

# STAT 714 Fall 2022 Class Schedule

Ray Bai

## Overview of Linear Models

- 8/19/22: syllabus and course overview
- 8/22/22: examples of linear models

## Review of Linear Algebra

- 8/24/22: rank, linear independence, vector spaces
- 8/26/22: Gram-Schmidt process, basis, column space and row space
- 8/29/22: nonsingular matrices, rank-nullity theorem, systems of linear equations
- 8/31/22: generalized inverses, eigenvalues, eigenvectors
- 9/2/22: spectral decomposition theorem
- 9/5/22: **Labor Day (no class)**
- 9/7/22: quadratic forms, orthogonal projections
- 9/9/22: orthogonal projections
- 9/12/22: orthogonal decompositions
- 9/14/22: orthogonal decompositions
- 9/16/22: random vectors
- 9/19/22: singular value decomposition
- 9/21/22: singular value decomposition
- 9/23/22: **Exam 1 (4:00-6:00 pm)**

## Least Squares Estimation

- 9/26/22: normal equations
- 9/28/22: geometry of the least squares estimator
- 9/30/22: orthogonal decomposition of least squares
- 10/3/22: estimability and identifiability
- 10/5/22: estimability
- 10/7/22: estimability
- 10/10/22: Gauss-Markov model and Gauss-Markov Theorem

## Gauss-Markov and Aitken Models

- 10/12/22: Gauss-Markov model and Gauss-Markov Theorem
- 10/14/22: **Fall Break (no class)**
- 10/17/22: Aitken's generalized least squares
- 10/19/22: Aitken's generalized least squares

## Distributional Theory

- 10/21/22: multivariate normal distribution
- 10/24/22: multivariate normal distribution
- 10/26/22: distributions of quadratic forms
- 10/28/22: **Exam 2 (4:00-6:00 pm)**
- 10/31/22: Cochran's Theorem, maximum likelihood estimation

## Inference in the Linear Model

- 11/2/22: confidence intervals,  $t$ -tests, prediction intervals
- 11/4/22:  $F$ -test
- 11/7/22:  $F$ -test, stochastic dominance
- 11/9/22:  $F$ -test, stochastic dominance
- 11/11/22:  $F$ -test for general linear hypotheses
- 11/14/22 (**Pt I**): likelihood ratio test

## Shrinkage Methods for Linear Regression

- 11/14/22 (**Pt II**): bias-variance trade-off
- 11/16/22: centering and scaling, ridge regression
- 11/18/22: ridge regression, subdifferential Calculus
- 11/21/21: lasso regression
- 11/23/22: **Thanksgiving holiday (no class)**
- 11/25/22: **Thanksgiving holiday (no class)**
- 11/28/22: coordinate descent algorithm
- 11/30/22: coordinate descent algorithm for lasso, adaptive lasso
- 12/2/22: elastic net, coordinate descent for elastic net
- 12/7/22: **Final Exam (12:00-3:00 pm)**