BIOSTAT/STAT 576
Statistical Methods for Survival Data

TuTh 9:00am - 10:20am, Spring 2009; HSB I-132

- **Instructor**:
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Office hour: 9:00am - 10:00am, HSB F-646

- **Course Web Site**:
http://www.scharp.org/users/yqchen/teach.html

- **Course Description**:
This course introduces statistical methods for censored survival data arising from clinical and epidemiological studies. The topics include parametric methods, Kaplan-Meier estimator and NPMLE, comparison of survival curves and log-rank test, regression models and the Cox proportional hazards model. Additional topics include residual time analysis, multivariate survival time analysis, competing risks and study designs. This course is intended for biostatistics graduate students and other students with comparable statistical training.

- **Course Evaluation**:
Students will be evaluated on the basis of 8 problem sets (40%), 1 mid-term exam (30%) and 1 final take-home exam (30%). Students are encouraged to use any statistical softwares to do the problem sets.

- **Textbooks:**

Fleming and Harrington (1991) *Counting Processes and Survival Analysis*, Wiley.

Kalbfleisch and Prentice (2002) *The Statistical Analysis of Failure Time Data, 2nd Ed.*, Wiley.

- **References:**

Andersen, Borgan, Gill and Keiding (1993) *Statistical Models Based on Counting Processes*, Springer.

Bickel, Klaassen, Ritov and Wellner (1993) *Efficient and Adaptive Estimation for Semiparametric Models*, JHU/Springer.

Cox and Oakes (1984) *Analysis of Survival Data*, Chapman and Hall.

Miller (1981) *Survival Analysis*, Wiley.

Tsiatis (2006) *Semiparametric Theory and Missing Data*, Springer.

Shorack and Wellner (1986) *Empirical Processes with Applications to Statistics*, Wiley.

Therneau and Grambsch (2000) *Modeling Survival Data: Extending the Cox Model*, Springer.

van der Vaart and Wellner (1996) *Weak Convergence and Empirical Processes, with Applications to Statistics*, Springer.

- **Course Calendar:**
  - March 31: First in-class instruction; Problem Set 1 assigned
  - April 7: Problem Set 1 due; Problem Set 2 assigned
  - April 14: Problem Set 2 due; Problem Set 3 assigned
  - April 21: Problem Set 3 due; Problem Set 4 assigned
  - April 28: Problem Set 4 due; Problem Set 5 assigned
  - May 5: Problem Set 5 due; Mid-term in-class exam
  - May 12: Problem Set 6 assigned
  - May 19: Problem Set 6 due; Problem Set 7 assigned
  - May 26: Problem Set 7 due; Problem Set 8 assigned
  - May 28: Last in-class instruction
  - June 2: Problem Set 8 due; Final take-home exam assigned
  - June 5: Final exam due
  - June 9: Final exam returned, Grades assigned

- **Course Syllabus**

  1. Background
     (a) A brief history of time-to-event analysis
     (b) Time-to-event and censoring
     (c) Life tables
     (d) Counting processes and martingale theory
  2. Parametric methods
     (a) Parametric distributions
     (b) Likelihood functions and MLE
  3. Kaplan-Meier curve and nonparametric MLE
  4. Comparing survival curves
  5. Regression methods
     (a) Proportional hazards model
     (b) Accelerated failure time model
     (c) Alternative regression models
  6. Multivariate survival time analysis
  7. Special topics
     (a) Residual time analysis
     (b) Competing risks
     (c) Study designs
     (d) Bayesian survival analysis (Guest Lecture by Professor Elizabeth Brown)