

ME 599-5 ARTIFICIAL NEURAL NETWORK : THEORY AND APPLICATIONS

Professor : Hyungsuck Cho

MLP Neural Network simulation using Matlab

The process to train and test a designed MLP neural network :

- 1) We make training patterns and test patterns.
- 2) A network architecture should be defined by **newff** MATLAB function with the number of layers, neurons and transfer functions.
- 3) The defined neural network architecture is trained by **train** MATLAB function with input patterns and training parameters.
- 4) We can easily check the result by using a **sim** MATLAB function.

Example :

1. Training Patterns

Input(x) : [-15 -10 -5 0 5 10 15]

Desired Output(y) : function $y = 0.05x^3 - 0.2x^2 - 3x + 20$ for input(x)

[-148.7500 -20.0000 23.7500 20.0000 6.2500 20.0000 98.7500]

2. Architecture of MLP

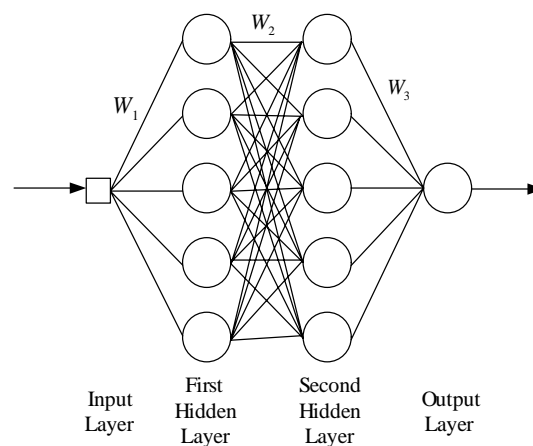


Figure 1. Architecture of MLP

3. Test Patterns

Input(x) : values from -15 to 15

Desired Output(y) : function $y = 0.05x^3 - 0.2x^2 - 3x + 20$

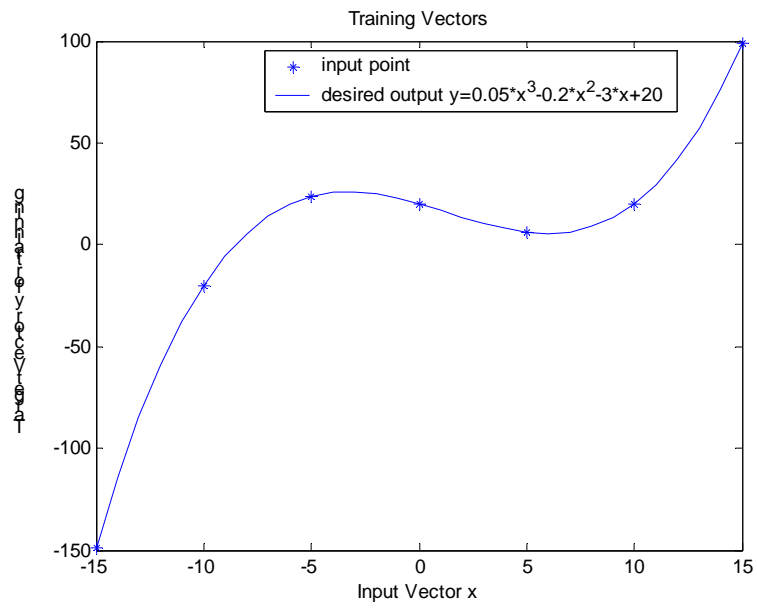


Figure 2. input data

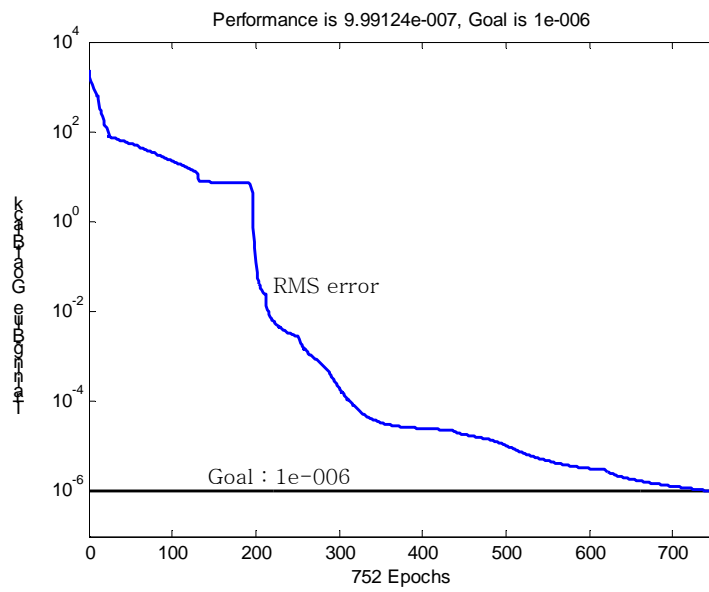


