

**Lab Assignment No. 5:**  
**Factorial Multivariate Analysis of Variance**  
PSGA7816 Multivariate Statistical Analysis

In completing your assignment you are expected to be specific and analytical in your responses. This assignment is meant to evaluate if you are able to substantively use your analyses. Simply producing tables or output is **not sufficient** and if not accompanied by any explanation or discussion it will not be given **any** credit.

Please append the full syntax you used to compute your answers. Your typed assignment answers should include the products of your computations (estimates, tables and/or charts) pasted into the body of your paper with appropriate remarks and comments (preferably in APA style).

No e-mail submissions will be accepted. Late assignments will be penalized 2 points per day. The dataset for the assignment (evaluation.sas7bdat) will be e-mailed to students. Homework 5 is due **March 26, 2009 at 1:30 PM**.

**Data:** The data in evaluation.sas7bdat are a subset of young adults from a Chicago community center. At this particular outreach program youth who have been mandated by legal authorities are aided in their reintegration into society. The staff of the center aims to be able to provide and address specific needs of the youth. In order to do so the staff is interested in differences within and between specific groups that enroll at the center.

**Variables:** Two categorical variables are provided for the youth in this dataset. *Gender* codes for the sex of the youth (male = 0, and female = 1) as well *Prior*, which codes if the youth had prior convictions to the present mandate (none = 0, and some = 1).

The screening battery that is administered to every youth enrolling at the center includes three measures, *Anxiety*, *Independence* and *Teamwork*. Respectively, *Anxiety* measures the extended to which youth entering the program experience anxiety. The *Independence* measure assesses how well an individual functions on his/her own (i.e. if they are able to complete tasks by themselves, follow through on projects, keep their appointments and regularly schedules events etc.). *Teamwork* aims at evaluating if the youth is able to cooperate in teams, work efficiently with the staff and other youth to reach set goals and regularly communicate with both staff and family. All three measures have been scaled so as to be on the same scale (0-100 expressed as a percentage). Assume that all three measures are psychometrically sound (with adequate validity, reliability etc.). On average youth at the center (NOT mandated to be there by the law) score around 50% on all three measures at the time of admittance.

**Hypotheses:** The center staff is interested if mean scores on all three measures vary significantly by gender, prior conviction or a mixture thereof. Specifically, the staff believes that males with prior convictions will score significantly higher on *Independence* as opposed to *Teamwork*, preferring to work alone rather than in groups. Furthermore, the staff thinks that these males will also experience less anxiety than their female counterparts.

**NOTE.** When interpreting your output you should consider Type III Sums of Squares solutions only. Also, remember that the ANOVA for the overall model is irrelevant (testing the overall model against a null model) and you should look for the specific ANOVA's associated with the effects of interest (gender, prior and gender\*prior).

- 1) What are the appropriate univariate measures of central tendency and bivariate correlations for your data (including age)? Interpret the means and correlations.
- 2) Assess whether your data is multivariate normally distributed and meets basic assumptions (leverage values, Mardia's coefficients, Henze-Zirkler  $T$ , and Bartlett's test).
- 3) Run a 2x2 factorial MANOVA. Report, discuss and interpret the produced Wilk's Lambdas.
- 4) Report, discuss and interpret the produced univariate ANOVA's.
- 5) Report, discuss and interpret only the appropriate and significant  $t$ -tests with their corresponding simultaneous confidence intervals.
- 6) Provide a means plot for the observed four groups (gender by prior). What can you deduce from this plot? How does this plot relate to your findings?
- 7) How would you answer the center's original hypotheses/questions? As someone who works at the center, what recommendations would you make regarding the approach to the youth mandated to enroll at the center?
- 8) The center's director is a strong advocate that anxiety, independent and teamwork oriented working are all greatly influences by both gender and prior convictions. What would you say to the director and what evidence would you site/present?
- 9) Look at the multivariate distribution of residuals (by group). Discuss their corresponding distributions. What direct bearing do these residuals have on your analysis?
- 10) What potential limitations could this analysis have? Also, as a program evaluator what further recommendations (for research and analysis) would you make based on these analyses and results alone?

**Extra Credit.** Produce at least one additional plot / graph that could be helpful to the staff at the center. Why did you choose this plot / graph and how is it useful?