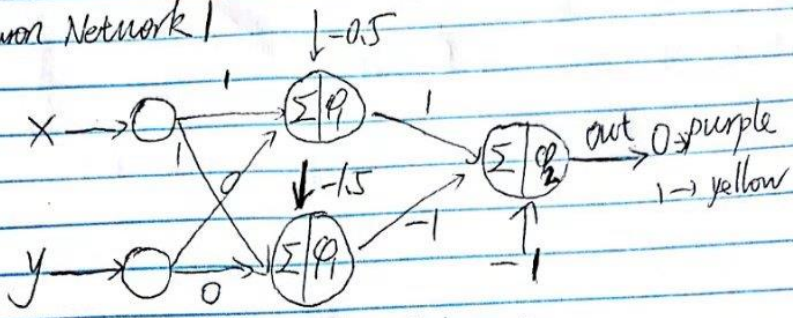
HW04

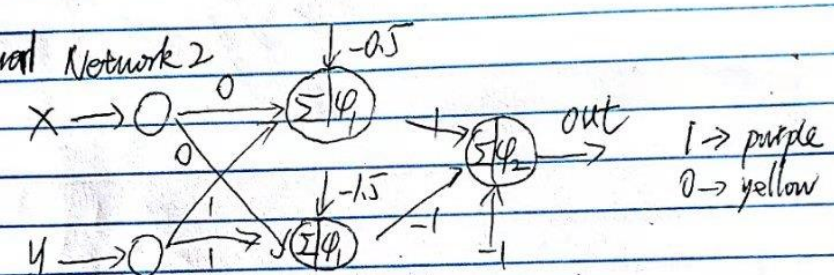
Q1 $Y = [0, 0, 0.78, 3.54, 0, 3.5]$

Q2 a. Neuron Network 1



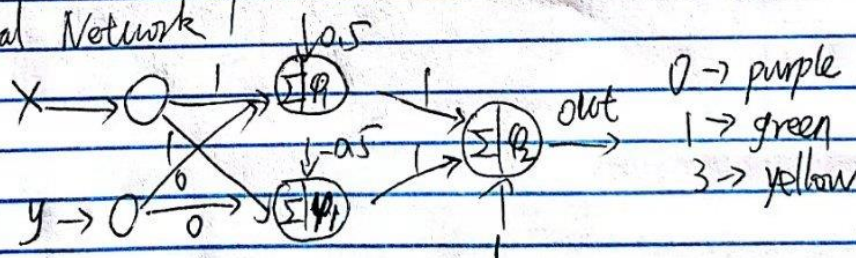
$$\varphi_1(v) = \begin{cases} 1 & v > 0 \\ -1 & v \le 0 \end{cases} \qquad \varphi_2(v) = \begin{cases} 1 & v > 0 \\ 0 & v \le 0 \end{cases}$$

Neural Network 2



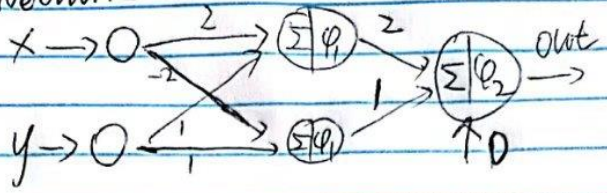
$$\varphi_1(v) = \begin{cases} 1 & v > 0 \\ -1 & v \le 0 \end{cases} \qquad \varphi_2(v) = \begin{cases} 1 & v > 0 \\ 0 & v \le 0 \end{cases}$$

b. Neural Network 1



$$\varphi_1(v) = \begin{cases} 1 & v > 0 \\ -1 & v \le 0 \end{cases} \qquad \varphi_2(v) = \begin{cases} v & v > 0 \\ 0 & v \le 0 \end{cases}$$

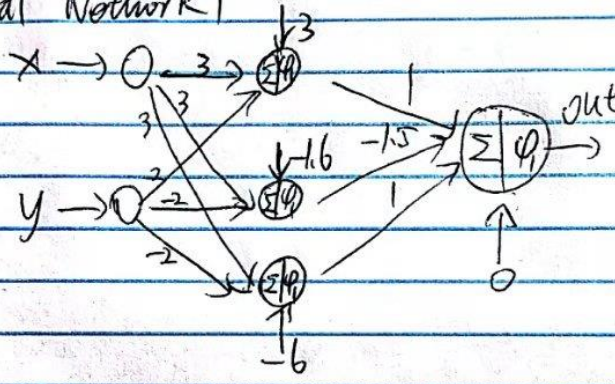
Neural Network 2



0 → purple
1 → yellow
3 → green

$\varphi_1(v) = \begin{cases} 1 & v > 0 \\ -1 & v \le 0 \end{cases}$ $\varphi_2(v) = \begin{cases} v & v > 0 \\ 0 & v \le 0 \end{cases}$

