

## **Experiments with Linear Models for Regression**

1. Repeat the experiments in §4.1.3 [1] to illustrate the lack of robustness to outliers to obtain plots similar to Fig. 4.4.
2. Implement the Rosenblatt learning algorithm for the perceptron. Verify the working of your program on the AND and OR gates.

## **Experiments with Supervised Learning**

1. Implement the Backpropagation algorithm for two networks, one with a single hidden layer, and the other with two hidden layers.
2. Verify the implementation of the backpropagation algorithm for function approximation:  $f(x) = x^2$ ,  $f(x) = \sin x$ ,  $f(x) = |x|$  and  $f(x)$  is the unit step function. Experiment with the number of neurons in the hidden layers. For each example determine the smallest of each type of network. This experiment is without noise. Implement early stopping criterion.
3. Repeat the above by adding noise to the function values.
4. Implement a radial basis function network assuming Gaussian kernel and one kernel centred at each data point.
5. Verify the implementation for the aforementioned exercises on function approximation, with and without noise.

## **References**

- [1] C. M. Bishop, *Pattern Recognition and Machine Learning*, Springer, 2006.