STATISTICS 350

Linear Models in Applied Statistics

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Text: *Applied Linear Statistical Models* by Kutner, Nachtsheim, Neter, Li (5th ed). I intend to cover Chapters 1 through 11 and selected material from Chapters 15 to 22; coverage in individual chapters will not be complete.

Course structure: There will be 3 hours per week of lectures, (2 on Monday and 1 on Wednesday). There will be regular assignments (one every two weeks roughly), two midterms and a final exam.

Web materials: In the frame at the left there are links to notes or slides; I do not yet know how much will be there. There will be links to assignment questions and eventually solutions.

Computing requirements: You will be required to do statistical computing in SAS, JMP or other statistical language. I will hold tutorials in the PC computing lab in week 2 (and possibly week 3) to show you a bit of SAS.

Grading: Assigments 15%, Midterms 35%, Final 50%.

Privacy Policy: The Stat & Act Sci department has a policy on privacy under which students who desire so may have their homework returned in some private way; if you are such a student you should speak to me immediately.

Course Coverage:

1. Linear models: Definition, simple and multiple linear regression models, ANOVA models. Incorporating different types of predictor variables and their interactions in the model. Matrix notation.

2. Estimation methods: Least-squares, maximum likelihood. Algebraic and geometrical interpretations.

3. Properties of least-squares estimators: Mean, variance, and covariance of least-squares estimators. Expected value of residual sum of squares.

4. Diagnostic tools: Residual plots, multicollinearity, outliers, influential observations, goodness-of-fit tests.

5. Inference: Interpretation of the parameter estimates. Hypothesis tests, p-values, confidence intervals, prediction and intervals. Inferences for a linear function of the regression coefficients.

6. General Linear Hypotheses: Additional sum of squares principle. Test for lack of fit based on the pure error sum of squares.

7. Model selection: Effect of the question of interest on the choice of model, difficulties in model selection due to multicollinearity. Automatic variable selection procedures, warnings and recommendations.

8. Special methods for ANOVA models: Linear constraints. Factor and interaction plots. Multiple comparison procedures.

9. Introduction to weighted least-squares and generalized linear models.