

1. Construct a three layer feedforward neural network (one hidden layer) using the back propagation learning algorithm to approximate the following two input and one output function: (10 pts)

$$F_1(x_1, x_2) = 3(1 - x_1)^2 e^{-x_1^2 - (x_2+1)^2} - 10\left(\frac{x_1}{5} - x_1^3 - x_2^5\right)e^{-x_1^2 - x_2^2} - \frac{1}{3}e^{-(x_1+1)^2 - x_2^2}$$

$$-3 \leq x_1 \leq 3, \quad -3 \leq x_2 \leq 3$$

Show the error reduction graphically with the increasing number of hidden nodes using the following criterion:

$$NDEI = \sqrt{\frac{\sum_{k=1}^N [d(k) - y(k)]^2}{\sum_{k=1}^N [d(k) - \bar{d}]^2}}$$

2. Construct a radial basis function neural network for the sample problem given in Problem 1, using the Gaussian basis function. Use the linear least square technique to update the weights only. (10 pts)

Show the error reduction graphically with the increasing number of hidden nodes using the same criterion: