

Test 3 for Explainable Fuzzy AI Class

Summer 2021

1. *Simulating a simple neural network.*

Suppose that a 2-layer neural network has two inputs $x_1 = -2$ and $x_2 = 2$.

- In the first layer, we perform a linear transformation and compute the value $y = w_0 + w_1 \cdot x_1 + w_2 \cdot x_2$.
- In the second layer, we apply, to the result of the first layer, the rectified linear activation function and get $z = f(y)$.

What will be the result z of this data processing in the following two situations:

- when $w_0 = 0$, $w_1 = 1$, and $w_2 = 2$, and
- when $w_0 = 0$, $w_1 = -1$, and $w_2 = -2$.

2. *Activation functions.*

- 2a. What is an activation function and why do we need it?
- 2b. What activation function was used in traditional neural networks and why?
- 2c. What activation function is used in deep learning?
- 2d. What operations are hardware supported on a computer? How does a computer compute $\exp(x)$?
- 2e. Explain why rectified linear activation functions work the best.

3. *Pooling.*

- 3a. What is pooling and why do we need it?
- 3b. What poolings are used in deep learning?
- 3c. If we pool together the values $x_1 = 1$, $x_2 = 2$, and $x_3 = 3$, what will be the result of max-pooling? sum-pooling?
- 3d. Explain why max-pooling and sum-pooling work the best.

4. Describe a paper that you reviewed in your project:

- what is the general practical problem for whose solution this paper is aimed;
- what was known before this paper and what were the remaining challenges;
- what are the results of this paper, and in what sense they are better than what was done before;
- what are the remaining challenges – if any.

5. Describe a paper that someone else presented:

- what is the general practical problem for whose solution this paper is aimed;;
- what was known before this paper and what were the remaining challenges;
- what are the results of this paper, and in what sense they are better than what was done before;
- what are the remaining challenges – if any.