Statistics 481 / Economics 580 / CS&SS 481

Introduction to Mathematical Statistics

Statistics Department
University of Washington
Autumn Quarter 2009

Instructor: Thomas Richardson

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Time and place:

M 9.30 - 10.50 Architecture (ARC) 160
W 9.30 - 10.50 Architecture (ARC) 160

Quiz sections:

(AA) F 12.30 - 1.20 Communications CMU 243
(AB) F 1.30 - 2.20 Communications CMU 243

Course web-page: http://www.stat.washington.edu/tsr/s481

Purpose of the course:

This course is an introduction to the mathematical theory of probability and statistical inference at the calculus level. The course explains the basic theory and principles underlying statistical methods. Emphasis will be on mastering concepts and techniques needed for subsequent work in economics and econometrics. Students who complete Stat 481 / Econ 580 will be well prepared to study the application of statistical methods in courses such as Stat 421, 423, 427, or Econ 581, 582, or similar courses in other applied fields.

Pre-requisites:

Stat 311, Econ 281 or equivalent. Math 124, 125, 126, and a course in linear algebra. Math 324 is recommended, as the course makes use of multivariate calculus.

Textbooks:
A.S. Goldberger, *A course in Econometrics*, Harvard.
J. Rice: *Mathematical Statistics and Data Analysis*, Duxbury.

I have assigned readings from these books on the topics covered in lectures. You will get much more from the lectures if you do the reading in advance.

Supplementary textbooks:

Introduction to R
`http://www.r-project.org`

J.E. Freund's Mathematical Statistics, Prentice Hall.

L. Gonick and W. Smith: *The Cartoon Guide to Statistics*, Harper Perennial.

M. Lavine *Introduction to Statistical Thought*
`http://www.isds.duke.edu/~michael/book.html`
W. Greene: *Econometric Analysis*, Prentice Hall.
Depending on the time available additional articles may be assigned.

Software:

We will use the statistical software environment: `R` This is freely available from: `http://www.r-project.org`

Some homework exercises will require you to use `R` in order to perform simulations. I also use a Graphing Calculator program for demonstrations in class. This software is not required, but it is cheap, and I recommend it.

Laptops

Some classes and quiz sections will involve software demonstrations. Please let me know immediately if you are unable to bring (or borrow) a laptop to class.

Homework:

Homework will be handed out weekly. You will typically have a week in which to work on the homework. Late homework will not be accepted since solutions may be covered in the Friday quiz section. Each homework will contribute towards approximately 5% of the total grade. Thus you should turn in homework even if you are unable to finish all of it in time. A subset of homework questions will be graded. Homework grades will subsequently be combined to form an overall percentage. The algorithm for making this conversion will be specified later.

Evaluation:

The final grade will be made up as follows:

Homework: 35%; Midterm 30%; Final 35%

Grades are computed from the final percentage by dividing the overall percentage by 25. Incomplete grades will not be assigned except in extraordinary circumstances.

Midterm:

The midterm will be on Wednesday, 4 November. (Room TBA) You may bring a (double sided) $8.5'' \times 11''$ piece of paper with notes.

Final:

The final will be on Wednesday, December 16th, 8.30 - 10.20 am (Room TBA). It will include material covered during the whole quarter. Again you may bring a (double sided) $8.5'' \times 11''$ piece of paper with notes. Make-up exams will not be given except in extraordinary cases (certified medical condition, family emergency etc.)

Quiz Sections:

The TA will hand back homework during the quiz. He will also answer any questions that you may have concerning the homework that is due the following week. The TA will perform some software demonstrations in the class.

Mailing List

There is an e-mail list for this course. Your UW address will automatically be registered. (It is your responsibility to get e-mail forwarded if you use another account.)

Questions:

Please do not hesitate to raise questions about the material in class. If you have any concerns about any aspect of the class please let me know as soon as they arise. You can talk to me before or after class, during office hours, or you can send me e-mail. I will also accept (constructive!) anonymous notes or e-mail (see web-page). The Teaching Assistant will also be available during office hours to answer questions that you may have.

Academic integrity:

Collaboration and discussions are allowed and encouraged in this class, but copying or letting others copy your work amounts to plagiarism. This includes copying model solutions, e.g. from prior years. Although cheating occurs seldom in graduate classes, if it does, I will take the following action: assign a grade of 0.0 for the exam/homework where the cheating occurred, and report the incident to the Graduate School Committee on Academic Conduct, which will decide upon an appropriate University course of action.

Students with disabilities:

If you would like to request academic accommodations due to a disability, please contact Disabled Student Services, 448 Schmitz (206) 543-8924 (V/TTY). If you have a letter from Disabled Student Services indicating you have a disability that requires academic accommodations, please present this letter to me so we can discuss the accommodations you might need for the class.

PROVISIONAL COURSE OUTLINE

DATE	TOPIC	READINGS
Weds 30 Sep	Probability	G 1-2.1; R1 ; (F 2)
Mon 5 Oct	Univariate Probability Distributions	G 2.2-4; R 2.1-2; (F 3.1-4),
Weds 7 Oct	Functions of Random Variables	G 2.5-3.1; R 2.3; (F 7.2-3)
Mon 12 Oct	Expectations: Univariate Case	G 3.2-5; R 4.1-2; (F 4.1-4)
Weds 14 Oct	Moment generating functions (mgfs)	R 4.5
Mon 19 Oct	Bivariate Probability Distributions	G 4; R3; (F 3.4-7)
Weds 21 Oct	Functions of Two Random Variables	R 3.6 (F 7.4-5)
Mon 26 Oct	Expectations: Bivariate Case	G 5; R 4.3; 4.4 (F 4.6-7)
Weds 28 Oct	Independence; Normal Distributions	G 6; R 3.4 (F 3.7, F 6.5)
Mon 2 Nov	Univariate Sampling Distributions	G 8.1-8.4; R 7; (F 8.1-2, 8.4-6)
Weds 4 Nov	*Midterm*	
Mon 9 Nov	Likelihood	R 8.1-8.5
Weds 11 Nov	*Holiday*	
Mon 16 Nov	Parameter Estimation	G 11.1-4; R 8.5 (F 10.1-2 10.4-8)
Weds 18 Nov	Hypothesis Testing	R 9.1-3 (F 12,13.1-3)
Mon 23 Nov	Interval Estimation	G 11.5-12.1; R 9.4 (F 11)
Weds 25 Nov	Bayesian inference	R 8.6; Handout
Mon 30 Nov	Bayesian inference	R 8.6; Handout
Weds 2 Dec	Asymptotic Distribution Theory	G 9,10; R 5; (F 8.2)
Mon 7 Dec	The Cramér-Rao Inequality	G 12.2-3; R 8.7 (F 10.3)
Weds 9 Dec	Asymptotic Confidence Intervals	G 12.4 R 8.5.3
Mon 14 Dec	Review	
Weds 16 Dec	*Final*	

G, R, F, indicate assigned sections from Goldberger, Rice, and (optional) Freund respectively.

ERRATA FOR GOLDBERGER *A Course in Econometrics*

1. p.97 line 2 from bottom should read:

   and lim $G_n(t) = 1$ for all $t > c$, then we say

2. p.108, line 7 from bottom, equation should read:

   $$V(S_{XY}) = (n-1)^2(\mu_{22} - \mu_{11}^2)/n^3 \; + \; (n-1)(\mu_{11}^2 + \mu_{20}\mu_{02})/n^3$$

3. p.135 line 9 from bottom 'convex' should be 'concave'.