22-S1-Q2

Q (a) first - min

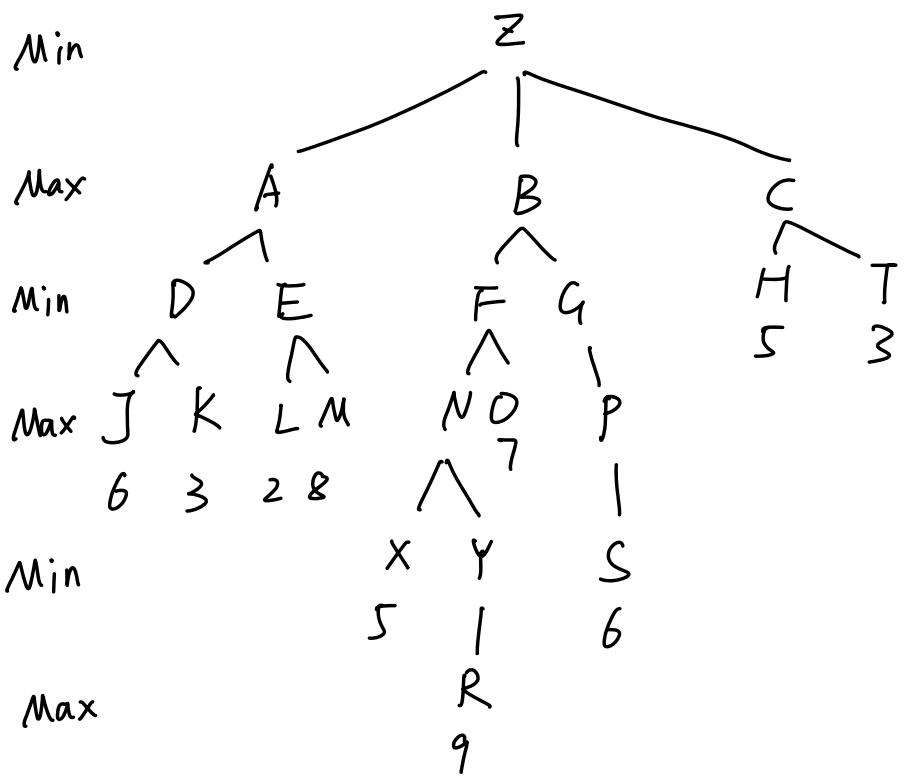
(i) choose of ABC

(ii) left - to - right $\alpha\beta$ pruning

list no examined node

(iii) reduce computation cost in α-β

2 factors compare: min max



(b) 2-1-21 ReLU bias = 1.0 $\eta = 0.5$

