JAMES FRANCIS HANNAN LECTURE SERIES
Department of Statistics and Probability
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Surprising Phenomena in Inference for iid p dimensional data for $0 < p/n < 1$ and for $p/n \to \infty$

Tuesday, September 11, 2012
A405 Wells Hall, 10:20 a.m. - 11:10 a.m.
Refreshments: 10:00 a.m.

Abstract

1. We study the behavior of robust regression and least squares in the un-penalized case for $0 < p/n < 1$. Surprisingly it turns out individual coefficients are still asymptotically normal unbiased at rate $1/\sqrt{n}$ but the variance differs from the fixed p situation with important implications for inference. There is an apparent conflict with work of Huber (1973), which we restore.

2. It is recognized through earlier work of Huber (1985) and Diaconis and Freedman (1984) on Projection Pursuit, as invented by Friedman and Tukey (1974) that, if coordinates are iid (or under weaker conditions), as p and $n \to \infty$ the marginal distributions for almost all projections are asymptotically Gaussian so that non-Gaussian empirical distributions suggest non linear phenomena. We show, if the data are in fact coordinatewise iid Gaussian, so that the distribution of all projections is Gaussian, and if $p/n \to \infty$, that given any distribution F, a projection can be found whose empirical d.f. is arbitrarily close to F.

This talk is based on joint work in various parts with Derek Bean, Noureddine el Karoui, Boaz Nadler, and Bin Yu.

References:
• Friedman, J. and Tukey, J.W. (1974). A Projection pursuit algorithm for exploratory data analysis. *IEEE Trans. Computation.*, **9**, 881-890.
• Huber, P.J. (1985). Projection Pursitu. *Ann. Statist.*, **13**, 435-525.
• Freedman, D.A. and Diaconis, P. (1984). Asymptotics of graphical projection pursuit. *Ann. Statist.*, **12**, 793-815.
• Bickel, P. and Nadler, B. (2012). Projection pursuit as $p/n \to \infty$. Preprint.

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