

CE 597 Homework 5 General LS

Due Tuesday, 2 Dec.

1. Determine the LS estimates of the transformation parameters for the model $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} a_0 \\ b_0 \end{pmatrix} + \begin{pmatrix} a_1 & a_2 \\ b_1 & b_2 \end{pmatrix} \begin{pmatrix} X \\ Y \end{pmatrix}$. Coordinates in both x, y and X, Y systems are observations. $\sigma_x = \sigma_y = 0.7$, $\sigma_X = \sigma_Y = 0.2$

Point	x	y	X	Y
1.	17.0	40.0	10.05	9.90
2.	51.5	19.5	20.10	10.04
3.	54.5	102.5	9.95	19.85
4.	88.5	83.0	20.15	20.08

make global test at $\alpha = 0.01$, (2-sided)

2. Fit an ellipsoid of rotation with the following model:

$$\frac{(X-x_0)^2}{a^2} + \frac{(Y-y_0)^2}{b^2} + \frac{(Z-z_0)^2}{c^2} = 1$$

to the following data points (all coordinate values are observations). Coordinate values are of equal precision and uncorrelated.

Point	X	Y	Z
1	15.1	25.2	36.2
2	5.3	23.7	37.2
3	4.4	18.1	37.3
4	16.2	18.5	36.9
5	19.8	20.2	31.8
6	11.0	29.0	33.8
7	14.2	22.2	22.1
8	4.5	21.7	22.6
9	4.7	18.6	22.5
10	12.9	15.3	22.5
11	0.3	19.9	27.8
12	9.5	11.1	25.9

Construct a 95% confidence region for (x_0, y_0)