(i) O_3 O_4 O_5 O_6 $x=(1,0)$

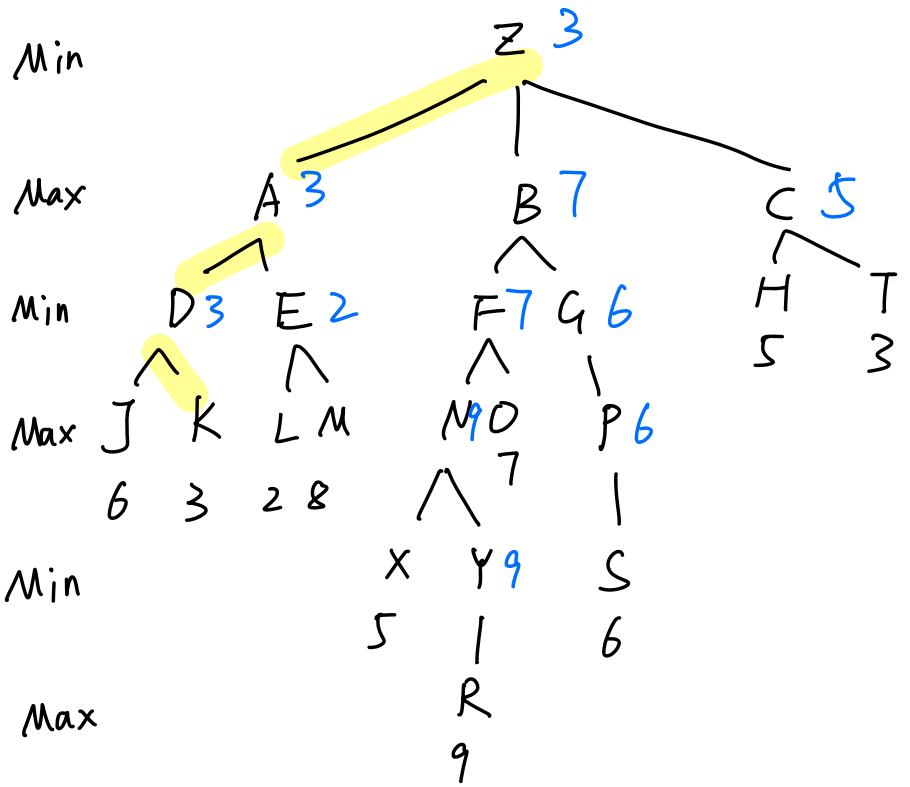
$t_6 = 0.8$

(ii) δ_{all}

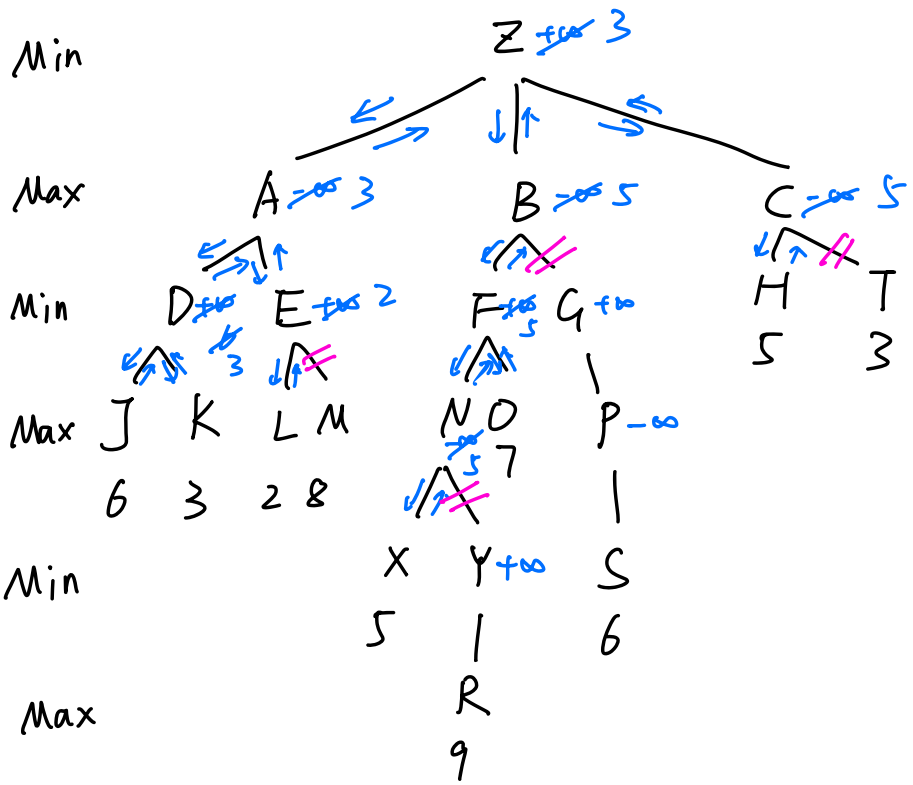
(iii) $W_{5,bias}$

(iv) σ_6

Solution(i) MinMax : choose A



(ii)



not examinated node.

