Course Syllabus:

Psychology 467 -- Multivariate Statistics in Psychology

Prof. William Marelich, Ph.D.
Spring 2001 Semester, CSUF
E-mail: wmarelich@fullerton.edu
Website: http://psych.fullerton.edu/marelich

Office: H-715D
Office Phone: 714-278-7374
Office Hours: TBA

Course Description/Objectives:

The goal of this course is to develop skills with a range of procedures and programs for multivariate data analysis. The focus will be on practical issues such as selecting the appropriate analysis, preparing data for analysis, menu-driven and syntax programming, interpreting output, and presenting results of a complex nature.

Possible topics to be covered include multivariate data screening, analysis of covariance, MANOVA, discriminant analysis, cluster analysis, multidimensional scaling, factor analysis, profile analysis, path analysis, structural equation modeling, hierarchical linear modeling, and meta analysis. Different semesters this course is taught will have slightly-different "flavors" of analyses. Topics for coverage are also somewhat driven by student interests.

This course is writing and analysis intensive. Students should expect to spend approximately 5-10 hours per week on home work assignments (beyond class time).

Required materials:

- An E-mail account (either Fullerton OR outside vendor).

- A calculator

Optional materials:

- Any version of SPSS (V. 7.5, 8, 9, or 10). There is an SPSS for Windows Graduate pack that you can purchase, OR you can use the facilities on campus.

Required reading:

Aldenderfer & Blashfield (1984). *Cluster analysis.* Sage (#44).

Green, Salkind, Akey (2000). Using SPSS for Windows: Analyzing and understanding Data (2nd ed.). Prentice Hall.

Kruskal & Wish (1978). *Multidimensional scaling.* Sage (#11).

Norusis, M.J. & SPSS Inc. (1994). SPSS Professional Statistics 6.1. SPSS Inc.

Tabachnick & Fidell (2001). *Using multivariate statistics* (4th ed.). Allyn & Bacon.

Lecture Resources:

All-Purpose Articles/Texts

Cohen, J. & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Stevens, J. (1996). *Applied multivariate statistics for the social sciences* (3rd ed.). Erlbaum.

Tatsuoka, M.M. (1971). *Multivariate analysis: Techniques for educational and psychological research.* NY: Wiley.

Thompson, B. (1994). Guidelines for authors. *Educational and Psychological Measurement, 54*(4), 837-847.

Wilkinson, L., & Task Force on Statistical Inference (1999). Statistical methods in psychology journals: Guidelines and explanations. *American Psychologist, 54*(8), 594-604.

Readings on Various Multivariate Topics

Atkinson, L. (1988). The measurement-statistics controversy: Factor analysis and subinterval data. *Bulletin of the Psychonomic Society, 26*(4), 361-364.

Brand, R. (1990). Using logistic regression in perinatal epidemiology: An introduction for clinical researchers. Part 2: The logistic regression equation. *Paediatric and Perinatal Epidemiology, 4*, 221-235.

Brand, R., & Keirse, M.J.N.C. (1990). Using logistic regression in perinatal epidemiology: An introduction for clinical researchers. Part 1: Basic concepts. *Paediatric and Perinatal Epidemiology, 4*, 22-38.

Bryk, A.S., & Raudenbush, S.W. (1992). *Hierarchical linear models: Applications and data analysis methods*. Newbury Park, CA: Sage.

Cliff, N. (1988). The eigenvalues-greater-than-one rule and the reliability of components. *Psychological Bulletin, 103*(2), 276-279.

Cole, D.,A., Maxwell, S.E., Arvey, R., & Salas, E. (1994). How the power of MANOVA can both increase and decrease as a function of the intercorrelations among the dependent variables. *Psychological Bulletin, 115*(3), 465-474.

Delucchi, K, & Bostrom, A. (1999). Small sample longitudinal clinical trials with missing data: A comparison of analytic methods. *Psychological Methods, 4*(2), 158-172.

Duntemen, G.H. (1989). *Principal components analysis (#69).* Newbury Park, CA: Sage.

Fabrigar, L.R., Wegener, D.T., MacCallum, R.C., & Strahan, E.J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods, 4*(3), 272-299.

Floyd, F.J., & Widaman, K.F. (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment, 7*(3), 286-299.

Huck, S. W., McLean, R.A. (1975). Using a repeated measures ANOVA to analyze the data from a pretest-posttest design: A potentially confusing task. *Psychological Bulletin, 82*(4), 511-518.

Hull, C.H. & Nie, N.H. (1981). *SPSS Update 7-9: New procedures and facilities for releases 7-9*). *NY: McGraw-Hill*.

Jennings, E. (1988). Models for pretest-posttest data: Repeated measures ANOVA revisited. J*ournal of Educational Statistics, 13*, 273-280.

Kaufman, L., & Rousseeuw, P.J. (1990). *Finding groups in data: An introduction to cluster analysis*. NY: Wiley.

Lautenschlager, G.L. (1989). A comparison of alternatives to conducting Monte Carlo analyses for determining parallel analysis criteria. *Multivariate Behavioral Research, 24*(3), 365-395.

Little, T.D., Lindenberger, U., & Nesselroade, J.R. (1999). On selecting indicators for multivariate measurement and modeling with latent variables: When "Good" indicators are Bad and "Bad" indicators are good. *Psychological Methods, 4*(2), 192-211.

MacCallum, R.C., & Widaman, K.F. (1999). Sample size in factor analysis. *Psychological Methods, 4*(1), 84-99.