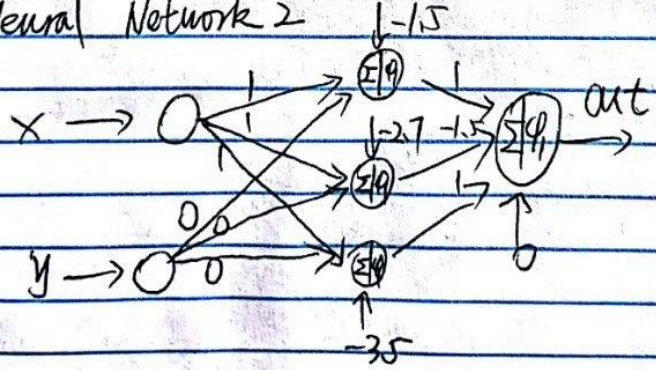
C_1 Neural Network 1



0 → purple
1 → yellow

$\varphi_1(v) = \begin{cases} 1 & v > 0 \\ 0, & v \le 0 \end{cases}$

Neural Network 2



0 → purple
1 → yellow

$\varphi_1(v) = \begin{cases} 1 & v > 0 \\ 0 & v \le 0 \end{cases}$

Q2.2

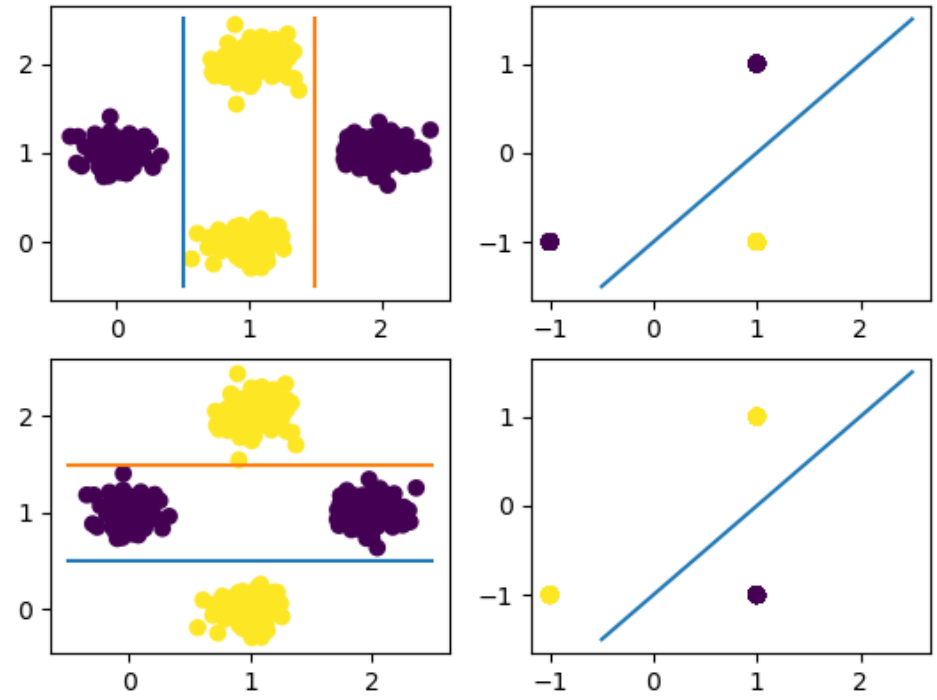


Figure 1

