Least squares data fitting

EG Data points: $(x_1, y_1, z_1), (x_2, y_2, z_2), \ldots$

Determine parameters a, b, c so that

$z = a + bx + cy$ best fits the data.

multiple linear regression

x, y : explanatory variables

z : dependent variable

for perfect fit:

$$a + bx_1 + cy_1 = z_1$$
$$a + bx_2 + cy_2 = z_2$$
$$\vdots \qquad\qquad \vdots$$

$$\begin{bmatrix} 1 & x_1 & y_1 \\ 1 & x_2 & y_2 \\ \vdots & \vdots & \vdots \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} z_1 \\ z_2 \\ \vdots \end{bmatrix}$$

design matrix — observation vector

for "best fit" take least squares solution

EG Data points: $(x_1, y_1), (x_2, y_2), \ldots$

Determine parameters a, b, c so that

$y = a + bx + cx^2$ best fits the data.

for perfect fit:

$$a + bx_1 + cx_1^2 = y_1$$
$$a + bx_2 + cx_2^2 = y_2$$
$$\vdots \qquad\qquad \vdots$$

$$\begin{bmatrix} 1 & x_1 & x_1^2 \\ 1 & x_2 & x_2^2 \\ \vdots & \vdots & \vdots \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \end{bmatrix}$$

design matrix — observation vector

for "best fit" take least squares solution