Math 541/643: Statistical Theory II, Fall 2011

Instructor: Songfeng (Andy) Zheng

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Room and Time: Cheek 173, 9:40am – 10:30am, MWF

Office and Hours: Cheek 22M, 2:00pm – 3:30pm, Monday, Wednesday, and Friday; or by appointment. Office hours are offered for individual help and getting to know how you understand the material, so please use them.


Mathematical Statistics and Data Analysis, 3-rd Edition, by John A. Rice. (Optional)


Lecture notes on some topics will be available.

Course webpage: 

http://people.missouristate.edu/songfengzheng/Teaching/MTH541_F11.htm will provide the download of various course materials, including the lecture notes, homework assignments, announcements, and data for exercises.

Objectives & Prerequisites: The course Math 541 is devoted to statistical inference. Students will be equipped with statistical principle, theory and methodology when they leave the course; also students are expected to be able to solve practical application problems using computer programming language. The prerequisite for this course is Math 540 or equivalent, and students are expected to be familiar with calculus (differentiation, integral). Programming technique is not required but it is a plus. In this course, we will use the extensively used programming language in statistics, R, for statistical computation and simulation, and it is FREE! The website for downloading R is http://www.r-project.org/

Please install and learn how to use R by yourselves! You can find tutorial materials by Google: just type in "R tutorial filetype:pdf", you will have a lot of tutorial files available. After we finish MLE part, I will show you how to use the basic commands of R by doing an example of MLE with R. For example:

**Materials to be covered (tentative):** Estimation (Method of Moment, Maximum Likelihood), the Properties of MLE, Sampling Distributions of Estimators, Confidence Intervals, Evaluation of various Estimators, Hypothesis Testing, Computer Simulations for Estimators and Confidence Intervals.

**Grading Policy and Studying Suggestions:**

Homework: 20% 
Computer Assignment: 10%

In-class 2 Tests: 30% 
Final Exam: 40%

Grading policy: A (>90%)  B (80 --- 89%)  C (70 --- 80%)  D (60 – 70%), F(<60%)

Final Exam date: 8:45 --- 10:45, Dec. 12, Monday.

It is important that you read the text book(s) and lecture notes regularly, understand the problems worked out in the text and practice by doing the problems. Doing the homework problems is absolutely essential to get a better grade in this course. You are allowed to discuss the homework problems among yourselves or with me. However the final work handed in must be completely your own. Anyone who receives or gives an unauthorized aid on a homework or test is considered to be cheating.

A good way to learn a programming language is practice, practice, practice! I encourage you install R on your own computer and play it whenever possible. You are encouraged to discuss your problems in using the software, and also don’t forget internet is a very good coach in your study.

No make-up test or exam will be given under ordinary conditions. The only acceptable excuse for missing a test is an extreme emergency. However, you must obtain a written explanation from a physician, etc. If you cannot take the test on the scheduled day, you must contact me before the test date.

**Emailing format:**

Email is an important means to communication in everyday life as well as in this course. Due to the large amount of emails sent to me every day, and due to different courses I am teaching, I suggest you clearly write a subject in the email, and in the subject, clearly tell which course you are from. For example, a good email subject would be like

Subject: MTH 541: Q about #7 in HW2

Thus, I can quickly locate your problem and will reply quickly. Emails which don’t have a clear subject may be simple ignored!
Miscellaneous Notes:

**Attendance policy:** The University expects instructors to be reasonable in accommodating students whose absence from class resulted from: (1) participation in University-sanctioned activities and programs; (2) personal illness; or (3) family and/or other compelling circumstances. Instructors have the right to request documentation verifying the basis of any absences resulting from the above factors. Please see The University’s attendance policy can be found in the 2010-2011 Undergraduate Catalog at www.missouristate.edu/registrar/attendan.html.

**Academic integrity:** Missouri State University is a community of scholars committed to developing educated persons who accept the responsibility to practice personal and academic integrity. You are responsible for knowing and following the university’s Student Academic Integrity Policies and Procedures, available at www.missouristate.edu/policy/academicintegritystudents.htm. You are also responsible for understanding and following any additional academic integrity policies specific to this class (as outlined by the instructor). Any student participating in any form of academic dishonesty will be subject to sanctions as described in this policy. If you are accused of violating this policy and are in the appeals process, you should continue participating in the class.

