CSE 5526 - Autumn 2017
Introduction to Neural Networks

Programming Assignment 2

Due Tuesday, Oct. 10
(<u>Midterm</u> will be in class on Tuesday, Oct. 10)

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Implement an RBF network for one input variable, one output variable and Gaussian basis functions. Generate a set of 75 data points by sampling the function $h(x) = 0.5 + 0.4\sin(2\pi x)$ with added uniform noise in the interval [-0.1, 0.1] and with x values taken randomly from a uniform distribution in the interval [0, 1]. Determine Gaussian centers by the K-means algorithm, and set the variance of each cluster accordingly. If a cluster contains only one sample point, use as its variance the mean variance of all the other clusters. Use the LMS rule for weight update (note a bias term is needed). Perform the following:

• Vary the number of bases in the range of 2, 4, 7, 11, 16.
• Use two values of η: 0.01 and 0.02.

For each of the above 10 cases, stop training after 100 epochs. Plot for each case a graph that shows the data points, the original function where the data points are sampled from, and the function generated by the RBF network.

Comment on the dependence of the network performance on the number of bases. Also comment on the choice of η.

In addition, repeat the above implementation but use the same variance for all clusters as described in the lectures. Comment on the comparative advantages of the two methods of determining cluster variance.

What you need to turn in:
        (1) 1-2 page summary report
        (2) Test results of your implementation
        (3) Your source program