

STT 890-2: Introduction to Statistical Genetics
Fall 2007 (3 credits)

Time: M-W-F, 10:20 – 11:10 AM

Place: C-315 Wells Hall

Instructor: Yuehua Cui
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Office Hours: Thursday 2:00 - 4:00, or by appointment.

Text: Lecture notes will be made available.

Prerequisite: STT862, STT442 or equivalent

Basic skills necessary for this course: Calculus; Basic probability distribution theory; Regression analysis; Maximum likelihood; Computer software (e.g., S-plus/R, SAS, C/C++, or Matlab); Familiarity with basic genetics is desirable.

Course objective

The course is designed for Master and Ph.D. students in statistics, human, plant and animal biology, and other biological and life sciences. Students will learn advanced techniques of modern statistical methods for genetic data analysis, and can do basic research and data analysis in the field after taking the class.

Course description

The course will introduce basic probabilistic and statistical methods in analyzing genetic data arising from plant, animal and human studies. It will cover fundamental concepts and theories as well as applications to real and simulated data. Topics include but are not limited to: basic genetic concepts, Mendel's law, Hardy-Weinberg equilibrium; linkage and linkage disequilibrium (LD) analysis of quantitative traits; joint linkage and LD mapping; QTL mapping methods include single marker analysis, interval and composite interval mapping; functional QTL mapping of dynamic/longitudinal traits; Single Nucleotide Polymorphism (SNP) data analyses include single SNP and haplotype based analyses; QTL mapping of gene expression profiles.

References:

1. *Statistical Genetics of Quantitative Traits: Linkage, Map and QTL* by Rongling Wu, Chang-Xiang Ma and George Casella, Springer-Verlag, New York

2. *Mathematical and Statistical Methods for Genetic Analysis* by Kenneth Lange, Springer-Verlag, New York
3. *Genetics and Analysis of Quantitative Traits* by Michael Lynch, Bruce Walsh, Sinauer Assoc.
4. *Analysis of Human Genetic Linkage* by Jurg Ott Johns Hopkins Univ. Pr.

Grading

- 40% Homework
- 60% Research project
 - Class presentation (20%)
 - Written report (40%)

Research Project

The instructor will conceive of multiple problems related to the topic of this course. Students can work singly or as a group. ***Each student/group will choose one of the problems as their final projects.*** Students with different backgrounds are encouraged to work together. Different students/groups may choose the same problem, but they should accomplish their projects independently.

Alternatively, ***students are also strongly encouraged to base their class projects on one of their own problems (if any).*** But they should consult with the instructor first.

Format of written reports

Follow the format of a refereed journal, e.g., *Genetics* or *Biometrics*.

- Introduction
- Statistical Models and Methods
- Results
- Discussion
- References

Page limit: ≤ 20 double-spaced pages (including tables, figures and references)

Important Dates for Fall, 2007

- 8/27 First day of classes
- 9/3/07 Labor Day, University closed
- 8/31/07 Close of free add period for fall
- 9/20 End of 100% refund
- 10/16/07 Middle of Semester
- Nov 22, 23 Thanksgiving Holiday, University Closed
- December 7 Last Day of Classes