AANT 601: ADVANCED QUANTITATIVE METHODS IN ANTHROPOLOGY
SPRING 2017 (CLASS 9824)
MONDAY & WEDNESDAY 2:45-4:05, BB 356

Instructor: Adam Gordon, Ph.D.
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Office hours: Wednesdays, 10 am to noon, or by appointment.

Prerequisites: Knowledge of univariate statistics is required for this course, and knowledge of basic bivariate statistics is strongly encouraged.

Course Objectives: This course is designed to provide a basic knowledge of multivariate data visualization, analysis, and hypothesis testing as applied to data sets typically found in anthropological research. In addition, resampling techniques such as the jackknife, bootstrap, and randomization will be covered. By the end of the course, students should be familiar with these methods and be able to implement them using the statistical programming language *R*.

Required Textbook:

Manly BFJ and Navarro Alberto JA. 2017. *Multivariate Statistical Methods: A Primer, fourth edition*. Chapman & Hall/CRC, New York.

The textbook will be supplemented with other required readings that will be made available via Blackboard.

Course Website:
Course materials such as readings, data sets for homework exercises, grades, and this syllabus will be posted on Blackboard. In addition, course announcements such as amendments to this syllabus will be posted on Blackboard.

Statistical Software:
We will be using the statistical programming language *R* in this course. Prior to the second class meeting, all students must download and install *R* from the *CRAN* website (cran.r-project.org/) onto a computer that they will have regular access to. In addition, Windows users should download and install a text editor for *R* code that color-codes functions and highlights matching brackets (such a text editor is built-in for Mac users). I use the freely-available program Notepad++ (https://notepad-plus-plus.org/), but there are many programs available. *R Studio* (www.rstudio.com/) is also a popular option that combines text editing and a GUI for *R*.

Students With Disabilities:
If you have special needs, please notify me immediately; I will be happy to work with you. Let me know if you anticipate needing any type of special accommodation in this course or have questions about physical access. For more information about "reasonable accommodation", please see the Disability Resource Center's Reasonable Accommodation Policy: www.albany.edu/disability/docs/RAP.pdf

Academic Integrity:
Academic dishonesty of any kind will not be tolerated in this course. Academic dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating information or citations, facilitating acts of academic dishonesty by others, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students. Students who are found to be academically dishonest will receive academic sanctions as outlined in the university's Graduate Regulations and Degree Requirements: www.albany.edu/graduatebulletin/requirements_degree.htm#penalties

Grading: Final grades will be given as A-E.

Course Requirements

Attendance: This is a graduate course; as such, I expect everyone to show up for every meeting. Furthermore, the material in each class builds on the material presented in earlier classes, even more so than is the case in many courses, so it is imperative that you attend every class. Please let me know if something comes up that prevents you from attending class. Poor attendance suggests that you are not committed to doing well in the course. I will allow excused absences in the case of religious holidays, documented illness, professional conferences, and possibly other activities, but please let me know about these absences with as much advance notice as possible. I will also allow one unexcused absence without penalty; however, it is common courtesy to let me know in advance if you know you are going to miss a class, or to let me know afterwards why you missed a class. I understand that people have family emergencies, have car trouble, etc. – just please let me know why you missed class. If you have more than one unexcused absence then I will deduct 5% from your final grade for each additional absence.

Homework Exercises: In order to ensure that you understand the material covered in class and do not fall behind, there will be homework exercises regularly throughout the semester. Unless otherwise stated, the assignments will be due the next class period after they are handed out. You will lose 10% of the total possible grade on any exercise for every day that a homework assignment is late (i.e., after ten days you will receive no credit for an assignment).

Exam: There will be one exam in the second half of the semester. Students may be expected to work through simple calculations on some questions, and will be expected to be able to describe how particular analyses work, how to interpret results of various analyses, and how to choose and set up an appropriate analysis for a given situation.

Poster: Each student will be required to analyze a data set of their own, a data set made available by a faculty member, or a publicly-available data set. The student will be expected to define the questions to be asked through background reading, develop the appropriate methodology, run the analysis, and present and discuss the limitations and results. Analyses may, and probably should, include univariate statistics, but must also include some form of multivariate analysis (i.e., one or more of the methods addressed in this course). These analyses will be presented as a poster session at the end of the semester. Grades will be assessed on the basis of originality, thoroughness, presentation, correctness, neatness, etc. **Poster topics must be cleared with me by March 8th.**

Final Grade:

Class participation:	10%	Homework exercises:	30%
Exam:	20%	Poster presentation:	40%

MAJOR DEADLINES

Wednesday, March 8th: Meet with me by this date to discuss poster topic
Wednesday, April 26th: Exam
Thursday, May 11th: Poster presentations

Note about the schedule: In the past we've held the poster presentations on the reading day after the last day of classes so that everyone in the entire department could come by to see the students' work. Alternatively, we can schedule the presentations on the final day of class. We'll talk in class about whether everyone is comfortable with the reading day option.