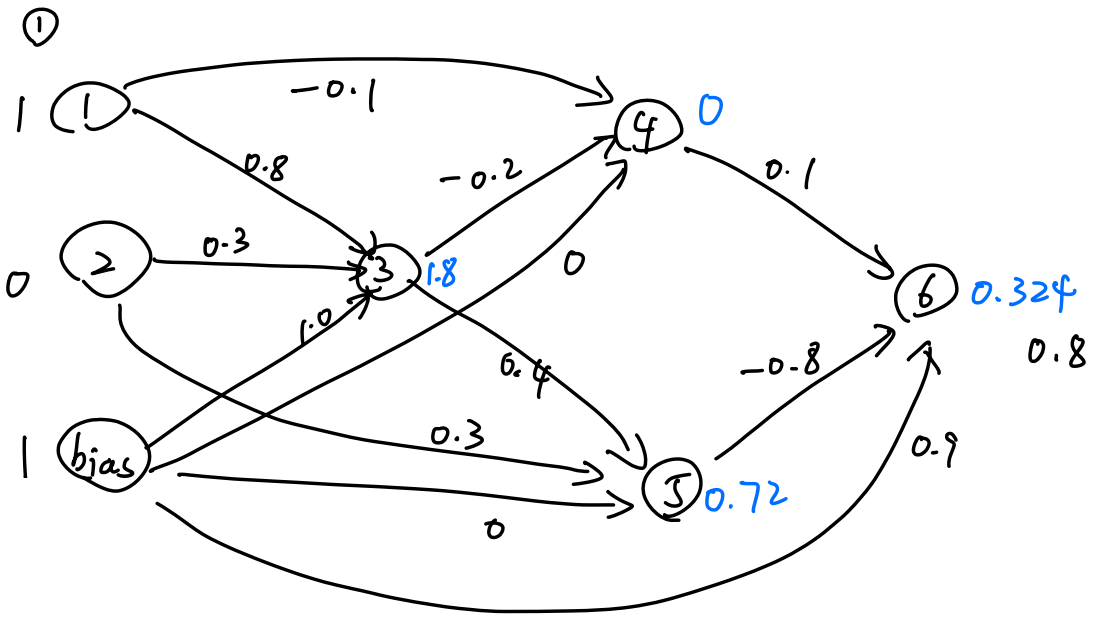
M Y R G P S T

(iii) ① Pruning of irrelevant branches:

Once α or β crosses, entire subtrees can be skipped.

② Move ordering: If one finds either a very good for Max or very bad for Min move early, it tightens α or β sooner and prunes more aggressively

(b) (i) O_3 O_4 O_5 O_6



② $net_3 = 0.8 \times 1 + 0.3 \times 0 + 1.0 \times 1$

$= 0.8 + 1$

$= 1.8$

$O_3 = \sigma(net_3) = 1.8$

③ $net_4 = -0.1 \times 1 - 0.2 \times 1.8 + 0 \times 1$

$= -0.46$

$O_4 = \sigma(net_4) = 0$

④ $net_5 = 0.4 \times 1.8 + 0.3 \times 0 + 0 \times 1$

$= 0.72$

$O_5 = \sigma(net_5) = 0.72$

⑤ $net_6 = 0.1 \times 0 - 0.8 \times 0.72 + 0.9 \times 1$

$= 0.324$

$O_6 = \sigma(net_6) = 0.324$

(ii) δ

① $\sigma(x) = \max(0, x)$

$$\sigma'(x) = \begin{cases} 1 & , x > 0 \\ 0 & , x < 0 \end{cases}$$

② $\delta_6 = \sigma'(net_6)(t_6 - o_6)$

$= 1 \times (0.8 - 0.324)$

$= 0.476$

③ $\delta_5 = \sigma'(net_5) \sum_k \delta_k w_{kj}$

$= 1 \times (\delta_6 \cdot w_{65})$

$= 0.476 \times (-0.8)$

$= -0.3808$

④ $\delta_4 = \sigma'(net_4) \ \delta_6 w_{64}$

$= 0$

⑤ $\delta_3 = 1 \times [\delta_4 \times (-0.2) + \delta_5 \times (0.4)]$

$= -0.3808 \times 0.4$

$= -0.15232$

(iii) $W_{5,bias}$

① $\Delta W_{5,bias} = \eta \delta_5 O_{bias}$

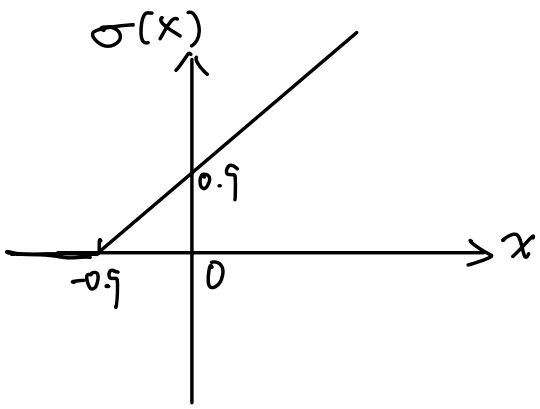
$= 0.5 \times (-0.3808) \times 1$

$= -0.1904$

② $W_{5,bias} = 0 - 0.1904$

$= -0.1904$

(iv) $\sigma(x) = \max(0, x+0.9)$



(c) (i) ① accuracy

TP	FN
FP	TN

300	200
250	9250

TP	FP
FN	TN

$$\text{accuray} = \frac{TP+TN}{TP+FP+FN+TN} = \frac{300+9250}{10000} = 95.5\%$$

② $\text{precision} = \frac{TP}{TP+FP} = \frac{300}{300+250} = 54.5454\%$

③ $\text{recall} = \frac{TP}{TP+FN} = \frac{300}{300+200} = 60\%$

(ii)

① raise the recall.

② we must reduce the number of missed fake (FN)