BIOSTAT 664 (Winter, 2014)
Statistical methods in genetic association studies

Instructor: Seunggeun (Shawn) Lee; Office: M4148; E-Mail: leeshawn@umich.edu.

Time and Place: M/W 11:30-1:00PM, 1138 SPH2
Office Hours: Will be set by the 2nd day of class

Pre-requisite:
Students should have basic knowledge in probability and statistics at the level of BOSTAT 601 and 602, and some experience on R.

Course Readings:
Optional textbooks:


Papers for reading will be posted on CTools.

Grading:
Four assignments 40%
One paper review and presentation 20%
Final project 30%
Class participation and in-class discussion 10%

Course Description:
This course will focus on providing statistical and mathematical background of popular methods in genetic association studies, and first hand experience to use them in data analysis. The topics include statistical tests for a single variant, population stratification adjustment, multiple test adjustment, gene- or region-based multiple variants tests for rare variants, meta-analysis and heritability and risk estimation. The course is aimed at Biostatistics students with an interest in statistical genetics. After taking this course, students will have the experience and skills to develop and apply statistical methods to large-scale genetic data.

Paper Review:
Each student should review a paper and give a presentation during the course. The papers can be selected from a given list of papers or outside the list given the permission from the instructors. You will read the paper critically and write up a review report of up to 2 pages.
In the report you should introduce the problem, summarize the contribution of the paper and point out any possible limitations or flaws that you found in the paper. You will also present your paper review to the class. The presentation should be 20~25 minutes followed by 5 minutes Q&A.

Class Projects:
Each student will pick a certain problem of interest, develop a model for the problem, perform the analysis and write up a report. The final report should contain a brief introduction that gives the background of your problem, a detailed description of the model and methods you used, analysis of results and a conclusion summarizing what you have learned from this study, with a limit of 10 pages including tables and figures. The final report will be graded based on (1) clarity of presentation, (2) thoughtfulness of model and methods, (3) creativity. Alternatively, with the permission from the instructors, you can pick a certain topic of interest, do a detailed survey of literatures around that topic and write up a final report.

Competencies covered in this course
Core Competencies:
- Describe preferred methodological alternatives to commonly used statistical methods when assumptions are not met.
- Distinguish among the different measurement scales and the implications for selection of statistical methods to be used based on these distinctions.
- Apply descriptive techniques commonly used to summarize public health data.
- Apply common statistical methods for inference.
- Apply descriptive and inferential methodologies according to the type of study design for answering a particular research question.
- Interpret results of statistical analyses found in public health studies.

Biostatistics:
- Develop knowledge to communicate and collaborate effectively with scientists in a variety of health-related disciplines to which biostatistics are applied (e.g. public health, medicine, genetics, biology; psychology; economics; management and policy).
- Become well-versed in the application of core statistical techniques (biostatistical inference, linear regression, generalized linear models, nonparametric statistical methods, linear mixed models) and 4-5 selected statistical specialization techniques.
- Select appropriate techniques and apply them to the processing of data from health studies.
- Interpret the results of statistical analysis and convert them into a language understandable to the broad statistical community.
- Develop written and oral presentation skills and other scientific reporting skills, based on statistical analyses for public health, medical and basic scientists and educated lay audiences.

Academic Integrity:
The faculty of the School of Public Health believes that the conduct of a student registered or taking courses in the School should be consistent with that of a professional person. Courtesy, honesty, and respect should be shown by students toward faculty members, guest lecturers, administrative support staff, and fellow students. Similarly, students should expect faculty to treat them fairly, showing respect for their ideas and opinions and striving to help them achieve maximum benefits from their experience in the School. Student academic misconduct refers to behavior that may include plagiarism, cheating, fabrication, falsification of records or official documents, intentional misuse of equipment or materials (including library materials), and aiding and abetting the perpetration of such acts. The preparation of reports, papers, and examinations, assigned on an individual basis, must represent each student own effort. Reference sources should be indicated clearly. The use of assistance from other students or aids of any kind during a written examination, except when the use of aids such as electronic devices, books or notes has been approved by an instructor, is a violation of the standard of academic conduct (Standard of Academic Conduct, University of Michigan School of Public Health).