STAT6450 – 4 CREDIT HOURS

Term: Fall, 2018
Instructor: Jared D. Huling
Email: huling.7@osu.edu (**not** @buckeyemail.osu.edu)
Location: TR 9:05am-10:55am in Jennings Hall 040
Office Hours: Monday 2-3pm, Wednesday, 10-11am CH329
Grader: Liu Zilu, email: liu.6536@buckeyemail.osu.edu
Text: *Applied Linear Regression Models*, 4th edition, by Kutner, Nachtsheim, and Neter.
Course Website: Carmen
Long Course Title: Applied Regression Analysis
Final Exam: Friday, December 7th, 8:00am-9:45am

Course overview:
Statistics 6450 is intended to be an introduction to regression analysis techniques. Its focus will be on the application of linear regression models in practice, however to facilitate good applied practice, this course will also cover basic theory of the linear model.
Topics of Stat 6450 include:

- Simple Linear Regression (SLR) model
  - Methodology for fitting models
  - Statistical inference
  - Diagnostics for verification of assumptions and their remedies
  - Solving using matrix algebra
- Multiple Linear Regression (MLR) model
  - Methodology for fitting models
  - Statistical inference
  - Binary indicator (1/0) and qualitative predictors
  - Diagnostic measures of model fit
  - Variable selection and model building
- Other Models
  - Generalized Linear Models (GLMs)
  - Logistic regression
  - Regression with ordinal and nominal polytomous response

Prerequisites / Co-requisites:
Statistics 521, 6201 or equivalent.

Exclusions:
Not open to students with credit for Stat 645 (Stat 6450 under semesters)

Course Objectives:
By the end of the course, you should:

- Understand the motivation, purpose, and goals of regression analysis
- Understand the theoretical assumptions behind the linear model and their importance in properly conducting a regression analysis
- Know how to estimate the parameters in regression models
- Be able to validate the modeling assumptions with formal tests and visual diagnostic tools
- Know how to make inferences regarding the linear model
- Be able to build and validate regression models in a principled manner
- Understand the limitations of regression analyses
- Be able to apply the above knowledge and techniques in on your own data or problems

Course Requirements:
You are responsible for all material covered in class and in the required readings; this includes derivation, proofs, computational techniques, etc. Statistics 6450 is an applied course and the emphasis will be on applying concepts learned in class to real-world datasets. However, there will be an emphasis on theoretical concepts which will help you better understand and apply the techniques covered in class. You are expected to be comfortable with multivariable calculus. It will be helpful but not required to know basic matrix operations from linear algebra. Strang, G., (2005), *Linear Algebra and Its Applications* (4th Ed.) is a good reference for linear algebra. There are computational elements to this class; you will learn how to use software to analyze data and apply concepts learned during the lectures. More information on the software used is in the following section.

Software:
The `R` statistical computing language (https://www.r-project.org/) will be used in class and for assignments. The code editor `RStudio` (https://www.rstudio.com/) is highly recommended to be used concurrently with `R`, as it makes `R` easier to use and offers tools for data visualization and code debugging. `RStudio` can be downloaded here: https://www.rstudio.com/products/rstudio/#Desktop.
Students are welcome to use other software for assignments (such as SAS, SPSS, minitab, etc), however `R` is strongly encouraged.

Homework and Assignments:
You are encouraged to discuss problems with each other in general terms, but you must write your own homework solutions and project reports. Homework and project reports must be submitted in a *stapled* hard copy in the beginning of class. Late submissions will **not** be accepted.

Computer output in homework solutions *must* be accompanied with annotations and thorough descriptions. You may lose points if the grader has trouble following the logical flow of your solutions. Interpretation of the results of statistical analyses and the explanation of analysis results to non-statisticians are crucial skills and are thus an emphasis of this class. As such, homework solutions to applied problems must have clear (non-statistical) interpretations of the analysis results.

Important (Tentative) Dates:

	Date
HW1 due	09/06
HW2 due	09/13
HW3 due	09/20
HW4 due	09/27
HW5 due	10/04
Midterm	10/16
HW6 due	10/25
HW7 due	11/08
HW8 due	11/15
HW9 due	11/29
Final	Friday, 12/07, 8:00am-9:45am

Homeworks are due Thursdays at the *start* of class and should be turned in as *stapled* hard copies.

Disclaimer:
Due dates and grading scheme are subject to change. Any changes will be applied to the entire class, not to individual students. Announcements about changes will be made *during class time* so **be sure to attend class**.

Grading scheme:

Homework	30%
Midterm	30%
Final	40%

I may make adjustments to the grading scheme if, in my judgment, it is warranted. The final grades (A, B, C, etc) will be graded on a curve but based on Homeworks, Midterm, and Final.

***Optional* References:**

- Related Texts
  - *Applied Regression Analysis*, Wiley. Normal Draper and Harry Smith (1998).
  - *Introduction to Linear Regression Analysis*, Wiley-Interscience. Douglas Montgomery (2006).
- R Resources
  - *Using R for Data Analysis and Graphics*. J.H. Maindonald. This text if available for free online: https://cran.r-project.org/doc/contrib/usingR.pdf
  - *R for Beginners*. Emmanuel Paradis. This text is available for free online: https://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf
  - *R Bootcamp*. Jared Knowles. This is an online-based R bootcamp: https://www.jaredknowles.com/r-bootcamp/
  - *Quick R*. This is a good online reference for R topics http://www.statmethods.net/
  - *Advanced R*. Hadley Wickham. This text is available for free online: http://adv-r.had.co.nz/ (*Advanced R* is for *advanced* users of `R` but is a very good `R` resource)

Rules and Policies

Cell Phones:
Cell phones must be either turned off or put on vibrate during class, as cell phones ringing during class disrupt the learning process.

E-mail Correspondence:
All emails to me regarding Statistics 6450 matters must have "Stat6450" in the beginning of the title. In order to protect your privacy, all course related e-mail correspondence must be done through a valid OSU "name.number" account.

Exams:
Exams are closed book/closed notes. Calculators are allowed - communication devices (including cell phones) are not. You may bring a single 8.5"x11" page of notes (double sided) to the midterm exams. You may bring two 8.5"x11" pages of notes (double sided) to the final exam. Statistical tables will be provided on exams as needed. The final exam will cover all material for the course.

Academic Misconduct:
Academic Misconduct is defined as "any activity that tends to compromise the academic integrity of the University or subvert the educational process." (Code of Student Conduct, Section 3335-23-04-A). Do not cheat. Finding and copying solutions from online or otherwise would be one form of cheating. Copying solutions during an exam is clearly another form of cheating.

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors will report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/.

Special Accommodations:

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.