서울대학교 통계연구소 특별강연

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초청강연 I

연사: Alexandre Tsybakov (CREST-ENSAE)

시간: 8월 20일 4시-5시

장소: 서울대학교 25-1동 1층 국제회의실

제목: Minimax Optimality in Nonparametric Statistics and Machine Learning.

초청강연 II

연사: Martin Wainwright (UC Berkeley, EECS & Statistics)

시간: 8월 21일 4시-5시

장소: 서울대학교 25-1동 1층 국제회의실

제목: Estimation by solving non-convex programs:
Statistical and computational guarantees

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Alexandre Tsybakov (CREST-ENSAE)

Title: Minimax Optimality in Nonparametric Statistics and Machine Learning.

Abstract:
In the standard nonparametric regression setting, it is assumed that the model is well specified, i.e., the unknown regression function belongs to a given functional class. The value of reference characterizing the best estimation is the minimax risk over this class. On the other hand, in Machine Learning no assumption is placed on the regression function; it does not necessarily belong to the specified class and the corresponding value of reference can be written as the minimax regret (mini-max excess risk). The study of the minimax risk and of the minimax regret represents two parallel developments: the former has been analyzed mostly within Nonparametric Statistics, while the second -- within Statistical Learning Theory. This talk aims to bring out a connection between these two objects. We introduce a more general risk measure that realizes a smooth transition between the minimax risk and the minimax regret depending on the magnitude of the approximation error. The minimax risk and the minimax regret appear as the two extremities of this scale. The main result shows that, unless the functional class is extremely "massive", the minimax risk and minimax regret have the same asymptotic behavior. Furthermore, the optimal rates for the minimax regret and minimax risk are attained by one and the same procedure called the aggregation-of-leaders estimator while they are not attained by classical procedures such as empirical risk minimization and skeleton aggregation. For very "massive" classes the minimax risk turns out to be of smaller order than the minimax regret. As a by-product of general results, we obtain oracle inequalities for the excess risk involving Vapnik-Chervonenkis type classes and classes with polynomial growth of empirical entropy without the usual convexity assumption on the class. Finally, for a slightly modied method, we derive a bound on the excess risk of s-sparse convex aggregation providing the optimal rate. This is a joint work with Alexander Rakhlin and Karthik Sridharan.

Martin Wainwright (UC Berkeley, EECS & Statistics)

TITLE: Estimation by solving non-convex programs: Statistical and computational guarantees

ABSTRACT: Many statistical estimators, including those for missing data or error-in-variables model, as well as regression with non-concave penalties, are defined via minimizing a non-convex function. In many cases, it can be shown that any global minimum has low mean-squared error. However, such a result leaves open a potential gap between theory and practice, since standard iterative methods are guaranteed only to find a stationary point.

In this talk, we show that in many problems, this gap between statistics and computation can be eliminated. In particular, we describe some natural conditions under which all stationary points of the objective achieve the same mean-squared error (up to constant factors) as any global minimum. We illustrate our general theory in application to regression with missing data, and regression with nonconcave penalization.

Based on joint work with Po-Ling Loh.

Pre-print: http://arxiv.org/abs/1305.2436