Course Syllabus

STAT/BIOST 425:
Introduction to Nonparametric Statistics

Winter 2023

Instructor: Yen-Chi Chen
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Office hours: TBD

Course Website:

On Canvas:

Class Schedule: There will be three sessions a week:

- Tuesday and Thursday, 3:30-4:50 PM, MGH 058

Course Overview: This is an advanced introduction to nonparametric statistics course. It is designed to be a very theoretical course. We will use concepts from calculus, linear algebra, and probability theory very often. We will cover the classical nonparametric tests, modern smoothing techniques, and statistical learning theory (theory for many machine learning algorithms).

Course Content: We will cover three important topics in nonparametric statistics–

- **Classical nonparametrics**: rank test, permutation test, KS-test, tests for trends, tests for contingency tables, empirical distribution function, and Kaplan-Meier estimator.
- **Nonparametric smoothing**: kernel estimators, histogram-type estimators, basis approaches, penalized estimators for density estimation, regression, and classification.
- **Statistical learning**: bias-variance tradeoff theory, normal means problem, concentration inequalities, empirical risk minimization, and model selection.

Prerequisites: You need to be familiar with calculus. I expect you to know basic concepts in probability and mathematical statistics (contents in STAT 340 or STAT 394-395), which include: random variables, Normal/Exponential/Uniform random variables, Bernoulli/Binomial/Poisson random variables, estimators, expected value, bias, variance, consistency, convergence in distribution/probability, confidence interval, hypothesis test, p-value, linear regression (and the inferences of parameters), law of large number, central limit theorem. If you are not familiar with some of them, please try to understand them as soon as possible.

Grades: You grades come from three parts: weekly homework assignments (40%), midterm exam (30%), and a final exam (30%)

Format of HWs: There will be 9 homework assignments (each worth 5%); the lowest one will be dropped. It will be out Thursday night and be due at the end of the next Wednesday (23:59:59). Homework turned in late will receive 0 points. You need to submit your answers in the format of PDF file that is typed by \texttt{\LaTeX} or \texttt{R-markdown} and upload them to the Canvas.

Course Textbook: In the first few weeks, we will use materials from the following two books

- Introduction to Modern Nonparametric Statistics. by J. J. Higgins, Duxbury (Thomson)
- All of Nonparametric Statistics. by Larry Wasserman, Springer

Useful Reading: I will recommend the following book

- Applied Nonparametric Statistical Methods. by Peter Sprent, Springer

Academic Integrity: Students at the University of Washington (UW) are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity. The UW School of Public Health (SPH) is committed to upholding standards of academic integrity consistent with the academic and professional communities of which it is a part. Plagiarism, cheating, and other misconduct are serious violations of
the University of Washington Student Conduct Code (WAC 478-121)\(^1\). We expect you to know and follow the university's policies on cheating and plagiarism, and the SPH Academic Integrity Policy\(^2\). Any suspected cases of academic misconduct will be handled according to University of Washington regulations. For more information, see the University of Washington Community Standards and Student Conduct\(^3\).

**Access and Accommodations:** Your experience in this class is important to me. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. If you have already established accommodations with Disability Resources for Students (DRS), please activate your accommodations via myDRS so we can discuss how they will be implemented in this course. If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), contact DRS directly to set up an Access Plan. DRS facilitates the interactive process that establishes reasonable accommodations. Contact DRS at disability.uw.edu.

**Religious Accommodations:** Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UWs policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy\(^4\). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form\(^5\).

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\(^1\)https://apps.leg.wa.gov/WAC/default.aspx?cite=478-121  
\(^2\)https://sph.washington.edu/students/academic-integrity-policy  
\(^3\)https://www.washington.edu/cssc/  
\(^4\)https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/  
\(^5\)https://registrar.washington.edu/students/religious-accommodations-request/