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Copulas for neural and behavioral parallel systems

An *n-copula* is an n-variate distribution function with univariate margins uniformly distributed on $[0, 1]$. Thus, a copula is a function that joins a multivariate distribution to its one-dimensional margins. The concept has stirred a lot of interest in recent years in several areas of statistics mainly for the following reasons: it allows one (i) to study the structure of stochastic dependency in a " scale-free " manner, i.e., independent of the specific marginal distributions, and (ii) to construct families of multivariate distributions with specified properties. First, we demonstrate how specific copulas with negative stochastic dependencies can be used in models of multisensory integration deriving quantitative measures in a given context for both neural (spike frequency) and behavioral (reaction time) data. Second, we show how a copula defining perfect negative dependence allows to solve a paradox between neural and behavioral measurements in a paradigm of inhibitory control.