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Abstract
A fiber of a contingency table is the space of all realizations of the table under a given set of constraints such as marginal totals. Understanding the geometry of this space is a key problem in algebraic statistics, important for conducting exact conditional inference, calculating cell bounds, imputing missing cell values, and assessing the risk of disclosure of sensitive information. Motivated by disclosure problems, in this paper we study the space of all possible tables for a given sample size and set of observed conditional frequencies. We show that this space can be decomposed according to different possible marginals, which, in turn, are encoded by the solution set of a linear Diophantine equation. Our decomposition has two important consequences: (1) we derive new cell bounds, some including connections to directed acyclic graphs, and (2) we describe a structure for the Markov bases for the given space that leads to a simplified calculation of Markov bases in this particular setting.

Abstract
We derive nonparametric tests of symmetry using asymmetric kernels with either vanishing or fixed bandwidths. The idea is to split the sample around the symmetry point and then test whether the distributions to the right and to the left are the same. We show how to extend the approach to examine conditional symmetry by deriving conditions under which our tests are applicable to residuals from semiparametric models with a (sufficiently smooth) nonparametric link function. The latter setting is general enough to entertain as a particular case a unknown symmetry point, which we duely estimate by the sample median. The conditions we derive ensure that the resulting estimation error is asymptotically negligible. Simulations show that the asymptotic tests perform well even in very small samples, entailing better size and power properties than some of the existing symmetry tests.

Abstract
An A-optimal minimax design criterion is proposed to construct fractional factorial designs, which extends the study of the D-optimal minimax design criterion in Lin and Zhou (*Canadian Journal of Statistics* **41**, 325–340, *2013*). The resulting A-optimal and D-optimal minimax designs minimize, respectively, the maximum trace and determinant of the mean squared error matrix of the least squares estimator (LSE) of the effects in the linear model. When there is a misspecification of the effects in the model, the LSE is biased and the minimax designs have some control over the bias. Various design properties are investigated for two-level and mixed-level fractional factorial designs. In addition, the relationships among A-optimal, D-optimal, E-optimal, A-optimal minimax and D-optimal minimax designs are explored.

Abstract
We propose methodology for exact statistical tests of hypotheses for models of network dynamics. The methodology formulates Markovian exponential families, then uses sequential importance sampling to compute expectations within basins of attraction and within level sets of a sufficient statistic for an over-dispersion model. Comparisons of hypotheses can be done conditional on basins of attraction. Examples are presented.

Abstract
We consider estimation of the quadratic (co)variation of a semimartingale from discrete observations which are irregularly spaced under high-frequency asymptotics. In the univariate setting, results by Jacod for regularly spaced observations are generalized to the case of irregular observations. In the two-dimensional setup under non-synchronous observations, we derive a stable central limit theorem for the Hayashi–Yoshida estimator in the presence of jumps. We reveal how idiosyncratic and simultaneous jumps affect the asymptotic distribution. Observation times generated by Poisson processes are explicitly discussed.

Abstract
Although the parameters in a finite mixture model are unidentifiable, there is a form of local identifiability guaranteeing the existence of the identifiable parameter regions. To verify its existence, practitioners use the Fisher information on the estimated parameters. However, there exist model/data situations where local identifiability based on Fisher information does not correspond to that based on the likelihood. In this paper, we propose a method to empirically measure degree of local identifiability on the estimated parameters, *empirical identifiability*, based on one's ability to construct an identifiable likelihood set. From a detailed topological study of the likelihood region, we show that for any given data set and mixture model, there typically exists limited range of confidence levels where the likelihood region has a natural partition into identifiable subsets. At confidence levels that are too high, there is no natural way to use the likelihood to resolve the identifiability problem.

Abstract
Hierarchical linear models with a block circular covariance structure are considered. Sufficient conditions for obtaining explicit and unique estimators for the variance–covariance components are derived. Different restricted models are discussed and maximum likelihood estimators are presented. The theory is illustrated through covariance matrices of small sizes and a real-life example.

Abstract

In this paper, we investigate the goodness-of-fit test of partial linear regression models when the true variable in the linear part is not observable but the surrogate variable ˜X, the variable in the non-linear part T and the response Y are exactly measured. In addition, an independent validation data set for X is available. By a transformation, it is found that we only need to check whether the linear model is plausible or not. We estimate the conditional expectation of X under a given the surrogate variable with the help of the validation sample. Finally, a residual-based empirical test for the partial linear models is constructed. A nonparametric Monte Carlo test procedure is used, and the null distribution can be well approximated even when data are from alternative models converging to the hypothetical model. Simulation results show that the proposed method works well.

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