

CSC 578 Quiz#1 Sample Solutions

1. Mitchell's book #4.1

By plugging in the two intercepts $\langle -1, 0 \rangle$ and $\langle 0, 2 \rangle$ in the general decision surface formula with 2 input variables, we get the following two equations with three variables:

$$\begin{aligned} w_0 - w_1 &= 0 \\ w_0 + 2w_2 &= 0 \end{aligned}$$

So we know $w_0 = w_1$ and $w_0 = -2w_2 \leftarrow (*)$

Since the origin $(0,0)$ is classified as negative, we also know

$$w_0 < 0 \leftarrow (**)$$

So by setting w_0 to be -1 arbitrarily, by $(**)$ we get $w_1 = -1$ and $w_2 = 0.5$.

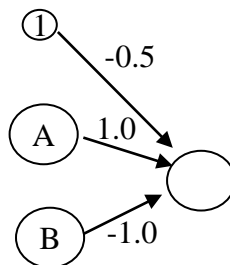
Other numbers work as well, as long as they satisfy the constraints $(*)$ and $(**)$.

2. Mitchell's book #4.2

a) $A \wedge \neg B$

A	B	$A \wedge \neg B$
1	1	-1
1	-1	1
-1	1	-1
-1	-1	-1

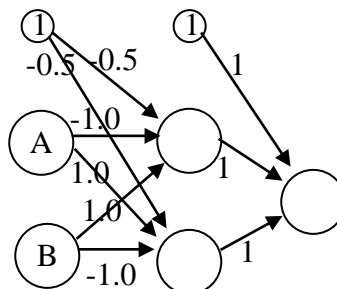
One example solution (while there are infinitely many):



b) $A \text{ XOR } B \equiv (A \wedge \neg B) \vee (\neg A \wedge B)$

So, the $A \wedge \neg B$ network above can be used directly for the first term and with the A,B weights flipped for the second term, and they are combined with OR.

A	B	$A \text{ XOR } B$
1	1	-1
1	-1	1
-1	1	1
-1	-1	-1



Other weights are fine as long as they produce correct result for all data instances.