COMP 502 - Neural Machine Learning I

Prashant Kalvapalle, Ragib Mostofa

Homework IV

1 Neural Network Parameters

Table 1: Parameters of Training BP Network to Fit $f(x) = 1/x$

Network parameters	
Topology	$(1 + 1_{Bias})$ — $(10 + 1_{Bias})$ — 1
Transfer function	Hyperbolic Tangent Function with slope of 1
Learning parameters	
Initial weights	drawn from U[-0.1, 0.1]
Learning rate (α)	constant at 0.05.
Momentum	none
Epoch size ($Epoch$)	200
Stopping criteria	error (Err_{stop}) ≤ 0.08 OR learn count (t) $> 500,000$
Error measure (Err_{stop})	$\|D - y\|$ averaged over all training samples (see formula (1) below)
Input / output data, representation, scaling	
# training samples (N_{tr})	200 (x values drawn randomly from U[0.1,1])
# test samples (N_{tst})	100 (x values drawn randomly from U[0.1,1])
Scaling of inputs	No scaling since the inputs range from 0.1 to 1.0
Scaling of outputs	map [global min, global max] to [0,1.0]
Parameters and error measures for performance evaluation	
Error of fit (Err_{fit})	Root Mean Square Error (RMSE), over all samples, at a given learn count, see formula (2)
# learn steps performed	Threshold was reached after 65,650 learning steps at an error of 0.79
Learning rate at end	0.05 (No decay or momentum was implemented)
Monitoring frequency (m)	1,200 learning steps

2 Performance Testing

We use the Root Mean Square Error in order to test the performance of the network. The formula for the error is

$$E_{total} = \sqrt{\sum_{k=1}^{N} e^k} \tag{1}$$

where $e_k = D_k - y_k$ We calculate this error after every m steps (where m = 120, in our case) over all training inputs or patterns to trace the performance of the network over time. The network uses 600000 iterations and converges to a final RMS error of around 0.2114. The learning curve and the fits have been shown on the next page.