Multivariate Methods

Homework #1 (2014-2015), Questions

Q1: Regression and "cross-correlation analysis"

Consider the standard regression scenario described in the class notes, pages 1-2. That is, there are *n* observations, $y_1,\ldots,y_n$, and p regressors, where the typical regressor $\vec{x}_j$ is a column $x_{1,j},\ldots x_{n,j}$, and the set of p regressors forms a $n \times p$ matrix X, and we seek a set of p coefficients $b_1,\ldots,b_p$, the $p \times 1$ matrix B, for which $|Y - XB|^2$ is minimized.

Now let's assume that the regressors $\vec{x}_j$ are orthonormal. For example, we're doing spatial receptive field analysis. Here $x_{i,j}$ corresponds to the luminance presented on the *i*th trial in pixel *j*, and we've designed our stimuli so that, over the entire stimulus sequence, $\sum_{i=1}^{N} x_{i,j}x_{i,k} = 0$ if $j \neq k$, and $\sum_{i=1}^{N} x_{i,j}x_{i,j} = 1$.

How does this simplify the computation of the regressors B?