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The numerical statistical fan and model selection

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Identifiability of polynomial models is a key requirement for multiple regression. We consider an analogue of the so-called statistical fan, the set of all maximal identifiable hierarchical models, for cases of noisy design of experiments or measured covariate vectors with a given tolerance vector. This gives rise to the definition of the numerical statistical fan. It includes all maximal hierarchical models that avoid approximate linear dependence of the design vectors. We develop an algorithm to compute the numerical statistical fan using recent results on the computation of all border bases of a design ideal from the field of algebra.
In the low-dimensional case and for sufficiently small data sets the numerical statistical fan is effectively computable and much smaller than the respective statistical fan. The gained enhanced knowledge of the space of all stable identifiable hierarchical models enables improved model selection procedures. We combine the recursive computation of the numerical statistical fan with model selection procedures for linear models and GLMs, and we provide implementations in R.

Keywords

identifiable regression models, hierarchical models, noisy experimental design

Special/invited session

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