and $r=0.9$ $P(0.9)=P(1.0)$, And $r=1.0$, $P(1.0)=0.5$