

Midterm Review

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Major Topics

1. Hypothesis testing
2. ANOVA
3. Linear regression concepts
4. Linear regression applications

Topic Details

1. Hypothesis testing
 - Setting up and interpreting hypothesis tests, P -values
 - Definitions of Type I Error, Type II Error, Power
 - Multiple testing, Bonferroni Correction
 - Calculating the bias and variance of estimators
2. ANOVA
 - Understanding the hypotheses and setting for one-way ANOVA
 - Interpreting SS_{Total} , SS_W , SS_B
 - Reading an ANOVA table
 - Why does ANOVA work?
3. Linear regression concepts
 - Model statement
 - Model assumptions
 - Interpretation of coefficients
 - Deriving the MLEs of model parameters for simple and multiple linear regression
 - Model diagnostics and remediation measures
 - Difference between correlation and causation
 - Definition and example of a confounding effect
4. Applications of Linear Regression
 - Given a real-world problem statement and data set, design an appropriate linear regression model, and identify the coefficients or hypothesis tests of interest
 - Discuss advantages and disadvantages of two candidate models for a given data set

- Given a plot or set of plots, identify potential violations of linear regression modeling assumptions and the consequences for statistical inference
- Give a real-world interpretation of a fitted model (e.g. from R output)