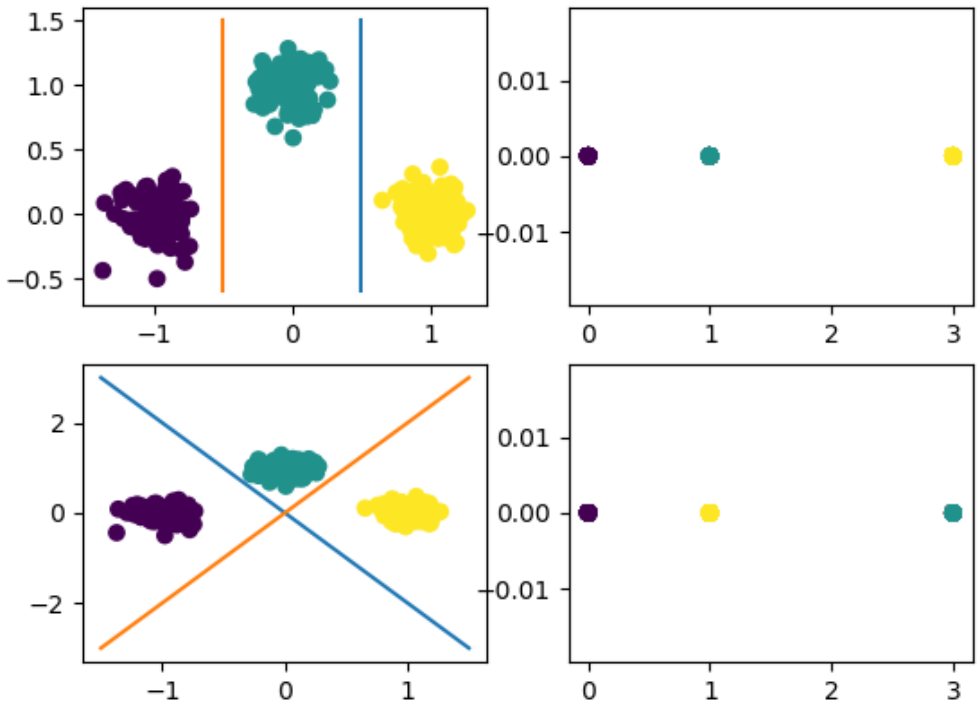


Figure 2

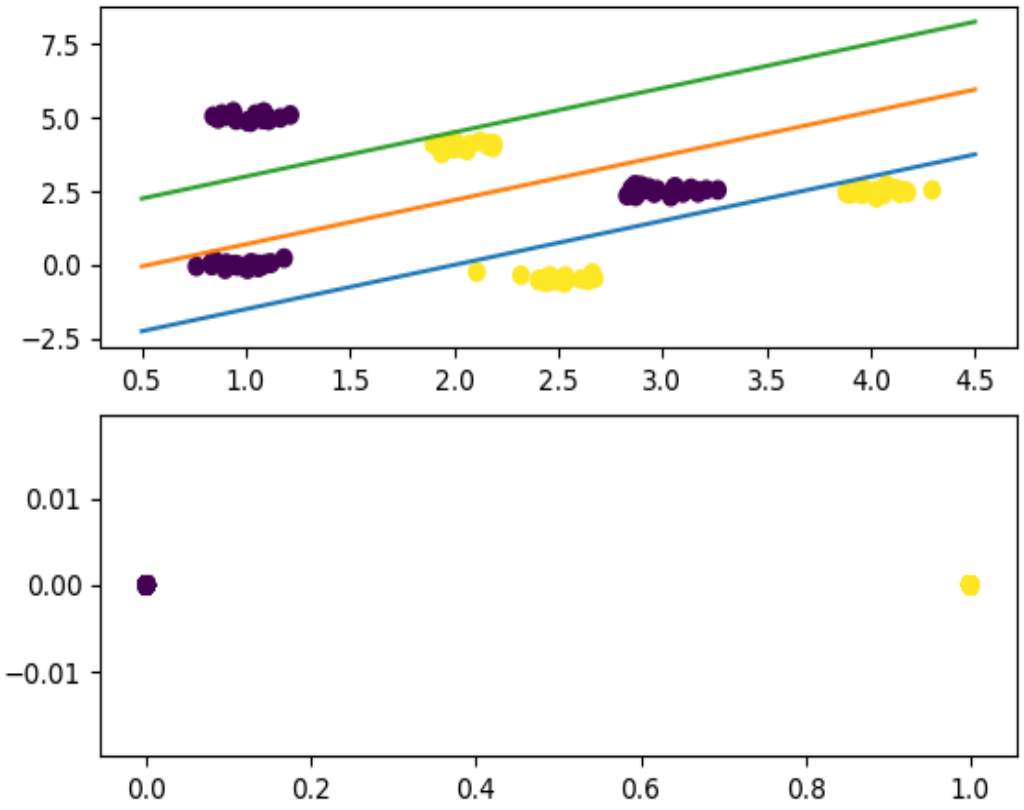


Figure 3

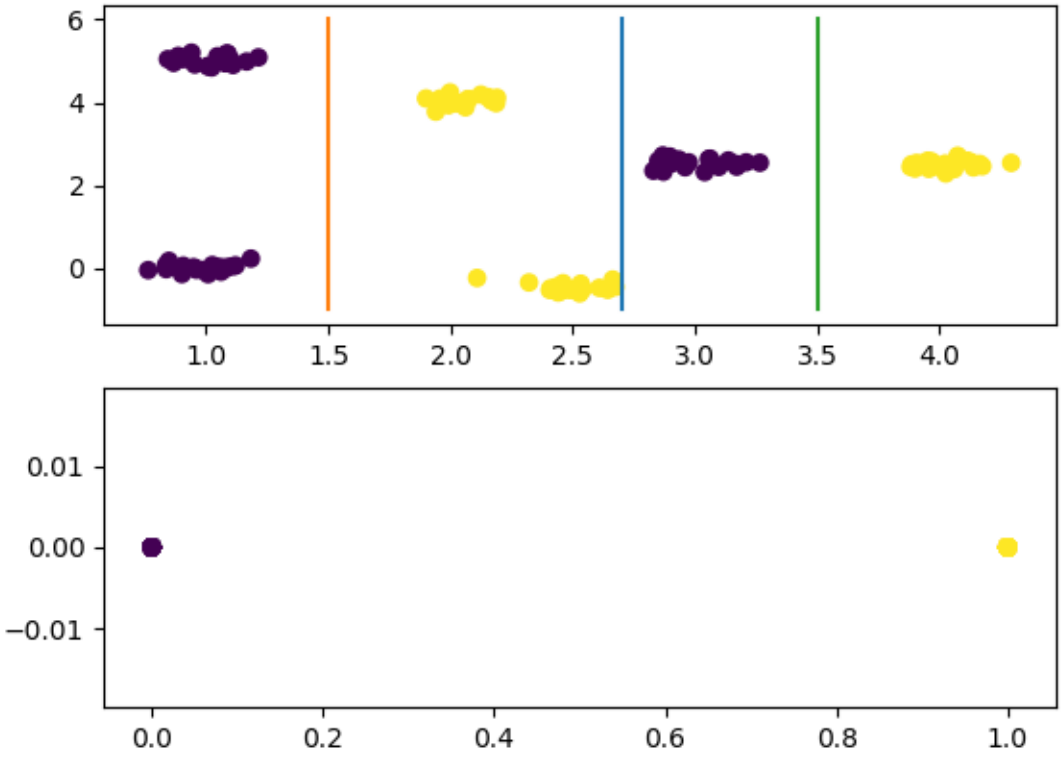


Figure 4

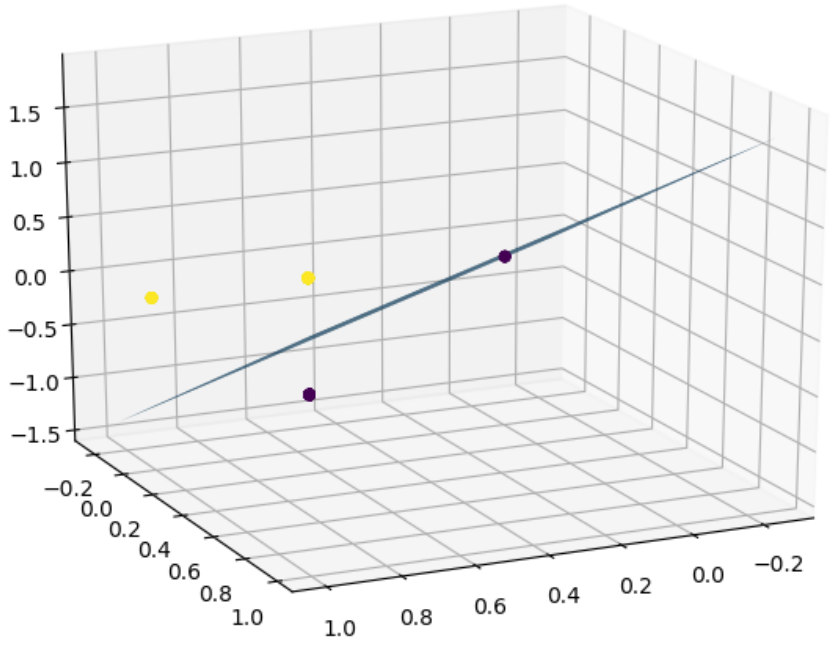


Figure 5

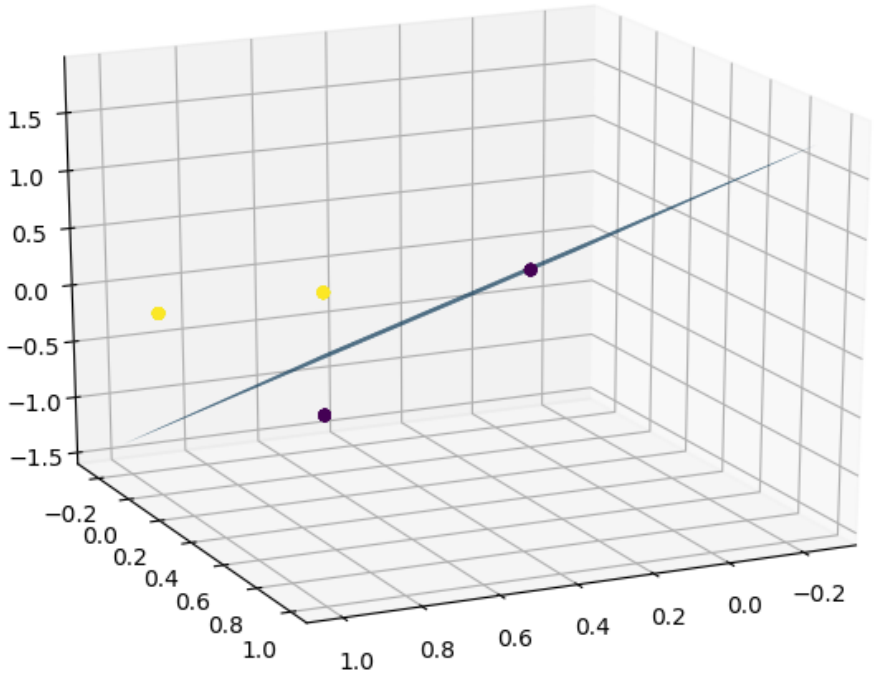


Figure 6

Figure 1 shows decision boundary of two data sets in homework dataset1. Right subplot