Course Schedule

Week 1

M 1/23 Introduction and review of univariate statistics

W 1/25 Review of bivariate statistics: Regression
Reading: Motulsky H. 1995. Simple linear regression. In: *Intuitive Biostatistics*. Oxford University Press, New York. pp. 167-180.
Recommended:
Warton DI, Wright IJ, Falster DS, Westoby M. 2006. Bivariate line-fitting methods for allometry. *Biological Reviews*. 81: 259-291.
Smith RJ. 2009. Use and misuse of the reduced major axis for line-fitting. *American Journal of Physical Anthropology*. 140: 476-486.

Week 2

M 1/30 Displaying multivariate data (and using R)
Reading: Manly & Navarro Alberto, Chapters 1 & 3

W 2/1 Matrix Algebra
Reading: Manly & Navarro Alberto, Chapter 2

Week 3

M 2/6 Matrix Algebra

W 2/8 Tests of significance with multivariate data: Multiple regression
Readings:
McDonald, JH. 2009. Multiple regression. In: *Handbook of Biological Statistics, 2nd ed*. Sparky House Publishing, Baltimore, MD. (http://udel.edu/~mcdonald/statmultreg.html)
Pages 521-544 in Wackerly DD, Mendenhall W, Scheaffer RL. 1996. *Mathematical Statistics with Applications*. Wadsworth: New York.

Week 4

M 2/13 Tests of significance with multivariate data: ANCOVA and nested models
Reading: McDonald, JH. 2009. Analysis of covariance. In: *Handbook of Biological Statistics, 2nd ed*. (www.biostathandbook.com/ancova.html)

W 2/15 Tests of significance with multivariate data: Hotelling's T^2
Reading: Manly & Navarro Alberto, Chapter 4

Week 5

M 2/20 Tests of significance with multivariate data: MANOVA
Reading: Manly & Navarro Alberto, Chapter 4

W 2/22 Measures of distance, similarity/difference indices, tests of significance with distance data: Randomization and the Mantel test
Reading: Manly & Navarro Alberto, Chapter 5

Week 6

M 2/27 Tests of significance with distance data: Levene test
Reading: Van Valen L. 2005. The statistics of variation. In: *Variation*, Hallgrimsson B, Hall BK, eds. New York: Elsevier. pp. 29-47.

W 3/1 Principal components analysis
Reading: Manly & Navarro Alberto, Chapter 6

Week 7

M 3/6 Principal components analysis

W 3/8 R workshop **(Poster topics must be cleared by this date)**
Reading: Manly & Navarro Alberto, Chapter 1 Appendix

Week 8

M 3/13 NO CLASS (Spring Break)

W 3/15 NO CLASS (Spring Break)

Week 9

M 3/20 Discriminant function analysis
Reading: Manly & Navarro Alberto, Chapter 8

W 3/22 Discriminant function analysis

Week 10

M 3/27 Cluster analysis
Reading: Manly & Navarro Alberto, Chapter 9

W 3/29 Cluster analysis

Week 11

M 4/3 Canonical correlation analysis
Reading: Manly & Navarro Alberto, Chapter 10

W 4/5 Canonical correlation analysis

Week 12

M 4/10 NO CLASS (Classes suspended at 2:35 pm for Passover)

W 4/12 Multidimensional scaling and ordination
Reading: Manly & Navarro Alberto, Chapters 11 & 12

Week 13

M 4/17 Resampling methods: Randomization
Reading: Manly BFJ. 2007. Randomization. In: *Randomization, Bootstrap and Monte Carlo Methods in Biology, third edition*. Chapman & Hall/CRC, New York. pp. 1-28.

W 4/19 Poster research day

Week 14

M 4/24 Review session for exam

W 4/26 **EXAM**

Week 15

M 5/1 Resampling methods: Jackknife
Reading: Manly BFJ. 2007. The Jackknife. In: *Randomization, Bootstrap and Monte Carlo Methods in Biology, third edition*. Chapman & Hall/CRC, New York. pp. 29-40.

W 5/3 Resampling methods: Bootstrap
Reading: Manly BFJ. 2007. The Bootstrap. In: *Randomization, Bootstrap and Monte Carlo Methods in Biology, third edition*. Chapman & Hall/CRC, New York. pp. 41-80.

Week 16

M 5/8 Topic of general interest to the class
Reading: TBA

W 5/10 Last day of class – continue final topic

Th 5/11 Poster presentations (**Reading Day for Final Exams**)