CE697 Adv. Data Adj.
Homework 3

assigned 14 June, Tue.
due 23 June, Thur.

1. Following are 10 observations of an unknown value, μ_x

19.82, 20.20, 21.52, 18.98, 20.02, 19.01, 19.51, 18.58, 20.77, 18.44

$\sigma_\ell = 0.8$

(a) Use LS indirect observations to solve this sample mean problem (i.e. use the mechanics of LS). show $\hat{x}$ and V.

(b) assume you have prior knowledge $x = 19.85$ with $\sigma_x = 0.15$
use ULS to find $\hat{x}$ and V

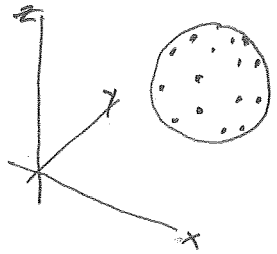
(c) assume you have prior knowledge $x = 19.85$ with $\sigma_x = 0.05$
use ULS to find $\hat{x}$ and V

---

2. The following points, observed in X, Y, Z are to be fit to a sphere.

X	108.34,	116.04,	115.91,	108.78,	95.78,	91.87,	92.26,	95.98,	95.51,	91.91,	92.28,	96.07
Y	500.77,	500.88,	499.66,	500.03,	507.89,	513.59,	513.38,	508.65,	492.67,	486.38,	486.43,	492.87
Z	8.57,	15.90,	34.33,	40.94,	9.54,	16.12,	34.30,	39.63,	9.79,	15.72,	34.49,	40.60

$\sigma_x = \sigma_y = \sigma_z = 0.4$



(a) Solve the LS problem for the center & radius

(b) assume you have prior knowledge that
$R = 18.1$, $\sigma = 0.2$, $X_0 = 99.8$, $\sigma = 0.2$, $Y_0 = 500.3$, $\sigma = 0.2$, $Z_0 = 25.85$, $\sigma = 0.2$
Solve the ULS problem for parameters

(in both cases, show the residuals)

---

3. Derive the Sherman Morrison Matrix Inversion Lemma as follows:

(a) derive the 4 elements $B_{11}, B_{12}, B_{21}, B_{22}$ of partitioned inverse as shown on pages 446 and 447 in OLS, using A_{22} as the pivot.

(b) derive the same 4 elements <u>again</u> using A_{11} as the pivot.

(c) equate 2 different expressions for B_{11}

$$(A + UCV)^{-1} = A^{-1} - A^{-1}U(C^{-1} + VA^{-1}U)^{-1}VA^{-1}$$