Marelich, B., & Richmond, T. (1994). *Cluster analysis*. Unpublished Manuscript.

Nagin, D.S. (1999). Analyzing developmental trajectories: A semiparametric, group-based approach. *Psychological Methods, 4*(2), 139-157.

Nezlek, J.B., & Zyzniewski, L.E. (1998). Using hierarchical linear modeling to analyze grouped data. *Group Dynamics: Theory, research, and practice, 2*(4), 313-319.

O'Brien, R. G., & Kaiser, M.K. (1985). MANOVA method for analyzing repeated measures designs: An extensive primer. *Psychological Bulletin, 97*(2), 316-333.

Olson, C.L. (1976). On choosing a test statistic in mulitivariate analysis of variance. *Psychological Bulletin, 83*(4), 579-586.

Ramsey, F.L. (1986). A fable of PCA. *The American Statistician, 40*(4), 323-324.

Reis, S.P., Waller, N.G., & Comrey, A.L. (2000). Factor analysis and scale revision. *Psychological Assessment, 12*(3), 287-297.

Romaniuk, J. G., Levin, J.R., & Hubert, L.J. (1977). Hypothesis-testing procedures in repeated-measures designs: On the road map not taken. *Child Development, 48*, 1757-1760.

Rosenthal, R. (1991). *Meta-analytic procedures for social research (Rev. ed.). Newbury Park, CA: Sage*.

Sheeber, L. B., Sorensen, E.D., Howe, S.R. (1996). Data analytic techniques for treatment outcome studies with pretest/posttest measurements: An extensive primer. *Journal of Psychiatric Research, 30*(3), 185-199.

Spector, P.E. (1977). What to do with significant multivariate effects in multivariate analyses of variance. *Journal of Applied Psychology, 62*(2), 158-163.

Stevens, J. (1979). Comment on Olson: Choosing a test statistic in multivariate analysis of variance. *Psychological Bulletin, 86*(2), 355-360.

Thompson, B., & Daniel, L.G. (1996). Factor analytic evidence for the construct validity of scores: A historical overview and some guidelines. *Educational and Psychological Measurement, 56*(2), 197-208.

Wolf, R.M. (1986). *Meta-analysis: Quantitative methods for research synthesis (#59)*. Newbury Park, CA: Sage.

Woodward, J.A., & Overall, J.E. (1976). Factorial analysis of rank-ordered data: An old approach revisited. *Psychological Bulletin, 83*(5), 864-867.

[General note: Older SPSS manuals have great statistical information and usually can be found in used book stores for very minimal costs. Although a bit dated, they do contain some wonderful analysis examples and explanations. I've listed a few of these below.]

Hull, C.H., & Nie, N.H. (1981). *SPSS Update 7-9: New procedures and facilities for releases 7-9*. NY: McGraw-Hill.

Nie, N.H., Hull, C.H., Jenkins, J.G., Steinbrenner, K., & Bent, D.H. (1975). *SPSS: Statical package for the social sciences* (2nd ed.). NY: McGraw-Hill.

Norusis, M. J. (1985). *SPSS-X advanced statistics guide*. NY : McGraw-Hill.

SPSS Inc. (1986). *SPSS-X user's guide* (2nd ed.). Chicago: SPSS.

SPSS Inc. (1988). SPSS-X user's guide (3rd ed.). Chicago: SPSS.

Homework:

Exercise sets will be assigned every week, skipping an occasional week depending on the topic area (possibly 2 will be back-to-back). Grading will be on an 11-point scale. Late homework will be penalized.

Accompanying the computer output for each exercise should be a brief (5-10 page) summary, including interpretation of findings written in APA results section style. The output should be annotated.

Group Project & Presentation:

Students will pair-up and select a multivariate technique (either one covered in class or outside of class) and prepare an individual project. Students will work with the instructor to select an appropriate statistical technique, how to develop the class presentation, and a written summary of the project. For example, Meta analysis or cluster analysis might be selected. The class presentation should be designed to introduce the class to the topic (or review the topic), with examples of your application. Clarity and accuracy are crucial. You are encouraged to present a topic NOT covered in lecture.

A written summary of the project is due the last day of class. The project paper should be about 10-20 pages long (with brief literature review), written in APA format with output appended and annotated. The project will be assessed for clarity, effort, and demonstration of understanding.

Grading

The course will be based on:

40% - Homework exercise sets
30% - Presentation of topic
30% - Written summary of topic

Class Schedule and Reading Assignments

Dates	Topic	Chapters	HW
Week 1	Course Introduction, Review, Multivariate data assumptions, data cleaning	T&F (1-4)	
Week 2	Matrix Algebra	T&F (Appendix A)	
Week 3	ANCOVA	T&F (8)	1
Week 4-5	MANOVA	T&F (9)	2
Week 6	Advanced Repeated Measures	Handout	3
Week 7	Profile Analysis	T&F (10)	4
Week 8-9	Factor Analysis	T&F (13)	5
Week 10	Discriminant Analysis	T&F (11)	6
Week 11	Multidimensional scaling & Cluster Analysis	Sage & SPSS	7
Week 12	Logistic Regression	T&F (12)	8
Week 13	Path Analysis & SEM	T&F (5,14)	
Week 14	HLM demonstration	Handout	9
Week 15	Class Presentations		
Week 16	Class Presentations Finals week if needed		

The above schedule and procedures in this course are subject to change in the event of unforeseen circumstances, or if we decide to spend additional time on a few of the topics.