

SyDe 312 Unit III: Extra curve fitting problems

In the suggested text problems, and the problems below, use a variety of methods (normal equations+Cholesky, QR factorization, SVD) to find solutions to the least-squares problem. Make sure you can confidently apply any of those methods. Plot the data and fitting curves in Matlab to examine the relationship between them.

1. Find the power fits $y = a/x$ and $y = b/x^2$ for the following data, and check residuals to determine which fit is best:

$$x = [0.5 \ 0.8 \ 1.1 \ 1.8 \ 4.0]$$

$$y = [7.1 \ 4.4 \ 3.2 \ 1.9 \ 0.9].$$

2. Find the least-squares parabola $y = ax^2 + bx + c$ and for the following data:

$$x = [-2 \ -1 \ 0 \ 1 \ 2]$$

$$y = [2.8 \ 2.1 \ 3.3 \ 6.0 \ 11.5].$$

3. For the given data, find the following least-squares curves: (a) $y = ce^{ax}$; and (b) $y = cx^a$. Check residuals to determine which fit is better:

$$x = [1 \ 2 \ 3 \ 4 \ 5]$$

$$y = [0.6 \ 1.9 \ 4.3 \ 7.6 \ 12.6].$$

4. For the following data find an appropriate fitting function (linear, quadratic, cubic, exponential, linear reciprocal, quadratic reciprocal):

$$(a) \ x = [3.0 \ 0.5 \ 6.9 \ 6.5 \ 9.8 \ 5.5 \ 4.0 \ 2.0 \ 6.3 \ 7.3]$$

$$y = [5.8 \ -2.5 \ 22.1 \ 23.9 \ 36.5 \ 18.0 \ 10.3 \ 2.2 \ 18.4 \ 21.5].$$

$$(b) \ x = [8.80 \ 4.90 \ 8.90 \ 7.60 \ 6.60 \ 9.70 \ 1.70 \ 1.40 \ 7.60 \ 3.10]$$

$$y = [-0.02 \ -0.04 \ -0.02 \ -0.02 \ -0.03 \ -0.02 \ -0.11 \ -0.13 \ -0.03 \ -0.06].$$

$$(c) \ x = [4.80 \ 4.00 \ -4.70 \ -2.20 \ -3.10 \ 1.10 \ -2.90 \ 5.00 \ -4.80 \ -0.60]$$

$$y = [262.00 \ 156.10 \ -200.60 \ -27.00 \ -75.20 \ 9.10 \ -62.40 \ 331.30 \ -262.70 \ -2.60].$$