Asymptotic analysis of statistical algorithms performance

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For: first year postgraduate students in Statistics
Prerequisites: basic courses of Functional analysis, Probability and Statistics for mathematical or statistical specialties of mathematical faculty or equivalent.
Short description:
This lecture course is a short introduction to asymptotic statistics, in which we discuss how to analyze and compare accuracy of different statistical procedures for large amount of data. Parametric, nonparametric and semiparametric procedures of estimation, hypotheses testing, classification and prediction will be discussed from the asymptotic perspective.
Sylabus:

1. Parametric and nonparametric inference. GEE-estimation. Statistical testing. Approaches to the asymptotic analysis.
2. Theory of stochastic convergence. (Weak convergence in functional spaces, weak and strong limit theorems).
3. Delta method and continuity theorems.
4. Maximum likelihood estimation. One-Step Estimators. Rate of convergence.
5. Likelihood ratios and contiguity.
6. Local asymptotic normality of estimators.
7. Efficiency of estimators. Fisher information matrix.
8. Efficiency of tests. Likelihood ratio tests. Chi-square tests.
9. Empirical processes and functional delta method. Hadamard differentiability.
10. Nonparametric density estimation. Rate optimality.
11. Semiparametric models. Efficient score functions.

   Required text:
1. van der Vaart A. (1998) Asymptotic Statistics, Cambridge U. Press.

   Recommended Text:
1. Shao J. (2003) Mathematical statistics. Springer-Verlag: New York.
2. Боровков, А.А. (1997) Математическая статистика. Наука: Москва.