

METR 5373-001

Resampling/Permutation Statistics

Class meets: 1:00-2:15 TR, Rm 5720

Professors: Kim Elmore and Mike Richman

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Philosophy behind the course

This course is designed to illustrate how to extract additional information from a data set. Many studies cite various statistics, but few delve into how accurate and reliable those statistics are. With the advent of high-speed, inexpensive computers, tools are now readily available to researchers for just this purpose. These tools will be introduced, described and put to use by the students during this course. The course is primarily practical in nature because computational statistics is intuitive in that it mimics the processes used in conceptual descriptions of theoretical statistics. Students will perform computational statistics on data, and observe, first hand, successes as well as failures, for it is as important to know what works as it is to know what doesn't work. If successful, at the course's conclusion, students will have within their research toolbox a powerful set of techniques by which they can extract as much information as possible from their data.

Course work and Grading Policies

Books: (Get them for less on addall.com):

Required: Efron, B. and R. J. Tibshirani, 1993: *An Introduction to the Bootstrap*. ISBN: 0-412-04231-2.

P. J. Burns, 1998: *S-Poetry*. Available for free as a PDF at

<http://www.burns-stat.com/pages/spoetry.html>. The text is intended as a reference for the student.

Optional: P. Spector, 1994: *An Introduction to S and S-Plus*. ISBN 0-534-19866-X.

Homework: Approximately 8 total, assigned 1 week in advance. This is a graduate-level course, so

homework is expected on time. Don't be late.  Just don't. Without a terribly compelling reason, you'll forfeit 25% of your score for every late day.

Tests: There will be a single, take-home mid-term exam. Work independently! There is no final, in lieu of a semester project.

Semester Project: Confer with Professor Elmore and Richman on an appropriate topic within the first month of class.

Computing: Any student who does not have account on the SOM system will receive one. S-Plus will be used as the computational engine on this system. You may install S-Plus on your own PC or the linux computers by obtaining a free copy from Dr. Mark Laufersweiler.

Student feedback: is essential! As this is a graduate level course, students are expected to ask challenging questions in class and to seek out either professor if they do not understand something or desire more in-depth discussion.

Grades:

- 50% homework
- 20% mid-term exam
- 30% semester project

Syllabus (tentative, subject – and likely – to change)

Date	Topic	Reading
1/18	Introduction; notation	ET 1 PB 1
1/20	Accuracy of the mean; S-Plus familiarization	ET 2
1/25	More S-Plus familiarization and examples	
1/27	Random samples and probability.	ET 3
2/01	More random samples and probability	
2/03	Even more random samples and probability (this is important stuff!)	
2/08	Empirical dist fun and the plug-in principle	ET4
2/10	More plug-in principle	
2/15	Standard errors and estimated standard errors	ET 5
2/17	Bootstrap estimate of standard error	ET 6
2/22	Standard error examples: test score data	ET 7
2/24	More test score data	
3/01	Standard error examples: curve fitting	
3/03	A bootstrap failure!	
3/08	Mid-term exam dispensed; more complicated data structures	ET 8
3/10	Moving blocks / Field Significance	
3/15 – 3/17	Spring Break	
3/22	Mid-term exam collected; regression models	
3/24	Regression models	
3/29	Even more regression	
3/31	The jackknife	ET 11
4/05	Confidence intervals	ET 12, 13
4/07	Confidence intervals	
4/12	Permutation tests	ET 15
4/14	Permutation tests	
4/19	Hypothesis testing	ET 16
4/21	Cross-validation	ET 17
4/26	Bootstrap validation	
4/28	Assessing errors	ET 19
5/03	Student Presentations 1	
5/05	Student Presentations 2	
5/10	FINAL: Semester Project Due	

Disability Statement:

The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the professor as early in the semester as possible. Students with disabilities must be registered with the Office of Disability Services prior to receiving accommodations in this course. The Office of Disability Services is located in Goddard Health Center, Suite 166, phone 405/325-3852 or TDD only 405/325-4173.

Academic Misconduct statement:

Any act which improperly affects the evaluation of a student's academic performance or achievement, including but not limited to the following: (a) Cheating: the use of unauthorized materials, methods, or information in any academic exercise, including improper collaboration; (b) Plagiarism: the representation of the words or ideas of another as one's own, including: (1) direct quotation without both attribution and indication that the material is being directly quoted, e.g. quotation marks; (2) paraphrase without attribution; (3) paraphrase with or without attribution where the wording of the original remains substantially intact and is represented as the author's own; (4) expression in one's own words, but without attribution, of ideas, arguments, lines of reasoning, facts, processes, or other products of the intellect where such material is learned from the work of another and is not part of the general fund of common academic knowledge; (c) Fabrication: the falsification or invention of any information or citation in an academic exercise; (d) Fraud: the falsification, forgery, or misrepresentation of academic work, including the resubmission of work performed for one class for credit in another class without the informed permission of the second instructor; or the falsification, forgery or misrepresentation of other academic records or documents, including admissions materials and transcripts; or the communication of false or misleading statements to obtain academic advantage or to avoid academic penalty; (e) Destruction, misappropriation or unauthorized possession of University property or the property of another; (f) Bribery or intimidation; (g) Assisting others in any act proscribed by this Code; or (h) Attempting to engage in such acts.

Penalties are listed in the Academic Code. For further information on academic misconduct please refer to the following link:
<http://www.ou.edu/provost/integrity/>