

Linear regression as least squares: quadratic functions of one variable

Started: Jul 19 at 1:14pm

Quiz Instructions

Question 1

We want to determine the coefficients of a polynomial of the form:

$$p(x) = c_1x^2 + c_2x + c_3$$

The polynomial $p(x)$ **must** satisfy the constraint $p(1) = 1$.

We would also like $p(x)$ to satisfy the following 4 constraints:

$$p(-1) = 5$$

$$p(0) = -1$$

$$p(2) = 6$$

$$p(3) = 12$$

However, this is not possible, since the system of equations is over-determined. Instead, we wish to minimize the error, E , as shown below, using least

$$E = (p(-1) - 5)^2 + (p(0) + 1)^2 + (p(2) - 6)^2 + (p(3) - 12)^2$$

Solve for c_3 in terms of c_1 and c_2 such that the constraint, $p(1) = 1$, holds. Which of the following expressions is c_3 equal to?

If you substitute the expression for c_3 into the polynomial, $p(x)$, what is the new polynomial?

Put the new polynomial and the 4 constraints you would like to satisfy into the $Ax = b$ form where $x = \begin{bmatrix} c_1 \\ c_2 \end{bmatrix}$. Using Matlab find the least squares solution to this system of equations. What is the value for x ?

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