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 = 0.685 //

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
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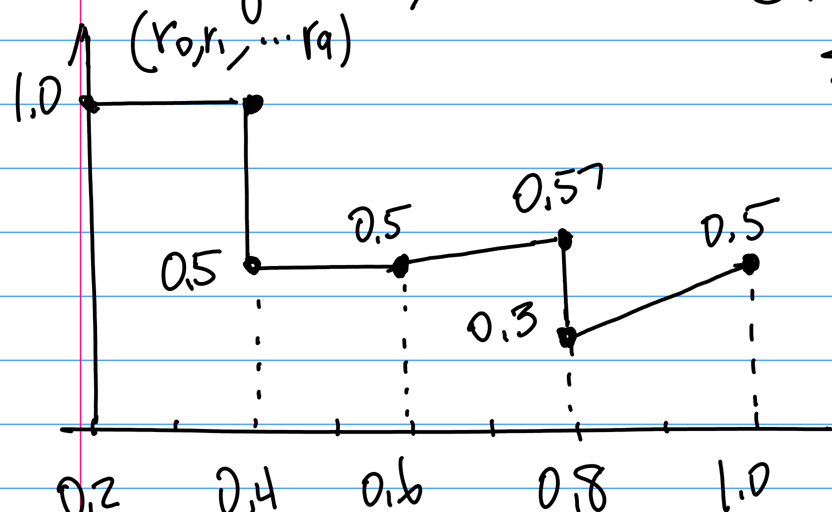
Step 1. Plot R-P Chart as x-y Chart, $N=10$



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

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

$$AP \simeq \frac{1}{10}\sum_{i=0}^{9} P(r_i) \quad \dots (1)$$

$$= \frac{1}{10}\left(P(r_0) + P(r_1) + P(r_2) + \dots + P(r_9)\right)$$

$$= \frac{1}{10}\big(P(0.2) + P(0.3) + P(0.4) + P(0.5) + P(0.6) + P(0.7) + P(0.8) + P(0.9) + P(1.0)\big) \quad \dots (2)$$

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

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

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

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

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

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

$$=0.57 \qquad \ldots(4)$$

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

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

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

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

$$=685/10=0.685$$

(END)