MTH 547/647: Applied Regression Analysis, Fall 2015

Instructor: Songfeng (Andy) Zheng

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Room and Time: Cheek 173, 11:15am – 12:05pm, MWF

Office and Hours: Cheek 22M, 1:30pm – 3:00pm, Tuesday and Thursday; or by appointment. Office hours are offered for individual help and getting to know how you understand the material, so please use them.


Objectives & Prerequisites: Regression models are widely used in business administration, economics, engineering, and the social, health, biological, geological and environmental sciences. The course of MTH 547 provides students with both the underlying theory and the practical problems encountered in using regression models in real-life situation. The statistical software S-PLUS is used in this course. Students are expected to have solid background in statistics, and familiar with the ideas of confidence interval and hypothesis testing. The Prerequisite for this course is MTH545 or MTH541 or equivalent.

Course webpage:

http://people.missouristate.edu/songfengzheng/Teaching/MTH547_F15.htm will provide the download of various course materials, including homework assignments, announcements, and data for exercises.

Materials to be covered (tentative): Linear regression models; Inference in regression analysis; Diagnostics and remedial measures; Simultaneous inferences; Matrix approach to linear regression analysis; Multiple linear regression models; Regression models for qualitative predictors; Nonlinear regression; Logistic regression and Poisson regression; Generalized linear models; stage wise regression models; overfitting in regression analysis; pattern classification and Fisher's Linear discriminant analysis.

The attached is list of the topics which are planned to be covered.

Grading policy (tentative):

Homework: 15%  In-class Tests: 20%

Project: 25%  Final exam: 40%
Final Exam date: 11:00—1:00, Dec 9, Wednesday.

It is important that you read the textbook(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. 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 547: Question about #4 in HW2*

Thus, I can quickly locate your problem and will reply quickly. *Emails which don’t have a clear subject may be simply 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](http://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](http://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 Topics Covered in Fall 2015

- week 1: Review: typical distributions, estimation, sampling distributions, confidence interval, hypothesis testing. Reading Assignment: Appendix A, Sec. 1.1 and 1.2 from Kutner
- week 2: Regression models, Simple linear regression models, estimation of regression function. Reading material: Sec. 1.1 to 1.6 from Kutner.
- week 3: Least square estimation and the properties, residuals. Reading material: Sec. 1.6 to 1.7 from Kutner.
- week 4: Computer Examples, Normal error regression models. Statistical Inference about beta_1. Reading: Sec. 1.8, 2.1 from Kutner.
- week 5: inference about beta_0, confidence interval for $E(Y_h)$, prediction of new observation. Sec. 2.2 --- 2.5.
- week 6: confidence band, ANOVA and regression analysis. Reading: sec. 2.6, 2.7.
- week 7: General linear test, linear association between X and Y; Matrix approach to simple linear regression analysis. Reading: Sec. 2.8, 2.9, Chapter 5.
- week 8: Test-#1, Fall Break
- week 9: Computer example for Chapter 5, graphical methods model diagnosis. Sec. 3.1---3.3. Reading 3.4&3.8.
- week 10: Variance Stabilize transformations. Multiple regression models, matrix representation, parameter estimation and predictors in matrix form, Analysis of variance in matrix form. Reading material: Sec. 3.8 --- 3.9, Sec. 6.1 --- 6.5
- week 11: Inference and prediction in multiple regression, computer examples, Test-II; Extra sum of squares. Sec. 6.6 -- 6.7, Sec. 7.1.
- week 12: Tests for regression coefficients, partial coefficient of determination. Reading material: Sec. 7.2 -- 7.4.
- week 13: standardized multiple linear regression model, weighted least squares, stage-wise least square and variable selection, multicollinearity: Sec. 7.5, 7.6
- week 14: Additive and Interactive effect, Overfitting, Binary predictors, non-linear regression models. Sec. 8.2 -- 8.4, Sec. 13.1.
- week 15: Polynomial regression models, computer Example. Thanksgiving break!!! Reading: Sec. 8.1