Industrial & Systems Engineering
Seminar Announcement

Minimax Risk Bounds for Piecewise Constant Models

Fang Han, Ph.D.
Assistant Professor
Statistics
University of Washington

Abstract: Consider a sequence of data points X_1, ..., X_n whose underlying mean is piecewise constant of at most k unknown pieces. We establish sharp nonasymptotic risk bounds for the least squares estimator (LSE) on estimating the mean. The main results are twofold. First, when there is no additional shape constraint assumed, we reveal a new phase transition for the risk of LSE: As k increases from 2 to higher, the rate changes from loglog n to klog(en/k). Secondly, when the mean is further assumed to be nondecreasing, we show the rate is improved to be kloglog(16n/k) over 2\leq k\leq n. These bounds are sharp in the sense that they match the minimax lower bounds of the studied problems (without sacrificing any logarithmic factor). The obtained result complements its counterpart in the change-point detection literature, reveals an interesting phenomenon that is in contrast to Kiefer's Theorem [Kiefer, 1982], and fills some notable gaps in recent discoveries relating isotonic regression to piecewise constant models. The developed techniques in the proofs are built on Levy's partial sum and Doob's martingale theory, which are of independent interest and may have potential applications to the study of some other shape-constrained regression problems. This is a collaboration work with Dr. Chao Gao at Chicago and Dr. Cun-Hui Zhang at Rutgers.

Bio: *Fang Han* received his B.S. degree in Probability and Statistics from Peking University, his M.S. degree in Biostatistics from University of Minnesota, and his Ph.D. degree in Biostatistics from Johns Hopkins University. He is currently an assistant professor in statistics at University of Washington. His research interest is in high dimensional statistics, robust statistics, semiparametric regression, and time series analysis. He is a finalist of 2016 Forbes 30 under 30 in Science, and a recipient of Google Ph.D. Fellowship in Statistics from 2013-2015.

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