

02-512 Assignment 02

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(a)

For one combination of substitutions made, define the following variables:

Let \vec{x} be an n -dimensional vector of 1s and 0s where x_i is 1 if the i^{th} substitution was made, and 0 if not.

Let \vec{k} be an n -dimensional vector of weights, where k_i is the amount that making the i^{th} substitution contributes to the expression level.

Let c be the baseline expression level.

Let y be the expression level.

Then:

$$\vec{k}\vec{x} + c = y$$

If we have $n+1$ such equations, one for each combination, we can represent the linear system in the following matrix: (x_i will now be $x_{j,i}$ where j is the ordinal number of the combination/equation, and apply a similar transformation to the indexes of k and y)

$$\begin{bmatrix} x_{1,1} & x_{1,2} & \cdots & x_{1,n} & 1 \\ x_{2,1} & x_{2,2} & \cdots & x_{2,n} & 1 \\ \vdots & \vdots & \ddots & \vdots & \\ x_{n+1,1} & x_{n+1,2} & \cdots & x_{n+1,n} & 1 \end{bmatrix} \begin{bmatrix} k_1 \\ k_2 \\ \vdots \\ k_n \\ c \end{bmatrix} = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_{n+1} \end{bmatrix}$$