Modern Methods in Multivariate Analysis

STAT 7630, Spring 2026

- Time: 230-345 TR
- Room: EC 2231
- Textbook: An Introduction to Multivariate Statistical Analysis, 3rd Edition Theodore W. Anderson ISBN: 978-0-471-36091-9 July 2003 [https://www.wiley.com/en-us/An+Introduction+to+Multivariate+Statistical+Analysis%2C+3rd+Edition-p-9780471360919 (https://www.wiley.com/en-us/An+Introduction+to+Multivariate+Statistical+Analysis%2C+3rd+Edition-p-9780471360919)]
- Supplementary Materials: Handbook of Applied Multivariate Statistics and Mathematical Modeling 1st Edition Howard E.A. Tinsley (Editor), Steven D. Brown [https://www.amazon.com/Handbook-Multivariate-Statistics-Mathematical-Modeling/dp/0126913609 (https://www.amazon.com/Handbook-Multivariate-Statistics-Mathematical-Modeling/dp/0126913609)]
- Credits: 3
- Instructor: Dustin Pluta, PhD
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- Office: EB 212
- Office Hrs: 1:00 - 2:00 T, and by appointment

Catalog Course Description

This course is designed as a first course in multivariate analysis, with emphasis on learning theoretical concepts and corresponding analytical tools in R. Topics to be covered include: discrete and continuous multivariate distributions, MANOVA, multivariate multiple regression, principal component analysis, discriminant analysis, canonical correlation analysis, dimension reduction methods such as multidimensional scaling and stochastic neighborhood embedding, data visualization, Gaussian graphical models and high dimensional inference. Upon successful completion of the course, the students will have sufficient practical knowledge for analyzing any multivariate data set. In this course, topics relevant to modern day problems in big data analysis are discussed and the multivariate tools necessary to tackle them are discussed.

Lecture Hours: 3

Grade Mode: Normal, Audit Prerequisites: STAT7630 >= C Repeat Status: No Schedule Type: Lecture, Asynchronous Instruction

Course Evaluation and Grading

Assessments

- 5 Homework Assignments **(49%)**
- 1 Midterm Exam **(19%)**
- 1 Course Project **(29%)**
- Professionalism **(3%)**

Homework Assignments

- Homework assignments consist of a combination of theory and application problems based on the lecture and book material, and involve, e.g., coding, mathematical derivations, and interpreting model results.
- Due date will typically be 1 - 2 weeks after it is assigned.
- Late assignments will not be accepted without prior approval.
- Your submitted assignments should be organized, with the assignment number, your name, and the date all clearly visible on the first page.
- Any results, derivations, or any other form of work you include that is not your own must be cited with a full reference.
- I **strongly** prefer you type your assignments using $\LaTeX$ or Markdown.
- Homework submission will occur online. See the course webpage for further instructions.

Midterm Exam

- In-class, closed book, one page of notes (standard letter paper, front and back).
- Questions similar to homework assignments.
- Specific material covered and further details on the exam will be provided in class.

Course Project

Students will be tasked with conducting a thorough analysis on a real world data set, producing a written report that includes a practical interpretation of results. Students will need to: find a real world data set, identify a question of interest that can be assessed with the data, develop and apply the appropriate set of methods from the course, and interpret the analysis results in the context of the motivating question. Students will be required to make use of statistical modeling software (R, Python) to conduct their analyses and generate the required plots.

Professionalism

For full credit in this category you must consistently attend class and complete the course evaluations at the end of the term.

Grading Scale

A-F Grading Scale:

A: >= 90% & <= 100%

B: >= 80% & < 90%

C: >= 70% & < 80%

D: >= 60% & < 70%

F: < 60%

Course Topics & Schedule

(Tentative)

1. JAN 06 Multivariate Distributions
2. JAN 13 Covariance: types, properties, estimation
3. JAN 20 Principal Component Analysis
4. JAN 27 Testing and Inference for Multivariate Data
5. FEB 03 Curse of Dimensionality, Clustering
6. FEB 10 Sampling and Optimization
7. FEB 17 Variable Selection: stepwise and criteria-based
8. FEB 24 Variable Selection: shrinkage, spike-and-slab
9. MAR 03 Modeling Multivariate Responses *(Spring Pause MAR 6-7)*
10. MAR 10 Multiple Response Regression
11. MAR 11 MANOVA
12. MAR 24 Matrix Regression
13. MAR 31 Graphical models *(Spring Break APR 7-11)*
14. APR 14 Extra Topics (to be chosen)
15. APR 21 Review

Last Day of Class: APR 26

Policies & Guidelines

Students are required to follow and be aware of the Augusta University Student Attendance Policy, which states

> regular, punctual attendance is expected of students in all courses at Augusta University and is > counted at the first class meeting each term. Faculty members are required to monitor student >attendance and ongoing participation in the course.