

Least Squares

Given m data points, find the equation of degree n

$$c_1 + c_2x + c_3x^2 + \dots + c_{n+1}x^n = y$$

so that the data points come as close as possible to the graph of the equation.

This is will be the “best fit”. The error can be calculated by finding the vertical distance from each data point to the point on the graph with the same x-coordinate. (square each of these distances and find the sum for the total error)

Method:

1. Write the general polynomial equation whose coefficients you are trying to find: $c_1 + c_2x + c_3x^2 + \dots + c_{n+1}x^n = y$
2. Form a system of equations by substituting each data point (x, y) into the equation for x and y .
3. This system usually is overdetermined and has NO solution. (The corresponding matrix equation $Ac = Y$ has no solution)
4. Form a new system $A^*Ac = A^*Y$. (This new system is called the Normal Equations)
5. The new system can be solved to find the coefficients of the polynomial that best fits the data set.