University of Thessaly

Neuro-Fuzzy Computing

ECE447

2nd Problem Set

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Problem 3

For the given neural network, we have:

- $w^1(0) = -3,\ w^2(0) = -1,$
- $b^1(0) = 2,\ b^2(0) = -1$ and
- input/target pair $\{p = 1,\ t = 0\}$

The output of the first layer is:

$$n^1 = w^1 p + b^1 = (-3)(1) + 2 = -1$$
$$a^1 = \text{Swish}\left(n^1\right) = \text{Swish}\left(-1\right) = \frac{n^1}{1 + e^{-n^1}} = \frac{-1}{1 + e} = -0.2689$$

The output of the second layer is then:

$$n^2 = w^2 a^1 + b^2 = (-1)(-0.2689) + (-1) = -0.7311$$
$$a^2 = \text{LReLU}\left(n^2\right) = \text{LReLU}\left(-0.7311\right) = 0.001$$

So, the error calculated is:

$$e = t - a^2 = (1 - (0.001)) = 0.999 \approx 1$$

Now, we can apply back-propagation starting from the second layer:

$$s^2 = -2\text{LReLU}'\left(n^2\right)(t - a)$$