Eleventh problem set

Due date: 2019.05.16, 9.00

Topic: real representation

You have to send your solutions via email (evolalghf@gmail.com). You have to solve them unassisted, unless it's marked with a star. The problems marked * can be solved in groups of two. You can get maximum 10 points.

1. (5 points) Let x_1 és x_2 two logical variables. Design a neural network with the activation function $g(z) = \dfrac{1}{1 + \exp(-z)}$ which has the output

   - AND(x_1, x_2)
   - XOR(x_1, x_2)

   If the output is < 0.5, then it's considered 0 otherwise 1.

2. (5 points) A test (N..ty) used to screen fetuses with Down syndrome is advertised with the following ad: if the fetus is healthy in 99.95% of the cases the test gives the correct result. If the fetus has Down syndrome the test results are positive in 99.17% of the cases. 99.9% fetuses predicted to be healthy are healthy.

   We know from literature that the incidence of Down syndrome is 1: 700. Calculate recall, sensitivity, and F_1 score from these data.

   Compute the probability that if the test is positive, then fetus actually has Down syndrome.

3. * (10 points) Find optimal weights for the first exercise with the gradient method.