Department of Economics
Syracuse University

ECN 720
Spring 2019

# Topics in Econometrics: Nonparametric Econometrics

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| Lectures: | F, 2:15pm – 5:00pm, Eggers 111 |
| Instructor: | Prof. Yoonseok Lee (Eggers 426, `ylee41@maxwell.syr.edu`) |
| Office Hours: | by appointment |

## Course Description

This is a graduate level topics course in econometric theory. The pre-requisites are ECN 620, ECN 621, and ECN 622 (or their equivalents). Solid knowledge of linear algebra as well as graduate level of statistics and econometrics is essential.

This course covers the statistical foundation of the nonparametric and semiparametric models in econometrics. The course involves a development of the asymptotic distribution theory in depth. Selected current research topics are also covered depending on time and interest.

The class web page is available at `http://blackboard.syr.edu`. Announcements and additional course materials are to be posted there, so make sure to visit the site frequently. Hard copies of these materials will *not* be distributed.

## Course Requirements

The requirement of this course is an original research prospectus (50%), presentations (25%), and referee reports (25%). Topics on the research prospectus should be on econometric theory; but topics on applied econometrics are allowed if the methodological contribution is significant enough−it should include not only a solid economic theory but also advanced econometrics tools with detailed data description. During the semester, students are encouraged to discuss about their research prospectus topics with me.

**Presentation (25%):** Students have reading assignments and make presentations summarizing them. The slide of each presentation should be shared in the class.

**Referee Report (25%):** Students are required to participate Econometrics Lunch Seminars and submit a short report for each paper/presentation including the following contents (no more than 2 pages long): (i) What is the main model and the key parameter(s) of interest? (ii) What is the main contribution or the novel idea? (iii) Where this idea/model can be applied? (iv) Which part(s) can be potentially improved and how? Each report should be submitted by the following Thursday night via E-mail.

**Prospectus (50%):** Each student write up a research prospectus; one can prepare a paper/draft instead of the prospectus, which could be used for the econometrics-field paper requirement as well. The complete prospectus or the first draft of the paper should be submitted by *5:00pm, Wednesday, May 8, 2019 via E-mail*.

## References

The main reading assignments are based on:

Li, Q. and J. Racine (2007). *Nonparametric Econometrics: Theory and Practice*, Princeton University Press.

The following references will be frequently cited during the lecture as well.

General Econometric/Asymptotic Theory

Amemiya, T. (1985). *Advanced Econometrics*, Harvard University Press.

Billingsley, P. (1995). *Probability and Measure*, 3rd ed., Wiley-Interscience.

van der Vaart, A.W. (2000). *Asymptotic Statistics*, Cambridge University Press.

White, H. (2001). *Asymptotic Theory for Econometricians*, rev. ed., Academic Press.

Nonparametric Econometrics

Härdle, W., and O. Linton (1994). Applied Nonparametric Methods, *Handbook of Econometrics*,[1] R. Engel and D. McFadden eds., Vol. 4, p. 2295-2339.

Härdle, W., M. Müller, S. Sperlich, and A. Werwatz (2004). *Nonparametric and Semiparametric Models*, Springer.

Pagan, A. and A. Ullah (1999). *Nonparametric Econometrics*, Cambridge University Press.

Powell, J. (1994). Estimation of Semiparametric Models, *Handbook of Econometrics*, R. Engel and D. McFadden eds., Vol. 4, p. 2443-2521.

## Course Outline

**I. Review of Basics** *(if needed)*

1. Review of Probability and Asymptotic Theory
2. Review of Extremum-Estimators (Nonlinear Models)

**II. Kernel Density Estimation**

1. Kernel Density Estimator and Its Statistical Properties
2. Bandwidth Parameter Choice
3. Additional Topics: Distribution Function Estimation; Testing Hypotheses about Densities

**III. Nonparametric Regression**

1. Nadaraya-Watson Estimator and Its Statistical Properties
2. Smoothing Parameter Choice and Confidence Intervals
3. Series Estimator and Its Statistical Properties
4. Other Estimators: Local Polynomial Estimator; $k$-Nearest Neighbor Estimator

[1] `www.sciencedirect.com/science/handbooks/15734412`

**IV. Semiparametric Models**

1. Partially Linear Models
2. Single Index Models and Average Derivative Estimator
3. More Examples: Semiparametric Discrete Choice Models; Semiparametric Censored and Truncated Regression Models

**V. Additional Topics** *(if time permits)*

1. Endogeneity in Nonparametric Regression
2. Regularization
3. Non/Semi-parametric Panel Data Models

**Academic Integrity** Syracuse University's Academic Integrity Policy reflects the high value that we, as a university community, place on honesty in academic work. The policy defines our expectations for academic honesty and holds students accountable for the integrity of all work they submit. Students should understand that it is their responsibility to learn about course-specific expectations, as well as about university-wide academic integrity expectations. The policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same work in more than one class without receiving written authorization in advance from both instructors. Under the policy, students found in violation are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered as described in the Violation and Sanction Classification Rubric. SU students are required to read an online summary of the University's academic integrity expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check-in on MySlice. For more information about the policy, see http://class.syr.edu.

**Accommodations for Students with Disabilities** If you believe that you need academic adjustments (accommodations) for a disability, please contact the Office of Disability Services (ODS), visit the ODS website– 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.