

STAT 536 - Statistics for Population Genetics

Syllabus

Lecture	TR 3:40 - 5:00 pm
Location	Molecular Biology Building (MBB) 1428
Webpage	http://rumi.gdcb.iastate.edu/wiki/stat536
Final Exam	Fri. Dec. 19 12:00 - 2:00 pm
Instructor	Karin S. Dorman
Office	Science II 534
Phone	(515)294-6078
Email	kdorman@iastate.edu

Stat 536. Statistics for Population Genetics.

(Cross-listed with GDCB). (3-0) Cr. 3. Alt. F., offered 2008. *Pre-req: 401, 447; Gen 320 or Biol 313.* Statistical models for population genetics covering: selection, mutation, migration, population structure, and linkage disequilibrium. Applications to gene mapping (case-control, TDT), inference about population structure, DNA and protein sequence analysis, and forensic and paternity identification.

Course Outline

Introduction to genetics and statistics.

Genetic variation in populations. Allele frequency estimation. Tests of disequilibrium.

Theoretical models and estimation of selection, mutation, migration, genetic drift, population structure.

Molecular population genetics: neutral theory, rates of divergence, molecular clock, selection, phylogenetics.

Theory and estimation for quantitative traits.

Advanced topics: diffusion theory, coalescent theory, challenges of genome-wide analysis.

Textbook

There will be no required textbook for this course. Some recommended texts are:

Principles of Population Genetics by Hartl and Clark. A popular, even classic, undergraduate-level introduction to population genetics.

Population Genetics: A Concise Guide by Gillespie. A highly lauded, compact, graduate-level primer to population genetics.

Genetic Data Analysis II by Weir. A popular graduate-level introduction to statistical genetics by a preeminent statistical geneticist.

Mathematical and Statistical Methods for Genetic Analysis by Lange. A mathematically heavy, but highly recommended treatment of statistical genetics.

Mathematical Population Genetics by Ewens. For the mathematically sophisticated reader.

Other textbooks in the field:

Statistical Methods in Genetic Epidemiology by Thomas. A focus on the effects of genes and environment on human disease.

A Statistical Approach to Genetic Epidemiology by Ziegler and König. Similar to above.

Statistical Genomics: Linkage, Mapping, and QTL Analysis by Liu. A focus on gene mapping.

Homework

You are encouraged to work together on the homework, but you are to *independently* write up the solutions and no two solutions should be identical. If you work with others on homework, please list the participants on the document you submit. Occasionally, I will assign slightly more involved homework assignments, which I call projects. You are required to work independently on projects.

Grading

Homework/Projects 50%

Class Participation 10% (you are encouraged to collaborate online and in class)

Exams 40% (equal weight of 20% to midterm and final)

Special Needs

Please address any special needs or special accommodations with me at the beginning of the semester or as soon as you become aware of your needs. Those seeking accommodations based on disabilities should obtain a Student Academic Accommodation Request (SAAR) form from the Disability Resources (DR) office (515-294-6624). DR is located on the main floor of the Student Services Building, Room 1076.

August 26, 2008