



Computer Exercise 2: MLP

Goal: To understand the Multi-Layered Perceptron and the Error Back-Propagation algorithm by training the neural network on fixed set of training samples.

Task: You are required to simulate the MLP for 3 sample sets out of 4, where, the 2nd may be chosen from problems ② and ③, the 3rd may be chosen from problems ④ and ⑤. The training samples and test samples are obtained from the following functions,

① $f_1(x) = \sin(x), x \in [0, 2\pi]$, 9 training samples uniformly distributed in the region of $[0, 2\pi]$, and 361 test samples. 

② $f_2(x) = |\sin(x)|, x \in [0, 2\pi]$, 9 training samples uniformly distributed in the region of $[0, 2\pi]$, and 361 test samples. 

③ $f_3(x) = XOR$, the Exclusive-OR problem

④ $f_4(x_1, x_2) = \frac{\sin x_1}{x_1} \square \frac{\sin x_2}{x_2}, x_1, x_2 \in [-10, +10]$, at least 11×11 training samples uniformly distributed in the region of $[-10, 10]$, and 21×21 test samples.

⑤ **Rosenbroke** $f_5(x_1, x_2) = 100(x_2 - x_1^2)^2 + (1 - x_1)^2$, $-5.0 \leq x_1, x_2 \leq 5.0$, at least 11×11 training samples.

Requirements:

- 1) Computer programming in any programming languages, i.e., C, C++, VC++, or .m, **EXCEPT** NN toolbox.
- 2) Research report, including Introduction, Methods, Results, and Conclusions, Source Code.
- 3) DUE: the Final Exam Day