Applied Multivariate Statistics

CLASS (DAY/TIME): Weekly meetings by appointment
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OFFICE HRS: by appointment via Zoom or in Chestnut Hall 103

Suggested Textbook:

Multivariate Data Analysis 7th ed. Hair, Black, Babin, and Anderson Prentice-Hall, 2010.
Online support at http://www.pearsonhighered.com/hair/ plus my BUSI6240 course site on Blackboard

Supplemental Reading:

1. Applied Linear Regression Models, Neter, Kutner, Wasserman and Nachtsheim, 3rd ed., McGraw-Hill.
2. Applied Multiple Regression/Correlational Analysis for the Behavioral Sciences 2nd ed., Cohen and Cohen, Lawrence Erlbaum Associates, 1983.
3. Applied Multivariate Statistics for the Social Sciences, James Stevens, Lawrence Erlbaum Associate Publishers, Hillside, New Jersey.
4. Applied Multivariate Techniques. Subhash Sharma. John Wiley & Sons, 1996.
5. Using Multivariate Statistics, 3rd Ed. Tabachnick and Fidell. Harper Collins Publishing Company, 1996
6. Other material assigned during the semester.

Online textbook - Electronic Statistical Textbook (from StatSoft) go to the site at http://www.statsoft.com/textbook/stathome.html
Online tutorials and lectures - how2stats at http://www.youtube.com/user/how2stats/videos
Journal publication information from Springer -
http://www.springer.com/authors/author+academy?SGWID=0-1739713-0-0-0
Statistics Packages:
SPSS for Windows Ver. 12 (or the latest one Available in all Labs & TA/TF Offices)

Home-Work Problems

The suggested homework problems for the semester include all questions listed at the back of each chapter and the data analysis completed in each chapter. The rational for assigning the data analysis that is supplied within the chapter is that you will be able to see solutions and read how to interpret the output. While the solutions are provided in the textbook it is important that you follow along by performing the same analysis yourself. You can obtain the data sets, commands and SPSS out files at the following web site - http://wps.prenhall.com/bp_hair_multivariate_7/ . Everyone is expected to complete the assignments on-time and you may be asked about the solution to select homework problems during class. Class needs and questions will determine the amount of class time that we spend on the assigned problems and questions. Also, feel free to attempt related analysis using your data set so that you find this material relevant to your discipline. Although you need to understand and be able to obtain the solutions to all problems on your own, I encourage you to learn this material by working in study groups.

RESEARCH PROJECT:

This course is designed to allow the mature graduate student the opportunity to purse a project that includes the use of multivariate analysis to better address a research question that contributes to their professional development. The project is graded based on performance at an appropriate level (expected from a doctoral student). The selection of an appropriate project, the project final report (manuscript), and presentation will be discussed further in class. The project is an ongoing part of the class and you will be required to make progress reports in class. Within the first week, you need to start thinking about a project topic that will utilize scale development, purification, tests of reliability, and theoretical relationships to be tested. Once you have narrowed down the theory part, you will be required to develop the data collection instrument, collect primary data, analyze data using SPSS statistical packages (e.g., Factor, Cluster, Discriminant Analyses, etc.), and prepare a manuscript. For each class you should prepare about a 2 to 3 minute update for class presentation on your progress. Your participation is essential to the class experience and it is important that you assess your own presentation and deliver handouts and overheads for evaluations.

The final product (manuscript) should be suitable for you to submit that to a national conference in your discipline. The project grade is based on your ongoing class participation as well as your final presentation and manuscript. However, submission of the work to a conference is not a requirement. While presentation and writing styles differ from student to student, appropriate grammar, style, etc. are expected both in presentations and in all written material. The projects will require significant work outside the classroom. Also, you are encouraged to work with a faculty member on converting your project into a conference or journal level manuscript. A brief outline of the project related steps is provided below.

1. Define the problem and research question.
2. Conduct a literature review to better anchor the research question in existing discipline specific theory and revise the question(s) as needed.
3. Construct a theoretical model or framework to illustrate the relationships examined in the context of the research question.
4. Determine the methodology needed to address the research question.
5. Develop a survey or identify an appropriate source of data to address your research questions.
6. Conduct a pilot study.
7. Collect the data and analysis using a variety of multivariate techniques including multiple regression, logistic regression and structural equation modeling.
8. Based upon progress and as time permits, test a model, write results and work on draft of a research paper.

COURSE OBJECTIVES:

This course is designed to do the following:

1. Provide course participants with knowledge related to the general topic of multivariate statistics.
2. Provide course participants with the conceptual and practical aspects of multivariate statistical procedures (e.g., factor, cluster, discriminant, analysis of variance, etc.) as needed to support research and publication
3. Provide course participants with a working knowledge (hands on experience) of multivariate statistical procedures as required to use the methods in the conduct of research.

