ISQS 6348 HW 2, Fall 11, due Thursday, Sept. 8.

Use the women's track data set http://westfall.ba.ttu.edu/isqs6348/SASData/t1_7.sas7bdat

1. A country's data vector (profile) is a (7×1) vector **y**. Write down USA's data vector **y** and China's data vector **y**. (Be sure these are *column vectors*!)

   For the problems 2-4, hand in code as well as results. Pass all variances and covariances into IML using data set manipulations, i.e., do not enter any data (means, standard deviations, covariances, etc.) into IML manually. See http://courses.ttu.edu/isqs6348-westfall/images/6348/ReadFromSASDataIntoIML.htm. Note: "centroid" is another term for "mean vector," and in this example it refers to all 55 countries.

2. Calculate the Euclidean distances from USA to China, from USA to the centroid, and from China to the centroid.

3. Calculate the standardized Euclidean distances from USA to China, from USA to the centroid, and from China to the centroid.

4. Calculate the Mahalanobis distances from USA to China, from USA to the centroid, and from China to the centroid.

5. Acting as if all distances in 2,3, and 4 were Euclidean distances in two-dimensional space, and as if China, USA and the centroid were all two-dimensional entities, draw three triangles, one for each of 2,3, and 4, to represent what you found. You can draw carefully by hand; see here. Compare and contrast the three distance metrics in terms of the triangles you drew.

6. A linear combination of interest is V_1 = m200 – 2*m100. Other ones are V_2 = m400 – 4*m100 and V_3 =60*m800 –8*m100. (The multiplication by 60 is to change the units of m800 to seconds). Why is V_1 interesting? Answer from the standpoint of a track runner. Using the same logic, explain also why V_2 and V_3 are interesting.

7. Write the (3×1) vector V as CY, where Y is the (4×1) vector comprised of m100, m200, m400, and m800.

8. Find the mean vector of V two different ways: (i) by constructing the linear combinations through SAS code and finding their mean vector, and (ii) by finding the mean vector of the original measures and applying the C matrix from problem 7. appropriately. Hand in SAS code as well as results. Do not enter any information manually, as above in 2-4.

9. Find the covariance matrix of V two different ways: (i) by constructing the linear combinations through SAS code finding their covariance matrix, and (ii) by finding the covariance matrix of the original measures and applying the C matrix from problem 7.

appropriately. Hand in SAS code as well as results. Do not enter any information manually, as above in 2-4.

10. Suppose $Y = (Y_1,\ldots,Y_n)'$ is an $(n\times 1)$ vector of iid observations whose means are all μ and whose variances are all σ^2.

    A. Identify the mean vector and covariance matrix of Y. Explain.
    B. Express $\bar{Y} = \frac{1}{n}\sum_{i=1}^{n} Y_i$ as $\bar{Y} = CY$, for an appropriate C.
    C. Find $E(\bar{Y})$ by applying the C of 10.B. appropriately along with your answer to 10.A.
    D. Find $Var(\bar{Y})$ by applying the C of 10.B. appropriately along with your answer to 10.A.