

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

**Time:** M-W-F, 10:20 – 11:10

**Place:** C-315 Wells Hall

**Instructor:** Yuehua Cui  
A411 Wells Hall  
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**Office Hours:** Thursday 2:00 - 4:00, or by appointment.

**Text:** No text book is required. 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., R, SAS, C, or Matlab); Familiarity with basic genetics is desirable.

**Course objective**

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

**Course description**

The course will introduce probabilistic and statistical methods in analyzing genetic data arising from plant, animal and human studies. Topics include basic genetic terms and 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, composite and multiple 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. *Mathematical and Statistical Methods for Genetic Analysis* by Kenneth Lange, Springer-Verlag, New York
2. *Statistical Genetics of Quantitative Traits: Linkage, Map and QTL* by Rongling Wu, Chang-Xiang Ma and George Casella, 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. Many of these problems are from the instructor's current research projects and, therefore, can possibly reach a publishing level. Students can work singly or as a group. ***Each student/group will choose one of the problems as their final projects.*** 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:  $\leq 20$  double-spaced pages (including tables, figures and references)

**Tentative Schedule** (will be announced later, check the course website for update)