4. To provide the course participants with the background to use multivariate statistics for research and publication at the level of the principles studied and discussed in class.
5. Apply these multivariate statistical procedures to a selected problem of your choice so you are better able to work on publishable research

PHILOSOPHY, EXPECTATIONS AND CLASS STRUCTURE:

You may struggle with this material and specifically the relevance of what we are learning to your discipline and how to apply the material. You would not be a student at this stage in your graduate education if you had not formed study habits that worked effectively for you. However, the content of this subject is probably sufficiently different to merit a different format for our meetings.

You will need to read the assignments for the next class before coming to class and make a list of any issues or questions about the textbook material or how it might be applicable to your research in preparation for class. Once you come to class we will form groups and you will discuss your questions with your group members in class. I will be in class to assist and help you as your group works through the questions. Then your group will need to make another list of questions that you find relevant to how you might use the material. These questions will then be shared with another class group who will attempt to answer and bring your question and their response up for class discussion. This interactive approach to the material will help you integrate the material into your understanding of its relevance to your discipline because, once you are beyond the introductory chapters, the relevance of the background provided in Hair et. al. may not be fully appreciated by reading or studying the chapter. If you come to some sections that represent a problem for you make a note for class discussion and continue to the next sections. I will moderate these activities and provide theory, background and context but because of time constraints we need to limit the issues that we address to the most substantive portions of the material. The material in this course is essential for you to be able to successfully approach about 95% of the problems that you are likely to encounter in the conduct of business research using multivariate statistics. If the lecture has not enlightened you on those sections that you found intractable ask questions in class and, if needed, in any meetings you deem necessary out of class.

While you may understand the general issues as discussed in Hair et. al. You may also find that you are not able to do the analysis yourself. To better address your understanding of the mechanics you should attempt to work the same problem that is completed at the end of each chapter in the textbook on the forthcoming material before attending class. This will alert you to the issues that require your attention and is likely to improve you ability to retain the mechanics of the methodology. Shortly after our class meeting, so you do not forget the details, you should complete any problems that you could not do before class. If you are having difficulty, at this stage bring the data, your attempts, and your associated questions to me for help. You will benefit more from seeing me with a few specific questions and attempting the analysis yourself rather than having me review the entire process again in a longer Q & A. Also, I encourage you to work in study groups because the feedback you provide each other will help you better master the material.

While this may not be obvious to you at this juncture it is not the mechanics that drive this process. Rather it is the theoretical understanding (conceptual?) that drive the methodologies and their associated mechanical approaches. Ultimately this distinction is important because as you gain an appreciation of the concepts involved you will be better able to plan your future research and the associated analysis.

OTHER IMPORTANT INFORMATION:

Required Software: We will use SPSS for Windows but may also use MINITAB, SAS and LISREL.

Course Outline:

The outline below is a tentative timeline for the semester. It is meant to be a guide and several items are subject to change. Exam dates may change to accommodate the class. Certain topics may be stressed more or less than indicated.

Hair, Black, Babin, and Anderson rely on only a few datasets for use throughout their textbook. The authors have provided a zip file with the datasets via the web site provide by Prentice-Hall that was listed above.

Date	Topic	Chapter (Hair et. al.)	Homework problems and project assignment due dates
Week 1	Read chapters 1 & 2 and prepare notes and questions for class discuss and exercises as described in the syllabus		
Wk 2	Introduction to Multivariate procedures. Introduction to Meta – analysis and SPSS Discussion of class project http://how2stats.blogspot.com/2011/09/how-to-get-free-copy-of-ibm-spss.html http://how2stats.blogspot.com/2011/10/testing-distributions-for-normality.html https://www.youtube.com/watch?feature=player_embedded&v=9a9Lp-1n_ZU http://how2stats.blogspot.com/2011/10/littles-mcar-test-spss.html http://how2stats.blogspot.com/2011/10/replace-missing-values-expectation.html https://www.youtube.com/watch?v=xEkJxl6mmQ0	1 and 2	Questions at the back of chapters 1 & 2 Basic statics in Appendix A Download and use TEXT datasets
Wk 3	Factor Analysis http://how2stats.blogspot.com/2011/10/principal-components-analysis-spss.html http://www.youtube.com/watch?v=CzWEJLoNmLA http://www.youtube.com/watch?v=JcCVl9JxhmU http://www.youtube.com/watch?v=jhqkDoj8tK8	3	Discuss the theory for your class project
Wk 4	Factor Analysis http://www.youtube.com/watch?v=iDT0tjU1TWo http://www.youtube.com/watch?v=f0ynIUyO9AU http://www.youtube.com/watch?v=X0RdXyGbJDY http://www.youtube.com/watch?v=twDhPCqVkak http://www.youtube.com/watch?v=M5E1R2Dj_0I http://www.youtube.com/watch?v=Cybmrn9PObo http://www.youtube.com/watch?v=ac63vDELLWI Assessment of Reliability and Validity http://how2stats.blogspot.com/2011/10/cronbachs-alpha.html	3	Discuss your project's experimental design and the questionnaire Analysis using TEXT datasets

