

Course Information

Course: Advanced Statistical Methods, PSTAT 220A, Fall 1998.

Instructor: Yuedong Wang, South Hall, Room 5509. Phone: 893-4870. E-mail: yuedong@pstat.ucsb.edu. Web: <http://www.pstat.ucsb.edu/~yuedong>.

Time: MWF 2:00 - 2:50

Place: Girvetz Hall 1108

Office hour: MW 11:00 - 12:00, or by prior appointment

Purpose of this class: This is the first quarter of the one year graduate course 220ABC on *applied* statistical methods. The aim is to develop analytical skill for the statistical analysis of data, with emphasis on the basis for the methods, the implementation of the methods, and report writing. We will be using S-Plus and SAS throughout the year to demonstrate how these methods work.

Topics: Descriptive statistics, numerical and graphical data summaries, statistical models, density estimation, basic design and tests, simulation and bootstrap, linear model, regression, experimental design, ANOVA, linear mixed effects models.

Prerequisites: Pstat 120ABC, or consent of instructor.

Text: available at Ucen Book store. All these books and the additional reference are reserved in the library.

VR Venables, W. N. and Ripley, B. D. (1997), *Modern Applied Statistics with S-Plus*, 2nd ed, Springer.

YA Yandell, B. S. (1997), *Practical Data Analysis for Designed Experiments*, Chapman and Hall.

Additional Reference:

AG Agresti, A. (1984), *Analysis of Ordinal Categorical Data*, Wiley.

BH Box, G. E. P., Hunter, W. G. and Hunter, J. S. (1978), *Statistics for Experimenters*, Wiley.

DA Davidian, M. (1995), *Nonlinear models for repeated measurement data*. Chapman and Hall.

MJ Milliken, G. A., Johnson. D. E. (1984), *Analysis of messy data*, Lifetime Learning.

SE Seber, G. A. F. (1977), *Linear Regression Analysis*, Wiley.

Course Grading: Homework, projects, mid-quarter test, final exam.

PSTAT 220ABC Outline

A S-Plus (VR ch1-ch4), SAS

A Statistical models

A Summary statistics (VR ch5)

- numerical: mean, median, quantile, variance etc.
- graphical: histogram, stem-and-leaf, box, QQ, kernel density smoother, etc.

A basic tests: t, F, Wilcoxon, chi-squared (AG ch1-ch4), permutation, bootstrap (VR ch5)

A Linear models (SE ch3-ch6, VR ch6, YA ch12)

- regression (SE ch7-ch8)
- ANOVA (SE ch9, YA Part A - Part E, BH)
- ANCOVA (SE ch10, YA Part F)

A Linear mixed models: random effects, mixed effects, split-plot, repeated measures (VR ch10, YA Part G - Part H, DA)

B Generalized linear models including log-linear models (VR ch7, MN)

B Nonlinear regression models, general optimization and MLE (VR ch10, BW)

B Modern regression models (VR ch 11, HT)

- scatterplot smoothing: kernel, regression spline, smoothing spline, loess
- additive models and generalized additive models, loess

C Multivariate analysis: PCA, CCA, discrimination, cluster analysis (VR ch13, MK)

C Survival analysis: Kaplan-Meier, Nelson, log rank test, parametric models, accelerate life models, Cox regression model (VR ch12, handouts)

ABC Other topics include tree method (VR ch14), neural works (VR ch 17), wavelet, robust methods (VR ch 8), missing data, error in variable, if we have time

Books for 220B and 220C:

MN McCullagh, P. and Nelder, J. A. (1989), *Generalized Linear Models*, Chapman and Hall.

BW Bates, D. M. and Watts, D. G. (1988), *Nonlinear Regression Analysis and its Applications*. Wiley.

HT Hastie, T. and Tibshirani, R. (1990), *Generalized Additive Models*, Chapman and Hall.

MK Mardia, K. V., Kent J. T. and Bibby, J. M. (1979), *Multivariate Analysis*, Academic Press.