

Department of Decision Sciences
Statistics Seminar

What is testable and what is not?

Bas J. K. Kleijn
University of Amsterdam

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Abstract

Given a statistical model for i.i.d. data, certain hypotheses can be tested consistently, while others cannot. If one thinks of consistent tests in terms of converging sequences of test statistics, some immediate conclusions can be drawn. But classical counterexamples (Cover, 1973; Dembo-Peres 1995) demonstrate that the matter is more involved. We address the problem of what characterizes the asymptotic testability of hypotheses for uniform, pointwise and Bayesian tests. Posteriors distinguish measurable hypotheses (prior-almost-surely), but frequentist tests require more. Application of the Le Cam-Schwartz theorem (Le Cam-Schwartz, 1960; write U for the associated uniformity), leads to two equivalences: hypotheses are testable with uniform power if and only if they are separated by U . Hypotheses are testable in a pointwise sense, if and only if the testing problem can be represented (continuously with respect to U) in a separable metric space. The above is illustrated with a variety of examples and counterexamples.