

## Mathematical Statistics - Spring 2019 - Midterm - Syllabus

- Reminders of probability: Law of Large Numbers, Central Limit Theorem, convergence in probability, independence, probability distribution functions, cumulative distribution functions etc. See Chapter 1–5, especially 1.5, 2.2, 2.3, 2.4, 2.7, 3.1–3.4, 4.1, 4.2, 5.2–5.4.
- Notions: statistical model, statistics, parameter. Estimator, consistent estimator, (asymptotically) unbiased estimator, asymptotically normal estimator. Chapter 6, mostly 6.2, 6.3.1.
- Non-parametric estimation: empirical mean, the empirical mean is a “good” estimator, empirical cdf, the empirical cdf is a “good” estimator. Chapter 7.
- Parametric estimation: method of moments, MLE and its properties (asymptotic normality, Fisher information). Chapter 9, especially 9.2–9.7, 9.13.1.
- Be familiar with: difference between quantitative/non-quantitative results, existence of quantitative bounds (Markov, Tchebychev, Hoeffding etc.), what a confidence interval is.
- Homework 1–4. In particular: how to compute expectation, variance – either directly from a pdf or by algebraic manipulations. How to study biasedness and consistency of estimators. How to compute an estimator by the method of moments, a MLE estimator, a Fisher information.