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Nonstandard analysis and statistical decision theory

Joint work with D. Roy and H. Duanmu

Statistical decision theory takes inspiration from game theory to provide a basic framework in which one can reason about optimality (or lack thereof) of statistical procedures, such as estimators and tests.

One property of a statistical procedure is "admissibility": Roughly, a procedure is admissible if there is no other procedure which does better under all circumstances ("better" in a sense specified by the decision theoretical framework, i.e., with respect to a fixed loss function). This is certainly a necessary condition for optimality.

Admissibility is notoriously hard to characterize. In particular, establishing a characterization in Bayesian terms has been an ongoing pursuit for decades in statistical decision theory. Recently we have found a characterization of admissibility in Bayesian terms, by using prior probability distributions which can take on infinitesimal values. We are also able to draw connections to classical methods establishing admissibility, such as Blyth's method and Stein's characterization of admissibility (which does partially characterize admissibility, but only under additional, technical hypotheses). Finally, our method has applications in concrete problems such as the problem of establishing the admissibility of the Graybill-Deal estimator.

The talk will not presuppose any knowledge on statistics or non-standard analysis.