

ANTHROPOLOGY 6413.10

ANALYTICAL METHODS IN HUMAN EVOLUTIONARY STUDIES

Course Instructors: Brian Richmond, Mark Grabowski
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Office Hours: BR, M 3:30-5 & by appt.; MG, F 1-3 & by appt.

Spring 2013
Class Time: M 1-3:30
Location: HAH Seminar Room, 201

COURSE DESCRIPTION: A survey of methods and approaches for data collection and analysis in human evolutionary biology research, including the comparative method, basic statistics, general multivariate statistics, bootstrapping methods, 2D and 3D data collection techniques, geometric morphometrics, size and scaling, and paleoenvironmental and behavioral analytical techniques.

COURSE MECHANICS: The course will be a combination of lecture, demonstration, and discussion. In addition to reading and discussing issues surrounding each method, students will apply methods to real data sets with the goal of gaining practical experience, and bring their results to class for discussion. Students will each be responsible for providing one in-class demonstration of the week's primary methods (some consultation with the Instructor may be necessary). The following texts are required:

Zar, J.H. (2010) Biostatistical Analysis. 5th edition. Prentice Hall: Upper Saddle River, NJ. ISBN: 0-13-100846-3; ISBN-13: 978-0-13-100846-5.

Manly, B.F.J. 2005. Multivariate Statistical Methods: A Primer. 3rd edition. Chapman & Hall: London. ISBN: 1-58488-414-2.

LEARNING OUTCOMES:

As a result of completing this course, students will be able to:

1. Understand the potential applications and basic assumptions of basic, multivariate, and nonparametric statistics.
2. Understand and be able to implement strategies to account for the effects of size in analyses of biological data.
3. Understand the strengths and weaknesses of geometric morphometric and resampling approaches.
4. Evaluate the strengths and weaknesses of statistical procedures for research problems in human evolutionary biology.
5. Perform statistical tests of biological data.

EVALUATION: Grades are based on performance on exams and class participation. There are two exams scheduled for this course for a total of 60% of the final grade. Each exam is worth 30% of the total grade. The remaining 40% of the grade is based on the homework exercises (25%) and class demonstration (15%).

CLASS POLICIES:

The course requires attendance. Late work will only be accepted, and make-up exams will only be offered, if there is a valid (e.g. medical, religious) justification.

University policy on religious holidays:

1. Students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance;

2. Faculty should extend to these students the courtesy of absence without penalty on such occasions, including permission to make up examinations;
3. Faculty who intend to observe a religious holiday should arrange at the beginning of the semester to reschedule missed classes or to make other provisions for their course-related activities

[NOTE: for other university policies on teaching, see
<http://www.gwu.edu/~academic/teaching/main.htm>]

ACADEMIC INTEGRITY: I personally support the GW Code of Academic Integrity. It states: "Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information." For the remainder of the code, see: (<http://www.gwu.edu/~ntegrity/code.html>).

SUPPORT FOR STUDENTS OUTSIDE THE CLASSROOM

DISABILITY SUPPORT SERVICES (DSS)

Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Marvin Center, Suite 242, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to: <http://gwired.gwu.edu/dss/>

UNIVERSITY COUNSELING CENTER (UCC) 202-994-5300

The University Counseling Center (UCC) offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include:

- crisis and emergency mental health consultations
 - confidential assessment, counseling services (individual and small group), and referrals
- <http://gwired.gwu.edu/counsel/CounselingServices/AcademicSupportServices>

SECURITY

In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.

COURSE SCHEDULE

<u>DATE</u>	<u>TOPIC</u>	<u>Reading</u>
Jan 14	Basic statistics I: Descriptive stats, Distributions	Zuur et al (2010)
Jan 21	<i>No Class - MLK Day</i>	
Jan 28	Basic statistics II: Hypothesis Testing	Zar, 1-7
Feb 4	Basic statistics III: ANOVA	Zar 8, 10; skim 9, 11-16
Feb 11	Basic statistics IV: Regression Techniques	Zar 17-19
Feb 18	<i>No Class - President's Day</i>	
Feb 25	Size & Scaling (allometric analyses)	(Chapters 2-3 in Schmidt-Nielson, 1984; Fleagle, 1985; Jungers et al., 1995)
Mar 4	EXAM 1	
Mar 11	*** SPRING BREAK ***	
Mar 18	Goodness of Fit – nominal data	Zar, 22
Mar 25	Multivariate Statistics I	Manly (2005), Chapters 1-7, especially 1, 6, 7
Apr 1	Multivariate Statistics II	Manly (2005), Chapters 8-9
Apr 8	Multiple Regression and GLMM	Zar 20; paper TBA
Apr 15	Resampling Methods	Manly (1997, pp. 1-44, 69-78), (Green et al., 2007)
Apr 22	2D and 3D data collection; image analysis	(Spencer & Spencer, 1995)
Apr 29	Geometric Morphometrics	(Rohlf, 1990; Rohlf & Marcus, 1993; Adams et al., 2003; Gunz et al., 2009)
	Glossary: http://life.bio.sunysb.edu/morph/	
May 1	Advanced Methods	
May 6-14	EXAM II	

References

- Adams DC, Rohlf FJ, and Slice DE (2003) Geometric Morphometrics: Ten years of progress following the 'revolution'. *Italian Journal of Zoology*.
- Fleagle JG (1985) Size and adaptation in primates. In WL Jungers (ed.): *Size and Scaling in Primate Biology*. New York: Plenum Press, pp. 1-19.
- Green DJ, Gordon AD, and Richmond BG (2007) Limb-size proportions in *Australopithecus afarensis* and *Australopithecus africanus*. *J Hum Evol* 52:187-200.
- Gunz P, Bookstein FL, Mitteroecker P, Stadlmayr A, Seidler H, and Weber GW (2009) Early modern human diversity suggests subdivided population structure and a complex out-of-Africa scenario. *Proc Natl Acad Sci U S A* 106:6094-8.
- Jungers WL, Falsetti AB, and Wall CE (1995) Shape, relative size, and size-adjustments in morphometrics. *Yrbk Phys Anthropol* 38:137-161.
- Rohlf FJ (1990) Fitting curves to outlines. In FJ Rohlf and FL Bookstein (eds.): *Proceedings of the Michigan Morphometrics Workshop*. Ann Arbor, Michigan: University of Michigan Museum of Zoology, pp. 167-177.
- Rohlf FJ, and Marcus LF (1993) A revolution in morphometrics. *TREE* 8:129-132.
- Schmidt-Nielson K (1984) *Scaling: Why Is Animal Size So Important?* Cambridge: Cambridge University Press.
- Spencer MA, and Spencer GS (1995) Technical note: video-based three-dimensional morphometrics. *Am J Phys Anthropol* 96:443-453.
- Zuur AF, Ieno EN, and Elphick CS (2010) A protocol for data exploration to avoid common statistical problems. *Methods in Ecology and Evolution* 1:3-14.