Department of Decision Sciences

Statistics Seminar

Local Proper Scoring Rules

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Abstract

A scoring rule $S(x, Q)$ measures the quality of a quoted distribution Q for an uncertain quantity X in the light of the realised value x of X. It is proper when it encourages honesty, i.e, when, if your uncertainty about X is represented by a distribution P, the choice Q = P minimises your expected loss. Traditionally, a scoring rule has been called local if it depends on Q only through $q(x)$, the density of Q at x. The only proper local scoring rule is then the log-score, $-\log q(x)$. For the continuous case, we can weaken the definition of locality to allow dependence on a finite number m of derivatives of q at x. A characterisation is given of such order-m local proper scoring rules, and their behaviour under transformations of the outcome space. In particular, any m-local scoring rule with m > 0 can be computed without knowledge of the normalising constant of the density. Parallel results for discrete spaces will be given.