Syllabus
MAT752: Statistical Ranking, Selection, and Multiple Comparisons


Instructor: Professor Pinyuen Chen, pinchen@syr.edu, x-1577.

Office Hours: Mondays, Tuesdays, Wednesdays 1 pm – 2 pm.

Objectives: Ranking and Selection theory was developed in 1950’s to provide experimenters
with statistical formulations for solving real world problems that had been previously
inappropriately handled by methods in hypothesis testing (of homogeneity.) It rapidly gained
recognition as an alternative approach to multiple hypotheses testing. In the last two decades, we
observed the successes of applications of ranking and selection procedures to signal processing,
pharmaceutical sciences, clinical trials, quality control, biology, environmental science and
forestry, educational and psychological measurements, etc. In the first half of the course, we will
review the fundamental approaches of ranking and selection theory. In the second half, we study
several recent modifications of the traditional ranking and selection approaches that were made
to fit respective applications. By the end of the semester, students will (1) be familiar with the
basic tools used in ranking and selection theory and (2) be ready to apply selection theory to
practical problems as well as to the research in their own disciplines.

Prerequisites: A mathematical statistics course and two semesters of calculus.

Textbooks: Both books can be read online at books.google.com:
1. Selecting and Ordering Populations: A New Statistical Methodology, written by Jean
   Dickinson Gibbons, Ingram Olkin, Milton Sobel, published by Society for Industrial and
2. Multiple Decision Procedures: Theory and Methodology of Selecting and Ranking
   Populations, written by Shanti S. Gupta, S. Panchapakesan, published by Society for

Grade: Midterm Presentation 40% + Final Project Presentation 60%.

Course Outline:

I. Fundamentals: (4 weeks)
   1. Philosophy of Ranking and Selection: Chapter 1 of GOS (Gibbons, Olkin, and Sobel
      (1999)).
   2. Selecting the Best Normal Population with Indifference Zone Approach: Chapters 2 & 5
      of GOS + Chapter 2 of GP (Gupta and Panchapakesan (2002)).
   3. Subset Selection Approach and an Alternative Definition of A Correct Selection: Chapter
      1 of GOS + Chapter 11 of GP.
   4. Selecting the best Bernoulli population: Chapter 4 of GOS + Chapter 4 of GP.
5. Selecting among multinomial cells: Chapter 6 of GOS + Section 4.9 and Section 13.6 of GP.
6. Nonparametric Selection: Chapter 7 of GOS.

II. Midterm Presentations by Students (4-5 weeks): Each student chooses an article from the list below or an article related to selection theory, study it, discuss the article with the instructor, and present it to the class.

Selection problems for Normal Populations:

Selection problems for binomial and multinomial populations:

**Nonparametric Selection:**
Selection Problems for Multivariate Populations:

III. Applications to clinical trials: (1-2 weeks)
1. Two-Stage Selection/Testing procedures.
2. Exact and curtailments for Bernoulli Selection/Testing.

IV. Applications to Signal Processing: (1-2 weeks)
1. Non-homogeneity Detection.
2. Number of Signals.
3. Selecting of the Principal Components.

V. Final Project Presentation: (4-5 weeks)
Each student shall choose his/her own topic to work on and discuss the project with the instructor as frequently as possible. The project could be in theory or in application as long as it is related to ranking and selection theory. Each student shall present his/her project in class at the end of the semester.

Students with disabilities. If you believe that you need academic adjustments (accommodations) for a disability, please contact the Office of Disability Services (ODS), [http://disabilityservices.syr.edu](http://disabilityservices.syr.edu), located in Room 309 of 804 University Avenue, or call (315) 443-4498 or TDD: (315) 443-1371 for an appointment to discuss your needs and the process for requesting academic adjustments. ODS is responsible for coordinating disability-related academic adjustments and will issue students with documented Disabilities Accommodation
Authorization Letters, as appropriate. Since academic adjustments may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

Related link: http://disabilityservices.syr.edu/faculty-staff/syllabus-statement/

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For more information and the complete policy, see http://class.syr.edu/academic-integrity/

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Related link: http://supolicies.syr.edu/studs/religious_observance.htm

**Cell Phones.** Cell phones should be turned off and put away during class.