# Tutorial 3
# (Neural Computing)

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EXERCISE 5

(a) Without momentum a network may get stuck in a shallow local minimum (M1). With momentum a network can slide through such a minimum and fall into a deeper minimum (M2). Why? Use the graph below (Figure 1) to illustrate your answer.
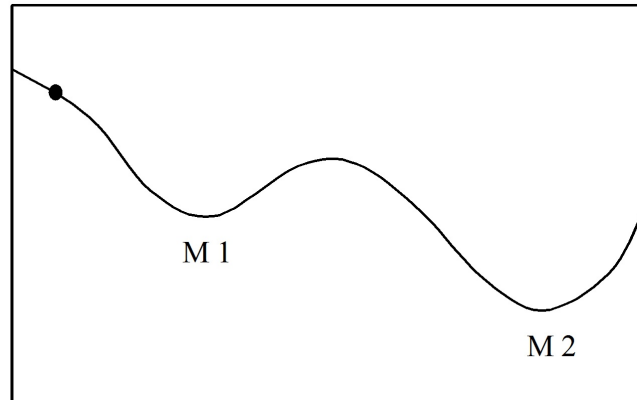


Figure 1: Error surface graph

(b) Draw an error surface graph where the contrary may also happen (i.e. the network may escape a deeper minimum due to the term of momentum).

EXERCISE 6

The plot of Figure 2 was generated by testing a network on each of the 21 input vectors used for its training set. It also shows the target function. The plot of Figure 3 was generated by testing the same network on the inputs used for training it, but also on another 21 inputs never seen by the network during training. What can be said about the learning and generalisation of this network? What can be said about the network's architecture, especially the number of hidden neurons used?
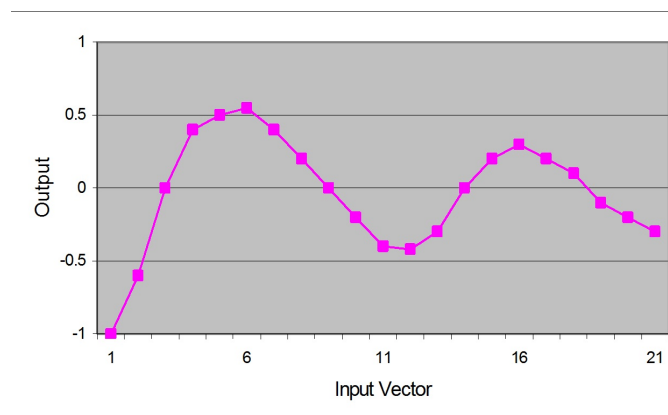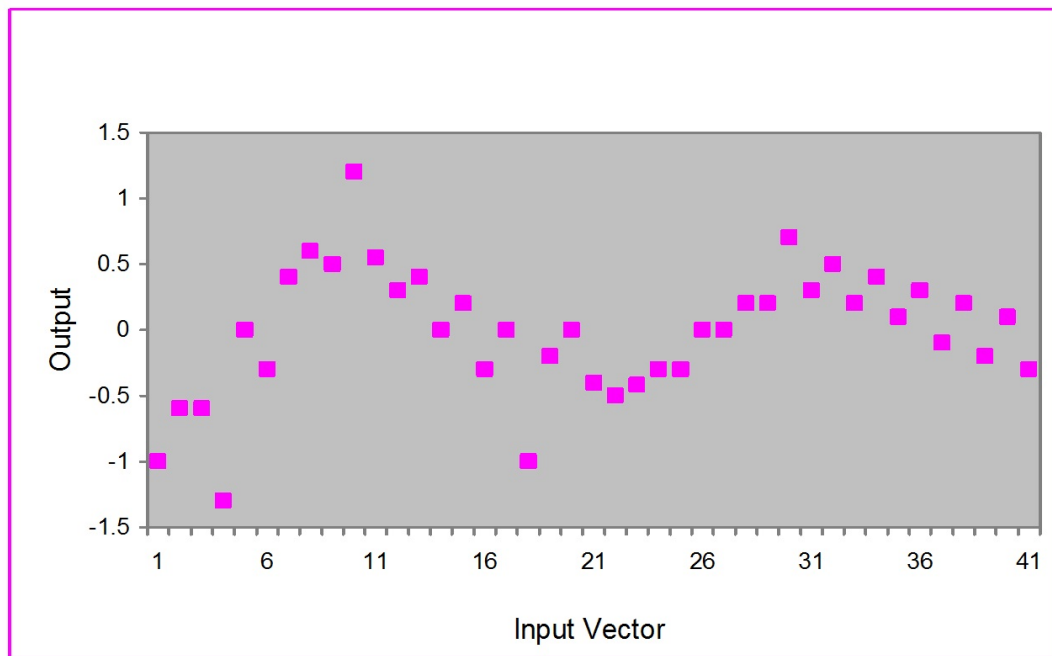


Figure 2: Function Approximation

Figure 3: Testing the network

EXERCISE 7

How many networks should be trained when 10-fold cross-validation is used on a training set with 1000 examples? Why is cross-validation useful?

EXERCISE 8

Consider whether your coursework choice of dataset will require any data pre-processing, e.g. if the data is unbalanced you may want to use a sampling method called *SMOTE*. Consider also whether or not to use *early stopping* to avoid overfitting and speed up training, or *boosting*, creating ensembles of neural networks to improve model accuracy. There are three papers available on Moodle for you to read about Smote, early stopping and boosting.