shows decision boundary of hidden layer. Figure 2 shows decision boundary of three data sets in homework dataset 2. Right subplot shows final outcome. Figure 3 and Figure 4 shows decision boundary of two data sets in homework dataset 3. Below subplot shows final outcome of neural network. Figure 5 and Figure 6 shows 3D surface boundary of dataset 3. I rotate the plot to make it more clear.

From Figure 1 to Figure 6, we can find our boundary is perfect for three datasets. Furthermore, in Figure 7, I calculated final outcome of 6 neural networks and compared the outcome with original labels. The result matches perfectly.

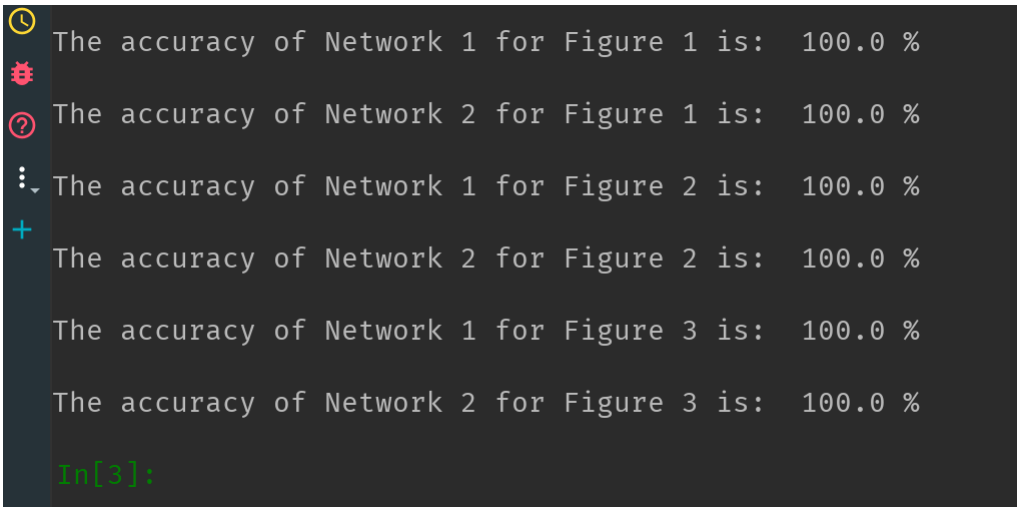


Figure 7