Course Outline

The goal of Econ 227 is to provide an introduction to nonparametric and semiparametric methods in econometrics. Nonparametric statistics is often concerned with the study of infinite dimensional objects, and as a result modern theory relies heavily on areas of topology and functional analysis. I will try to provide additional background on these topics as necessary, but you should expect a high level of mathematical analysis considerably beyond what is used in the core courses 220A-220C.

**Part I: Basic Nonparametric Estimators.**

**Kernel Estimators:** (i) Density estimation: bias, variance and asymptotic normality; (ii) Conditional Expectations: Nadaraya-Watson and Local Polynomial Estimators.

*References:* Chapters 2 and 3 in Pagan and Ullah (1999), Chapters 1 and 2 in Yixiao’s notes.

**Series Estimators:** (i) Rates of convergence and asymptotic normality for functionals.


**Part II: Empirical Process Theory.**

**Math Overview:** (i) Measurability; (ii) Topology; (iii) Metric and Hilbert Spaces; (iv) Compactness.


**Weak Convergence:** (i) Measurability issues (basic overview); (ii) General Theory of Weak Convergence; (iii) Weak Convergence in the Space of Bounded Functions; (iv) Convergence in Outer Probability.

*References:* Chapters 1.2, 1.3, 1.5, 1.9 and 1.10 in van der Vaart and Wellner (1996).

**Empirical Process Theory:** (i) Maximal Inequalities and Covering Numbers; (ii) Symmetrization; (iii) Glivenko-Cantelli Theorems; (iv) Donsker Theorems; (v) Uniform Entropy and Bracketing Numbers; (vi) Permanence of the Donsker Property.

*References:* Chapters 2.1-2.7, 2.10 and 2.13 in van der Vaart and Wellner (1996).

**Part III: Applications of Empirical Process Theory.**

**Semiparametric Methods** (i) Simulation estimators; (ii) The maximum score estimator and cube root asymptotics; (iii) Conditional Moment Models with possible endogeneity.

Additional Topics: (i) Bootstrap Methods; (ii) General Sieve Estimation; (iii) Nonparametric IV.


Web Page and Grading

The course materials will be posted on webct.ucsd.edu. You will be evaluated through your performance in the problem sets.

Textbook

There are no required textbooks for the course, although the following will be useful references. If you are planning to specialize in econometric theory you should probably add to your library at some point.


References


