Instructors
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Time and Location
1:00 – 3:15pm Tuesdays (including a 15-minutes break), 327 Thomas Building

Office Hours
By appointment

Web site
http://statgen.psu.edu/course.html

Mission
With the recent development of molecular biotechnologies and instruments, genetic and genomic data can now be generated from any organism almost with no limits. Statistical genetics, aimed to provide effective and efficient analyses and utilization of these data, has thus become one of the hottest, most active and most promising areas of statistics. The students in this course will receive the most rigorous training at the interplay between statistics and genetics. Statistical students will be fascinated by many latest genetic discoveries in life sciences and motivated to solve genetic mysteries with their quantitative skills. Biological students will find it helpful for learning statistical and computational details to facilitate genetic data analyses and result interpretations. This course will also provide a forum for statistical and biological students to exchange their ideas, problems, and thoughts in a free, stimulating atmosphere.

Textbook

Topics Covered
1. Basic concepts in genetics
2. Mendelian segregation
3. Linkage analysis and map construction
4. Quantitative genetics
5. QTL mapping: regression analysis
6. QTL mapping: Maximum likelihood
7. QTL mapping: Bayesian approach (if time permits)
8. Linkage disequilibrium analysis in natural populations
9. Joint linkage and linkage disequilibrium analysis of QTLs
10. Functional mapping
11. Genome-wide association studies in a case-control design
12. Microarray data analysis
13. Marriage of statistical genetics and systems biology

Grading
30% Homework (one per two weeks)
70% Research project
  • Class presentation (20%)
  • Written report (50%)

Research Project
The instructor will conceive of multiple problems related to the topic of this course. Many of these problems are from the instructors' current research projects and, therefore, can reach a publishing level. Each student will choose one of these problems as his/her final project. Different students may choose the same problem, but they should accomplish their projects independently.

Alternatively, the students are also strongly encouraged to base their class projects on one of their own problems (if any). However, for this option, the students should obtain advice from the instructor.

This course will enjoy every new and innovative idea each individual student may have.

Attendance
Attendance is required unless you obtain permission from the instructor.

Basic Skills Necessary for This Course
Calculus
Regression analysis
Maximum likelihood
Bayesian statistics (desirable)
Computer software (e.g., SAS, R, Matlab)
Familiarity with basic genetics is desirable

Format of Written Reports
Follow the format of a refereed journal, e.g., Genetics or Biometrics;
  - Introduction
  - Statistical Models
  - Results
  - Discussion
- References

Page limit: ≤ 20 double-spaced pages (excluding tables and figures)

The final project report is due April 30, 2010, 5:00 pm