

STAT 824 sp 2023 Nonparametric Inference

1:15 PM - 2:30 pm, TR, LeConte College 107
Jan 9th - May 3rd, 2023

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This course in *nonparametric inference* is designed to introduce statistics graduate students in their second year (or beyond) to some important topics in nonparametric statistics, such as density estimation, nonparametric regression, and bootstrapping. The course will focus on theory, practice, and computation.

Prerequisites

STAT 713 or consent of instructor.

Overview of topics

1. Density estimation: Estimating the cdf, kernel density estimation, Lipschitz and Hölder classes of densities, bounds on the MSE of kernel density estimators, bounds on the mean integrated squared error (MISE) of kernel density estimators, multivariate kernel density estimation, the “curse of dimensionality”.
2. Nonparametric regression: Nadaraya-Watson estimator, local polynomial estimator, least-squares splines, penalized splines and trend filtering, additive model, sparse additive model.
3. Bootstrap: Bootstrap for the mean, Edgeworth expansion and second-order correctness of the bootstrap, bootstrap for statistical functionals, bootstrap for linear regression, bootstrap in nonparametric regression.
4. Rank-based methods: Wilcoxon rank-sum test, some asymptotics for rank-based tests.

Textbook

There is no required textbook. Complete notes will be posted at the [course website](#). Some sources are:

1. Tsybakov, A. B. (2008). Introduction to nonparametric estimation. Springer Science & Business Media.
2. Wasserman, L. (2006). All of nonparametric statistics. Springer Science & Business Media.
3. Györfi, L., Kohler, M., Krzyzak, A., & Walk, H. (2006). A distribution-free theory of nonparametric regression. Springer Science & Business Media.

4. Ruppert, D., Wand, M. P., & Carroll, R. J. (2003). Semiparametric regression (No. 12). Cambridge university press.
5. Athreya, K. B., & Lahiri, S. N. (2006). Measure theory and probability theory. Springer Science & Business Media.
6. Hall, P. (2013). The bootstrap and Edgeworth expansion. Springer Science & Business Media.
7. Serfling, R. J. (2009). Approximation theorems of mathematical statistics (Vol. 162). John Wiley & Sons.
8. Pratt, J. W., & Gibbons, J. D. (2012). Concepts of nonparametric theory. Springer Science & Business Media.

Grading

The graded components of the course are the following:

Homework (50%) There will be 5 or 6 homework assignments. Homework will be submitted on Blackboard. All homework assignments must be typed in \LaTeX or in R Markdown.

Final Project (50%): Will be completed in phases and will culminate in a written report and a 15-minute presentation to the class.

The thresholds 90%, 87%, 80%, 77%, 70%, 67%, and 60% will be used to determine the assignment of the letter grades A, B+, B, C+, C, D+, and D, respectively. The grade of F will be assigned to those earning less than 60%.

Honor code

See the Carolinian Creed in the Carolina Community: Student Handbook & Policy Guide. Violations of the USC Honor Code may result in a 0 for the work in question, and, in accordance with University policy, other punishments up to and including expulsion from the University.

Accommodations

If you require special accommodations, they must be arranged in advance through the Office of Student Disability Services Close-Hipp, Suite 102. (803-777-6142, SADRC@mailbox.sc.edu).