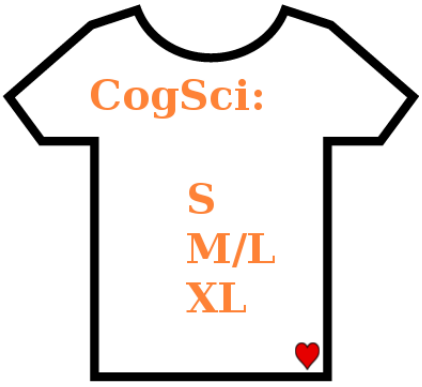
Submission until: **28.06.2015**
Discussion on: 30.06.2015
Submission as upload to your groups stud.IP folder as *groupNumber_sheet9.zip*

Assignment 1 *(k-Nearest Neighbor (4p))*

Inspired by the CogSci T-shirt, the weight, height and T-shirt size, regardless of any body fat scale nor Bioelectrical Impedance Analysis (BIA) from twelve men in AVZ building are collected on 22^th of June 2015. Mrs.A who studies Cognitive Science is looking for a T-shirt for her boyfriend, whose weight is about 80 kg and 177 cm tall. Please help her to find the right T-shirt size using simple k-Nearest Neighbor and Euclidean distance. To be certain, pick k=1,3 and 5. (This is not a programming task, therefore please provide a step-by-step calculation with the help of computer for numerical computation.)

Height(cm)	Weight(kg)	T-Shirt size
188	100	XL
178	108	XL
170	50	S
180	86	M/L
193	70	M/L
182	61	M/L
187	70	S
173	93	XL
172	80	XL
185	92	M/L
174	80	XL
174	70	M/L



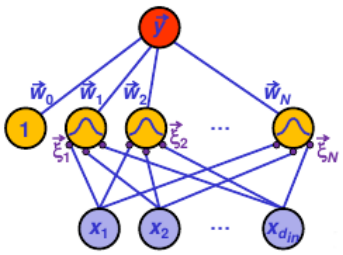


Figure 1: Radial basis function network

Assignment 2 *(RBF (8p))*

1. Discuss RBF network and MLP in different aspects e.g. input and output dimension, extrapolation, lesion tolerance and advantages of each network.

2. The training of RBF network concerns three parts. The first step is to find suitable *centers* or input weights, ξ. Explain in detail how to find these input weights.

3. The most popular radial basis function is a Gaussian bell, $\phi(r) = \exp(-\frac{r^2}{2\sigma})$, where r represents distance from center point ξ, or $\phi(r) = \phi(||x - \xi_i||)$. Normally, functions that are monotonically decreasing such as Gaussian which $\phi(r) \to 0$ as $|r| \to \infty$ are chosen. Write down another basis function which has similar property and one example of basis function which has property: $\phi(r) \to \infty$ as $|r| \to \infty$.

Assignment 3 *(SOM (8p))*

1. Explain :
   a) The meaning of topology preservation
   b) The properties of topology function
   c) Measuring similarity in SOM
2. How to avoid that the later training phases forcefully pull the entire map towards a new pattern?
3. Briefly discuss at least three applications of SOM in different aspects.