Figure 3. RMS error values at each iterations

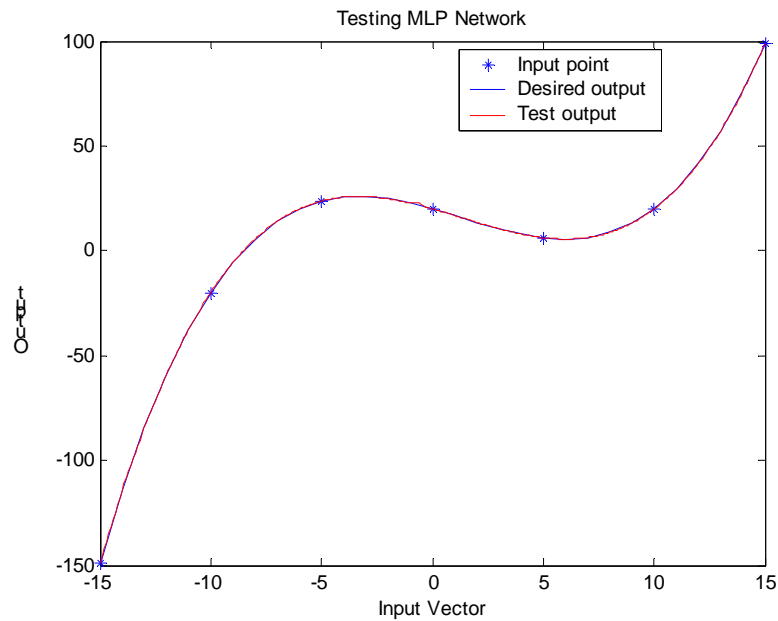


Figure 4. Test pattern simulation

Matlab Program with toolbox :

```
clear all          % clear all data and initializing

% process of making a data set for MLP training
%-----
x=[-15 -10 -5 0 5 10 15]; % input for training
y=0.05*x.^3-0.2*x.^2-3*x+ 20; % output for training
%-----

% Process of drawing the picture of trained MLP
%-----
x1=[-15:1:15];
y1=0.05*x1.^3-0.2*x1.^2-3*x1+ 20;
figure(1);          % making a new figure window
plot(x,y,'b*',x1,y1,'b') % drawing the graph (x,y), (x1,y1)
title('Training Vectors'); % a title of figure
xlabel('Input Vector x'); % x label of figure
ylabel('Target Vector y for training'); % y label of figure
legend({'input point','desired output y=0.05*x^3-0.2*x^2-3*x+ 20'})
% legend of figure
```



```
%-----  
  
% drawing the figure of result of simulation  
%-----  
figure(2);  
plot(x,y,'b*',x1,y1,'b',Test,Output,'r')  
title('Testing MLP Network');  
xlabel('Input Vector');  
ylabel('Output');  
legend({'Input point','Desired output','Test output'})  
%-----
```