Wk 5	The Role of Multivariate statistics in Survey Research		PPT handout
Wk 6	Review of simple Regression and diagnostics; Review of Regression Matrix Algebra Review of Multiple Regression and diagnostics http://how2stats.blogspot.com/2011/10/multiple-regression-spss-brief.html http://how2stats.blogspot.com/2011/10/multiple-regression-spss-in-depth.html	4	Questions at the back of chapter 4 Discuss your project's data collection. Analysis using TEXT datasets
Wk 7	Discriminant Analysis, Multiple discriminant analysis, and logistic regression http://www.youtube.com/watch?v=OvQShzJ7Sns http://www.youtube.com/watch?v=zdJhydkcqv4 http://www.youtube.com/watch?v=hxcDOoupB4Y http://www.youtube.com/watch?v=vhpnGL5m9Zs http://www.youtube.com/watch?v=rvopVisrgus	5 & 6	Questions at the back of chapters 5 & 6 Discuss project's data analysis Analysis using TEXT datasets
Wk 8	Exam 1 - presentation	Exam	
	No Class	Spring Break	
Wk 9	Univariate and Multivariate Analysis of Variance (MANOVA) as well as GLM ANOVA videos 1-9 http://how2stats.blogspot.com/2011/10/one-way-anova-spss.html http://www.youtube.com/watch?v=soPX6rO7WZ8 http://www.youtube.com/watch?v=J2vG7-8zDKs http://www.youtube.com/watch?v=CAkvvfGY7fA http://www.youtube.com/watch?v=EOnfOkeC4jk http://www.youtube.com/watch?v=F8udvOzSozk http://www.youtube.com/watch?v=F8udvOzSozk http://www.youtube.com/watch?v=kNRl8sZLTPQ http://www.youtube.com/watch?v=GdAqROK112A Repeated measures video http://how2stats.blogspot.com/2011/11/one-way-repeated-measures-anova-spss.html MANOVA videos 1-9 http://how2stats.blogspot.com/2011/10/manova-spss.html http://www.youtube.com/watch?v=IjlVleVnPuE	7	Questions at the back of chapter 7 Discuss your project's data collection and or analysis Analysis using TEXT datasets

	http://www.youtube.com/watch?v=H2XW1XqAdQs http://www.youtube.com/watch?v=ZBA8SXBrFgg http://www.youtube.com/watch?v=-4gQefaHvQk http://www.youtube.com/watch?v=PkFHx2-_-WU http://www.youtube.com/watch?v=pO4DcOZcmWA http://www.youtube.com/watch?v=4i8JJloE1As http://www.youtube.com/watch?v=XW66RC1l5uE Linear contrast video http://how2stats.blogspot.com/2011/12/linear-contrast-analysis-spss.html		
Wk 10	Conjoint Analysis http://www.youtube.com/watch?v=yiRNcHU2ZGU	8	Questions at the back of chapter 8 Discuss your project's data analysis and hypotheses testing Analysis using TEXT datasets
Wk 11	Cluster Analysis http://www.youtube.com/watch?v=amFaPFoHNyw http://www.youtube.com/watch?v=qt-8EBUY034&list=UL	9	Questions at the back of chapter 9 Discuss completed hypothesis tests Analysis using TEXT datasets
Wk 12	Multidimensional Scaling and Correspondence Analysis http://www.youtube.com/watch?v=38XzZ6rb79o&list=UL	10 & 11	Questions at the back of chapter 10 & 11 Discuss manuscript preparation Analysis using TEXT datasets
Wk 13	Peek into SEM and CFA – optional based on timing and class needs http://www.youtube.com/watch?v=RAL9X17r7CE&list=UL http://www.youtube.com/watch?v=SIjKHiXIMHI&list=UL Project presentations and review as needed	12, 13,14, & 15	Questions at the back of chapters Discuss manuscript preparation

Wk 14	Short class presentation - How and why we use multivariate statistics in the conduct of research for the dissertation: A Healthcare Example Review and group discussion in preparation for final presentations		
Wk 15	Exam 2 – presentation	Exam 2	
Wk 16	Project presentations and review as needed		Manuscript completed & turned in along with presentation PPTs
Enjoy the break			