**Nondiscrimination:** Missouri State University is an equal opportunity/affirmative action institution, and maintains a grievance procedure available to any person who believes he or she has been discriminated against. At all times, it is your right to address inquiries or concerns about possible discrimination to the Office for Equity and Diversity, Park Central Office Building, 117 Park Central Square, Suite 111, (417) 836-4252. Other types of concerns (i.e., concerns of an academic nature) should be discussed directly with your instructor and can also be brought to the attention of your instructor’s Department Head. Please visit the OED website at www.missouristate.edu/equity/.

**Disability Accommodation:** To request academic accommodations for a disability, contact the Director of the Disability Resource Center, Plaster Student Union, Suite 405, (417) 836-4192 or (417) 836-6792 (TTY), www.missouristate.edu/disability. Students are required to provide documentation of disability to the Disability Resource Center prior to receiving accommodations. The Disability Resource Center refers some types of accommodation requests to the Learning Diagnostic Clinic, which also provides diagnostic testing for learning and psychological disabilities. For information about testing, contact the Director of the Learning Diagnostic Clinic, (417) 836-4787, http://psychology.missouristate.edu/ldc.

**Cell phone policy:** As a member of the learning community, each student has a responsibility to other students who are members of the community. When cell phones or pagers ring and students respond in class or leave class to respond, it
disrupts the class. Therefore, the Office of the Provost prohibits the use by students of cell phones, pagers, PDAs, or similar communication devices during scheduled classes. All such devices must be turned off or put in a silent (vibrate) mode and ordinarily should not be taken out during class. Given the fact that these same communication devices are an integral part of the University’s emergency notification system, an exception to this policy would occur when numerous devices activate simultaneously. When this occurs, students may consult their devices to determine if a university emergency exists. If that is not the case, the devices should be immediately returned to silent mode and put away. Other exceptions to this policy may be granted at the discretion of the instructor.

**Emergency Response policy:** Students who require assistance during an emergency evacuation must discuss their needs with their professors and Disability Services. If you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible. For additional information students should contact the Disability Resource Center, 836-4192 (PSU 405), or Larry Combs, Interim Assistant Director of Public Safety and Transportation at 836-6576. For further information on Missouri State University’s Emergency Response Plan, please refer to the following web site: http://www.missouristate.edu/safetran/erp.htm

**Dropping a Class:** It is your responsibility to understand the University’s procedure for dropping a class. If you stop attending this class but do not follow proper procedure for dropping the class, you will receive a failing grade and will also be financially obligated to pay for the class. For information about dropping a class or withdrawing from the university, contact the Office of the Registrar at 836-5520.
Tentative Lecture Schedule in Fall 2011 (MTH 541/643)


week 3: Maximum likelihood estimation, Examples. Reading Materials: Lecture notes, Sec. 6.5 from DeGroot.


week 6: Sufficient Statistics and Estimators, Exponential distribution family.


week 8: sampling distributions, distribution of sample mean and sample variance, exact confidence intervals. Reading materials: 7.1, 7.3, 7.4, 7.5 from DeGroot, CI lecture notes

week 9: Exact confidence interval; bootstrap for sampling distribution and confidence interval; Fisher Information. Note for Bootstrap, Note for Fisher information.

week 10: Cramer-Rao lower bound, Asymptotic Distribution of MLE, approximate confidence intervals.

week 11: Mean square error or an estimator, Efficient estimators, Reading material: Lecture note.


week 13: Type I and Type II error, commonly used Tests with threshold value: z-test, t-test, chi-square test.

week 14: Test-#2. Thanksgiving.
week 15: p-values and interpretation, Duality of Confidence Intervals and HT. Two sample tests for mean values. Lecture note for two sample tests

week 16: F-distribution, Two sample tests for variances, Likelihood ratio tests. Lecture notes for LRT.