Psychology 613: Multivariate Statistics
Spring 2014, 260 Condon, T/R 10:00 – 11:20

Instructor Information

Professor: Elliot Berkman
Office hours: Fridays, 12-2, 325 Lewis Integrative Sciences Building, or by appointment
Contact info: berkman@uoregon.edu

TA Name	Office	Office hours	Contact	Notes
Nicole Lawless	232 Franklin	Monday 1 – 3	gradstats@uo	http://gradstats.youcanbook.me
Rose Maier	214 Franklin	Friday 3:30 – 5:30	gradstats@uo	
Joe Rodini	243 Franklin	Tuesday 1 – 3	gradstats@uo	Main grader

Course description

The multivariate statistical methods used in psychology and related fields are both broad in range and deep in complexity. A thorough treatment of any one of these could encompass an entire course. However, most advanced multivariate statistical techniques share some core underlying similarities. The purpose of this course is to survey a number of these techniques—those most popular among and useful to psychologists—while emphasizing a conceptual understanding of their underlying structure. This will be accomplished through hands-on application of each technique using software packages.

This course has four educational objectives:
1. To survey a range of multivariate statistical methods of interest to empirical psychology.
2. To help you develop a strong conceptual understanding of multivariate models.
3. To introduce you to computational methods for each technique.
4. To give you sufficient understanding of each technique to self-teach for your own research.

Course Organization and Requirements

Lectures

The first principal component of the course is lecture. The goals of the lecture for a given statistical technique are **(a)** to teach you the conceptual logic of what the technique does and how it does it, when to use the technique, and what its assumptions are, **(b)** to show you the most common or popular computational method for the technique, and **(c)** to give you the opportunity to ask questions about how and when the technique might be used in your own research.

I strongly encourage discussion and questions. You are encouraged to participate in course discussions and to interrupt me when I lecture in order to ask a question or to share an insight.

Though lecture is not technically required, I strongly recommend that you come to all lectures and obtain detailed notes for those that you are unable to attend.

Labs

The second principal component of the course are the lab and review sections. Each **Friday**, Rose and/or Nicole will show you how to use the software available at UO to apply the techniques for that week to real data sets. During the labs, you will work through example problems and may begin working on the homework for that week. You are encouraged to work in teams.

Problem sets

There will be **five problem sets** throughout the quarter. These assignments are intended to elucidate the concepts underpinning each technique, and as such will be more challenging theoretically than computationally. The problem sets will be assigned on Thursday and due the following Tuesday at 5pm. You may begin working on the problem sets in the computer lab section on Friday. You may work in groups to generate the computer output, but **the final product must be completed individually**.

Exams

There will be **one midterm** and **one final**. Both will be **take-home**. These will consist of a mix of computational and conceptual questions about the material. There will be no make-up exams and no extensions. The midterm will be distributed on **Thursday, May 1st** and due **Thursday, May 8th at 5pm**; the final will be distributed on **Thursday, June 5th** and due **Thursday, June 12th at 5pm**. You **may not work in groups** on the exams, and the **final product must be completed individually**.

Grading

The midterm, final, and cumulative problem set score will each be worth 1/3 of your total grade. These scores will be combined and weighted to yield one score out of 100%. I will average the scores of the top 10% of the students, and use that number to determine the cutoff for letter grades. To get an A- you will need to get 90% of the average top score, to get a B- you will need to get 80% of the top score, and so on. This system has the advantage of a curve in that if everyone does poorly on the exams because they are too hard, nobody suffers, but it is also possible for every single person to get an A (since you could all do as well as 90% of the average of the top 10% of students).

Policies

Late/missed assignments. Due dates for each assignment are listed in the "Lecture/Assignment Schedule." All assignments are due at the beginning of class. Late assignments will not be accepted.

Cheating/plagiarism. Not allowed. This is graduate school; the purpose of the work is self-evident.

Students with special needs. The UO works to create inclusive learning environments. If there are aspects of the instruction or design of this course that result in disability-related barriers to your participation, please notify me as soon as possible. You may also wish to contact Disability Services in 164 Oregon Hall at 346-1155 or disabsrv@uoregon.edu.

Texts

There is no required text. I will post excerpts from the following excellent sources on Blackboard (Bb):

Abelson, R.P. (1995). *Statistics as Principled Argument*. Lawrence Erlbaum: Hillsdale, NJ.
Berkman, E.T., & Reise, S.P. (2011). *A Conceptual Guide to Statistics Using SPSS*. Sage: Thousand Oaks, CA. *"B+R" below.*
Hastie, T., Tibshirani, R., & Friedman, J. (2009). *The Elements of Statistical Learning: Data Mining, Inference, and Prediction* (2nd ed.). Springer: New York, NY.
Kline, R.B. (2011). *Principles and Practice of Structural Equation Modeling* (3rd ed.). Guilford Press: New York, NY. *"Kline" below*.
Raudenbush, S.W. & Bryk, A.S. (2002). *Hierarchical Linear Models: Applications and Data Analysis Methods* (2nd ed.). Sage: Thousand Oaks, CA. *"R+B" below.*
Tabachnick, B.G. & Fidell, L.S. (2007). *Using Multivariate Statistics* (5th ed.). Pearson: Boston, MA. *"T+F" below*.

Lecture/Assignment Schedule

Month	Day	Topic	Reading	Assignment
April	1	Introduction and overview	Abelson, Pref. & Ch 1 T+F, Ch 1-2	
	3	Introduction to matrix algebra	Woodward et al., 1990 Appendix A (on Bb)	PS1: Matrix Algebra
	8	Matrix algebra in SPSS	B+R, Ch 16	
	10	Programming in R	TBD / QuickR (on Bb)	PS 2: Central Limit Theorem
	15	Multilevel linear modeling I	R+B, Ch 2	
	17	Multilevel linear modeling II		
	22	Multilevel linear modeling III	R+B, Ch 4	PS3: MLM
	24	Multilevel linear modeling review *Special guest lecture!*	A+M, 2010, pp. 13-18, 28-32 (on Bb)	
	29	Interactions and moderation I		
May	1	Interactions and moderation II		**Midterm out**
	6	Logit analysis		
	8	Logistic regression	T+F, Ch 10	**Midterm due at 5pm**
	13	Logistic regression II		
	15	Psychometrics *Special guest lecture!*	B+R, Ch 14	
	20	Mediation	MacKinnon et al., '02	
	22	Factor and components analysis I	B+R, Ch 13	PS4: Mediation
	27	Factor and components analysis II		
	29	Structural equation modeling I	Kline, Ch 2	PS5: FA/CA
June	3	Structural equation modeling II	Kline, Ch 5	
	5	Non-normality, Box-Cox, and Non-parametric analyses	B+R, Ch 15	**Final out**
Finals Week	**10**			
	12	**Take-home final due at 5pm**		

Note. A+M = Albright and Marinova (2010); B+R = Berkman and Reise (2011); Kline = Kline (2011); R+B = Raudenbush and Bryk (2002); T+F = Tabachnick and Fidell (2007).