STAT 689

Special Topics in Advanced Statistical Genetics

Instructor: Ruzong Fan, Spring 2005, Blocker 411

Credits, Class Periods: 3 credits; MW 9:00AM-10:15AM.

Description

This is a continuing course of **Stat 689 Special Topics in Statistical Genetics**. It intends for Ph.D students with advanced knowledge of statistics, genetics, and better mathematical preparation. The advanced materials of statistical genetics will be taken from Lange (2002) Mathematical and Statistical Methods for Genetic Analysis, 2nd edition, Springer. Moreover, the latest articles from journals such as American Journal of Human Genetics, Nature, Nature Genetics, and Science will be used to catch up with the latest development. Research topics of statistical genetics will be introduced for students to fit their interests and possibly lead to their dissertation topics.

Prerequisites

Stat 610, 611, 689

Course Outline

1. Basic principles of population genetics
2. Counting methods and the EM algorithm
3. Newton's method and scoring in genetics
4. Hypothesis testing and categorical data
5. Genetic identity coefficients
6. Applications of identity coefficients
7. Descent graph methods
8. Molecular phylogeny
9. Models of recombination
10. Sequence analysis
11. Poisson Approximation

12. Diffusion processes

13. Linkage disequilibrium mapping of quantitative trait loci

Instructional Objectives

After taking this class, students will have advanced knowledge of modern statistical methods for genetic study, and can start to do research in the field.

Evaluation Methods of the Course

Minimum requirements for a grade A: (1) Attend class regularly; (2) Do two problems with CORRECT SOLUTION for each class, i.e., four problems with CORRECT SOLUTION each week. To be safe for a grade A, it is better to finish as many problems as possible! Of course, students are expected to work seriously on each problem which they choose. Students may choose problems from the problem list at the end of each chapter. Instructor does not specify which problems to choose for students, but he expect that students to choose the problems that the instructor himself has not had a solution yet! Homework problems count 100%) for grade, no project, no exam! Homework due in every two week circle!

Relationship of the Course to Other Courses

This is a continuing course of Stat 689 Special Topics in Statistical Genetics

Relationship of the Course to Major, Minor, or Option

N/A – See above.

Consultation with Other Departments and Academic Support Units

Technology Needs

Student must have a pocket calculator, access to a modern computer which may run genetic software such as GENEHUNTER and MENDEL (e.g. Unix Sunstation), and TDT/S-TDT (Microsoft)

Frequency of Offering and Enrollment

Once every two years

Effective date

January 2003