STAT/BIST 5665: Applied Multivariate Analysis
Fall 2018

Instructor
Kun Chen, Ph.D.
Associate Professor
Department of Statistics
University of Connecticut

Office: AUST 314
Phone: (860) 486-4847
E-mail: kun.chen@uconn.edu

Office Hours
1:15PM – 2:15PM Monday & Wednesday, or by appointment.

Course Time & Location
Monday 2:30PM – 4:25PM, AUST 313
Wednesday 2:30PM – 3:20PM, AUST 313

Reference Books
Izenman, A. J. (2008) *Mordern Multivariate Statistical Techniques*. Springer.
Johnson, R. A. and Wichern, D. W. (2007) *Applied Multivariate Statistical Analysis*. Prentice Hall, 6 edn.
Hastie, T., Tibshirani, R. and Friedman, J. (2009) *The Elements of Statistical Learning*. Spring.
Anderson, T. (2003) *An Introduction to Multivariate Statistical Analysis*. Wiley-Interscience.

Prerequisites
Open to graduate students in statistics, others with permission.

Course Materials & Website
Announcements, lecture notes and other course information will be posted on HuskyCT.

Course Description and Objectives
We will explore a variety of classical statistical methods used for multivariate data analysis, emphasizing on methodologies, interpretations and the underlying theoretical ideas, along with several examples and case studies. Some modern multivariate techniques developed in the current age of data explosion and high-speed computation will also be introduced. The course aims to help students gain basic understanding of various multivariate techniques and develop skills to appropriately analyze multivariate data in practice.

Topics may include but are not limited to:

- Descriptive statistics, graphics and sample geometry;

- Multivariate normal distribution;
- Inferences about mean vectors and multivariate analysis of variance;
- High-dimensional statistics and regularized estimation;
- Multivariate regression and its extensions;
- Principal component analysis (PCA) and its variants;
- Factor analysis and its variants;
- Canonical correlation analysis and its variants;
- Classification (Logistic regression, LDA, QDA, SVM, etc);
- Neural networks and an introduction to deep learning;
- Clustering;
- Graphical models.

Attendance

Attendance is required. The penalty for absence is at the discretion of the instructor and may include deduction of the final grade and failure of the course.

Grading (tentative)

Assignments	30%
Midterm Exam	30%
Project	40%
Total	100%

Grades for the course are assigned totally at the instructor's discretion. A **rough** guide:

A: 91–100%	A−: 89–90%	B+: 87–88%	B: 81–86%
B−: 79–80%	C+: 77–78%	C: 71–76%	C−: 69–70%
D+: 67–68%	D: 61–66%	D−: 59–60%	F: $< 59\%$

Exam Time & Location:	TBD
Final project due:	TBD

- Homework: *The work must be entirely yours*. Neatness counts a lot. Unless prior arrangements are made for reasons judged to be acceptable by the instructor, late homework will receive ZERO credit.

- Exams: *There will be one midterm exam*.

- Project: *Each student is required to complete a class project* on a topic of your choice about multivariate statistics. There are many possibilities. For example, you may review an important topic in multivariate analysis, you may solve a real problem which requires comprehensive multivariate techniques, you may compare several methods via simulation, and you may build an R package to implement

certain multivariate methods. You are also encouraged to explore new ideas originated from taking this course.

For students who are interested in exploring new ideas and doing research in this area, I will provide a list of potential topics for your consideration. You are encouraged to discuss with me and write a proposal of your idea. Once a topic is assigned to a student, it is no longer available for others to choose.

A final paper/report of your project should be about 5–8 pages in length, excluding any appendices you wish to attach. In any case, the project should present new work, not something you have done for another course. If you use any reference, you must cite and credit your sources. Your project will be shared with the class through the class website on HuskyCT.

Disclaimer

The instructor reserves the right to make changes to the syllabus as necessitated by circumstances.

Updated: August 27, 2018

Academic Integrity

Academic integrity is a fundamental expectation of all students in this course. Cheating, plagiarism and other forms of academic misconduct will not be tolerated. According to Responsibilities of Community Life: The Student Code:

"*Academic misconduct is dishonest or unethical academic behavior that includes, but is not limited, to misrepresenting mastery in an academic area (e.g., cheating), intentionally or knowingly failing to properly credit information, research or ideas to their rightful originators or representing such information, research or ideas as your own (e.g., plagiarism).*"

Students with Accommodations

Any student with a disability who needs a classroom accommodation, access to technology or other assistance in this course should contact the Center for Students with Disabilities and inform the instructor, so that arrangements can be made to accommodate the student as best as possible.

Classroom Conduct

Students that engage in behavior that disrupts the learning environment may be asked to leave the class.