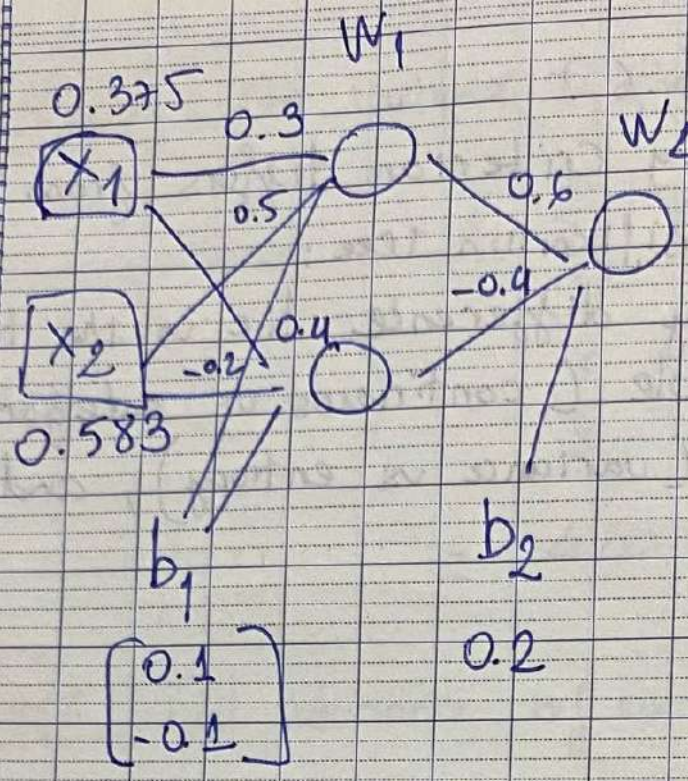
Question 10



- Hidden neuron 1:

$$z_{h_1} = W_1[1,1] \cdot x_1 + W_1[1,2]\, x_2 + b_1[1]$$

$$= 0.504$$

- Apply sigmoid: $h_1 = \sigma(z_{h_1}) \approx 0,6234$

- Hidden neuron 2:

$$z_{h_2} = -0,0666$$

- Apply sigmoid: $\Rightarrow h_2 \approx 0,4833$

- Output layer:

$$z_2 = W_2[1] \cdot h_1 + W_2[2] \cdot h_2 + b_2$$

$$\Rightarrow \hat{y} = \sigma(z_2) \approx 0,594$$

- Forward pass Result:

$\hat{y} = 0.594 \Rightarrow T_1$ is classify as Low Risk

which match the target $y = 1$, however there is still an error to back propagate.

Cal loss:

$$L = -[y \log(\hat{y}) + (1-y)\log(1-\hat{y})]$$

$$\approx 0.522$$

- Backprop to Cal Gradients

$$\frac{\partial L}{\partial z_2} = \hat{y} - y = -0.406.$$

- Gradient w.r.t W_2:

$$\frac{\partial L}{\partial W_2[i]} = \frac{\partial L}{\partial z_2} \cdot h_i$$

- For $W_2[1] = 0.6$ $\Rightarrow$ $\Rightarrow \frac{\partial L}{\partial W_2[1]} \approx -0.25$

$W_2[2] \Rightarrow \frac{\partial L}{\partial W_2[2]} \approx -0.1962$

- $\frac{\partial L}{\partial W_1[1,1]} \approx -0.02145$

- $\frac{\partial L}{\partial W_1[2,1]} \approx 0.0152$

- $\frac{\partial L}{\partial W_2[1,2]} \approx -0,033$

- $\frac{\partial L}{\partial W_1[2,2]} \approx 0.0236$

- Update weights:
  - $W_2[1] \approx 0.6253$
  - $W_2[2] \approx -0.3804$
  - $W_1[1,1] \approx 0.302$
  - $W_1[1,2] \approx 0.503$
  - $W_1[2,1] \approx 0.395$
  - $W_1[2,2] \approx -0.202$

- Error Propagation:

The error propagates from the output back to the hidden layers, scaled by the weights W_2 and the sigmoid derivatives, then back to the input-hidden weights, adjusting all parameters to reduce the prediction error.