Regression Basics

Suppose we have n data points $(y_i,\ \mathbf{x}_i)$ where $\mathbf{x}_i$ is a $k \times 1$ vector, and β is a $k \times 1$ vector of coefficients. We then represent our model in matrix notation as

$$\mathbf{y} = \mathbf{X}\beta + \mathbf{e} \tag{1}$$

where $\mathbf{y}$ is $n \times 1$, $\mathbf{X}$ is $n \times k$ and $\mathbf{e}$ is $n \times 1$.