EE 509 Assignment #3

Neural Network Simulation

Tyler Mau

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```matlab
% Clear and Close Windows
clear;
close all;

% Create Input/Output Pairs for Training
p = rand(1, 500) * 20;
t = zeros(1, 500);
size_p = size(p);

for i = 1:size_p(2)
    t(i) = p(i) * exp(-p(i));
end

% Generate Test Input and Desired Output Data
p_test = 0:5/50:5;
t_desired = zeros(1, 50);
size_p_test = size(p_test);

for i = 1:size_p_test(2)
    t_desired(i) = p_test(i) * exp(-p_test(i));
end

% Create Neural Network
net = feedforwardnet(5);

% Configure Neural Network
net = configure(net, p, t);

% Define Activation Functions
net.layers{1}.transferFcn = 'tansig';
net.layers{2}.transferFcn = 'purelin';

% Initialize Weights and Biases with Random Numbers
net.inputWeights{1,1}.initFcn = 'rands';
net.layerWeights{2,1}.initFcn = 'rands';
net.biases{1,1}.initFcn = 'rands';
net.biases{2,1}.initFcn = 'rands';

% Set Training Epochs and Desired Max Performance Error
net.trainParam.epochs = 100;
net.trainParam.goal = 1e-07;

% Test Neural Network Before Training
test_output_before = net(p_test);
```
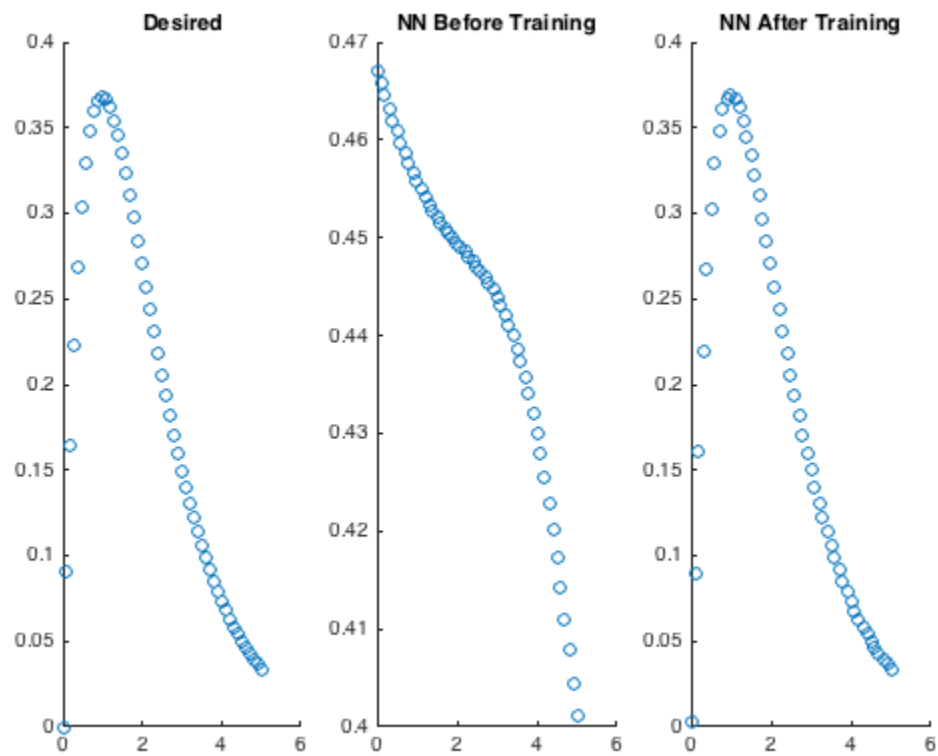
```matlab
% Train Neural Network
net = train(net, p, t);

% Test Performance of Neural Network
test_output_after = net(p_test);

% Display Results
figure(1),
subplot(1,3,1), scatter(p_test, t_desired), title('Desired'),
subplot(1,3,2), scatter(p_test, test_output_before), title('NN Before
 Training'),
subplot(1,3,3), scatter(p_test, test_output_after), title('NN After
 Training');
```


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