Advanced Statistical Inference

Credits: 15 ECTS

Course organizer and lecturer
Department of Mathematics and Mathematical Statistics
Jun Yu, e-mail: jun.yu@umu.se

Prerequisites
Courses in probability theory and inference theory at second cycle level, corresponding to 5MS073 and 5MS058. The PhD course in Advanced Probability Theory (7.5 credits).

Objective
The goal of the course is in a mathematically rigorous fashion to provide essential materials in statistical theory that a first- or second-year graduate student typically needs to learn as preparation for work on a PhD degree in mathematical statistics.

There will be one three-hour lecture per week and one three-hour exercise presentation and discussion per week.

Content
This course covers topics in statistical theory essential for graduate students. The course introduces some fundamental concepts in statistical decision theory and inference and contains detailed studies on some important topics: unbiased estimation, parametric estimation, nonparametric estimation, hypothesis testing, and confidence sets. In addition to the classical results, some topics in modern statistical theory are also introduced, including Markov chain Monte Carlo, quasi-likelihoods, empirical likelihoods, semiparametric models, statistical functionals, generalized estimation equations, the jackknife, and the bootstrap, together with a large number of exercises which includes many additional results.

Examination
The examination consists of an oral exam and a written exam at the end of the course.

Literature
The main course literature is Jun Shao's book (recommended buying). The other books are complementary reading. They are excellent reference literature.

Shao, J. *Mathematical Statistics*, 2nd Edition. Springer, 2003.
Shao, J. *Mathematical Statistics: Exercises and Solutions*. Springer, 2005.
Lehmann, E.L. & Casella, G. Theory of Point Estimation, 2nd Edition. Springer, 1998.
Efron, B. & Hastie, T. *Computer Age Statistical Inference*, Cambridge University Press, 2016.