

MTH 359/659 Multivariate Statistics (Statistics Involving Multiple Response Variables)

Purpose: Often, one wants to examine relationships and make inferences about a set of random variables. In this course, we will examine how to best analyze these types of data, as well as study additional types of inferences we can make with this multi-variable (multivariate) response data that we can not make with single-variable (univariate) response data.

Textbook: Applied Multivariate Statistical Analysis; Fifth Edition; by Johnson and Wichern

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Requirements: Attend all classes; Complete homework; projects; tests.

Grading:

Homework/Projects	100
Test 1	100
Test 2	100
Final Exam	100

Office Hours: Tuesday 9-11am; Wednesday 2-4 pm. Also, please feel free to stop by my office anytime, or set up an appointment.

TimeLine for the Course

Chapter 1: basic aspects of multivariate analysis : 2 classes

Chapter 2: matrix algebra and random vectors: 2 classes

Chapter 3: sample geometry / generalized variance; sample mean; sample covariance matrix: 2 classes

Chapter 4: Multivariate Normal density:

Maximum likelihood estimation; sufficient statistics (Sections 4.1-4.3 – 2 classes)

Sampling distribution of sample mean and covariance; large sample behavior (Sections 4.4-4.5 – 2 classes)

Assessing Normality/ detecting outliers/ transforming variables (Sect. 4.6-4.8 – 1 class)

Chapter 5 Inferences about Mean Vector:

Tests and Confidence Intervals (Sec. 5.1-5.5 – 2 classes)

Multivariate Quality Control Charts (Sec 5.6 – 1 class)

Missing Values and Time Dependence (Sec 5.7-5.8 – 1 class)

Chapter 6: Comparison of Several Multivariate Mean Vectors

Intro and Paired Comparisons of 2 Multiv Populations (Sec 6.1-6.3 – 1 class)

Two Independent Multivariate Populations (Sec 6.4-6.5 – 1 class)

Two-Way Multivariate. Analysis of Variance (Sec 6.6 – 1 class)

Profile Analysis (Sec 6.7 – 1 class)

Repeated Measures and Growth Curves (Sec 6.8 and 6.9 – 1 class)

Chapter 7: Multivariate Linear Regression Models

Univariate Multiple Regression (Sec 7.1-7.6 – 1 class)

Multivariate Multiple Regression(Sec 7.7 – 1 class)

Concepts of Linear Regression (Sec 7.8-7.9 – 1 class)

Multiple Regression with time dependent errors / time series (Sec 7.10 – 1 class)

Chapter 8: Principle Components

Intro and description (Sec 8.1-8.3 = 1 class)

Utility (1 class)

Chapter 9: Factor Analysis

Description (Sec 9.1-9.5 – 1 class)

Structural Equation Models (Sec 9.7 – 1 class)

Chapter 10: Canonical Correlation Analysis – 1 class

Chapter 11: Discrimination and Classification

Separation and Classification of populations (Sec 11.1-11.2, 11.6 – 1 class)

Classif with Normal populations (Sec 11.3-11.4 – 1 class)

Fisher's Discriminant Function (Sec 11.7 – 1 class)

Including Qualitative Variable/ logistic Regression – 1 class

Classification and Regression Trees – 1 class

Chapter 12: Clustering

Similarity Measures (Sec 12.1-12.2

Hierarcical Clustering Methods (Sec 12.3 – 1 class)

Multivariate Scaling (Sec 12.5 – 1 class)

Correspondence Analysis (Sec 12.6)

Data Mining (1 class)