HUT , Institute of mathematics Gripenberg
Mat-1.196 Mathematics of neural networks
Exercise 8
5.3–15.3.2002

1. Let H be a separable Hilbert space, let $(f_n)_{n=1}^{\infty}$ be a frame H, and let W be a closed subspace of H. Construct a frame in W using $(f_n)_{n=1}^{\infty}$ and the orthogonal projection of H onto W.

2. Why is it not possible to construct a frame in $L^2(\mathbb{R}^d)$ of functions of the form $\frac{1}{\sqrt{a}}\varphi(\frac{\mathbf{u}\cdot\mathbf{x}-b}{a})$ when $d > 1$.

3. Suppose we are given m functions φ_j, $j = 1, \ldots, m$ and n points $(\mathbf{x}_i, y_i)$ with $m > n$. How can one, using Lagrange multipliers find numbers c_j, $j = 1, 2, \ldots, m$ such that $\sum_{j=1}^{m} c_j\varphi_j(\mathbf{x}_i) = y_i$ for all $i = 1, \ldots, n$ and $\sum_{j=1}^{m} c_j^2$ is as small as possible?

C1. Write a matlab function `fferr` such that `[f,fp]=fferr(w,aux)` calculates the error and the derivative with respect to the weights and thresholds of a feed-forward neural network with dimensions, inputs, and outputs given in the vector `aux`.