Appendix A: Principal Component Analysis

Principal Component Analysis (PCA) is almost equivalent to Singular Value Decomposition (SVA), or Karhunen-Loeve expansion. It will be presented first as an important computational method for feature extraction from input-data (Ritter, Martinetz & Schulten, 1992; Haken, 1996; AuxLit 10). To perform PCA, input-patterns $\mathbf{x}^k$ are decomposed into a series, i.e. a linear combination of prototype-patterns $\mathbf{w}^r$ ($r = 1, ..., p'$):

$$\mathbf{x}^k = \mathbf{w}^0 + \sum_{r=1}^{p'} \mathbf{w}^r c_r(\mathbf{x}^k) + \mathbf{R}(\mathbf{x}^k)$$

(12.1)

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