Empirical Process Theory Through Examples
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In the talk I will briefly describe three problems from my research where empirical process theory turns out to be crucial. In the first example I consider the nonparametric maximum likelihood estimator (NPMLE) of a decreasing density on the positive half-line. I will illustrate how the weak convergence of the usual empirical process is useful in deriving the pointwise limiting distribution of the NPMLE. In the second example I consider the least squares estimator (LSE) of an unknown multivariate convex regression function. I will illustrate how metric entropy and chaining, two fundamental concepts in the empirical process theory, can be used to provide risk (upper) bounds for the LSE. In the third problem I shall consider estimation of the optimal transport map between two multivariate (continuous) distributions given i.i.d. samples. I will show how one can derive the rate of convergence of the estimated transport map using tools from empirical process theory. In all the three problems I will try to emphasize the main ideas and only provide proof sketches.