To ignore dependencies is perhaps not a sin

Douglas Wiens

University of Alberta, Edmonton, Canada

Abstract

We present a result according to which certain functions of covariance matrices are maximized at scalar multiples of the identity matrix. In a statistical context, in which such functions measure loss, this has surprising consequences. In particular it implies the robustness against dependence of experimental designs constructed assuming independence. Another consequence is that the ordinary least squares (ols) estimate of a correctly specified regression function can be robust, among generalized least squares (gls) estimates, against dependence. An implication is that it can be not only safe, but optimal to ignore such departures from the usual assumption of i.i.d. errors. We then consider regression models in which the response function is possibly misspecified, and show that ols is minimax if the design is uniform on its support, but that this often fails otherwise. We go on to investigate the interplay between minimax gls procedures and minimax designs, leading us to extend, to robustness against dependencies, an existing observation - that robustness against model misspecifications is increased by splitting replicates into clusters of observations at nearby locations