Machine Learning

ECE 4332 / ECE 5332

Project 5

Use your own implementation of the feed-forward neural network to

   a. Solve the XOR classification problem, as shown below, using an architecture with one hidden layer composed of 2 units.
Plot the loss function value throughout the training process. Once convergence is achieved, plot the resulting decision surface together with the input data.

$$C_1 = \left\{ \begin{bmatrix} -1 \\ -1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \end{bmatrix} \right\}; \ C_2 = \left\{ \begin{bmatrix} -1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ -1 \end{bmatrix} \right\}$$

   b. Solve the regression problem described below.

      i. Dataset:

```
rng(100)
X=2*rand(1,50)-1;
T=sin(2*pi*X)+0.3*randn(1,50);
```

      ii. Network architecture: One hidden layer composed of 3 hyperbolic tangent hidden units

      iii. Repeat with 20 hyperbolic tangent hidden units

Plot the loss function value throughout the training process. Once convergence is achieved, plot the resulting model together with the input data and report the training error on the figure.

When executed, your code must display all required plots and data at once.

Upload your .m or .py file to Blackboard prior to the deadline.