

## Exercise 2

### Radial-basis Functions and Self Organization

#### Questions

### 3.1 Radial-basis function networks

- What is the lower bound for the number of training examples,  $N$ ?
- What happens with the error if  $N = n$ ? Why?
- Under what conditions, if any, does (4) have a solution in this case?
- During training we use an error measure defined over the training examples. Is it good to use this measure when evaluating the performance of the network? Explain!

### 4.1 Batch mode training using least squares

- How many units did you require to get down to a maximum (absolute) residual value of 0.1, 0.01 and 0.001?
- Give a good reason for the big difference in residual between 5 and 6 units for  $\sin(2x)$ .
- How many units did you require, when approximating  $\text{square}(2x)$ , to come down to residual values of 0.1, 0.01 and 0.001?
- Approximating  $\text{square}(2x)$  is a somewhat special case of function approximation since it is similar to another area of use for artificial neural networks. Which?
- Can you, with a suitable action (e.g. transforming network output), easily get down (for training values) to a residual value=0? What action? How many units did you require?
- Can an RBF network solve the XOR problem? If not, explain why not. If yes, explain how.