Information Bounds and Nonparametric Maximum Likelihood Estimation - P. Groeneboom; JA. Wellner.

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Army formula, the Pollaczek-Khinchin formula, Kleinrock's conservation law, the PASTA property (Poisson Arrivals See Time Averages), which expresses the equality between event averages and time averages, and the property of insensitivity to the choice of service time distribution, etc.

The comparison of queues or service disciplines (first-in-first-out, last-in-first-out, etc.), and their optimality properties in terms of the various stochastic order relations available for random vectors constitutes the subject matter of the fourth chapter, which concludes with a proof and some applications of Strassen's theorem on the existence of distributions with given marginals.

The reader learns a great deal from this book, both in terms of broad ideas and the qualitative properties of individual systems. Although "networks" of queues appear only marginally in it, nevertheless it provides a step in the direction of the complex queueing systems so widely used nowadays in communications and computing. Much of the exposition moves forward through the discussion of a wealth of examples, and the presentation is clear and precise. There are quite extensive bibliographical notes, indicating the sources of most results, and a list of 136 references. Altogether, a most valuable addition to the literature and an extremely useful source of information.

P. Groeneboom, J. A. Wellner: Information Bounds and Nonparametric Maximum Likelihood Estimation, Birkhäuser Verlag Basel, Boston, Berlin, 1992, 1994, VIII/125 pp., DM 58.00/öS 452.40/sFr 48.00/ 19.00

Reviewed by A. Janssen, Düsseldorf

This monograph grew out of a DMV seminar given in 1990 in the German city of Günzburg and represents an excellent contribution to modern (asymptotic) statistics. The most important notion is the tangent vector of a smooth (L^2-differentiable) curve of distributions, going back to Koshevnik and Levit (1976) and Pfanzagl (with Wefelmeyer) (1983).

The book consists of two parts. The first part is based on J. Wellner's lectures which studied information bounds of statistical models. The whole theory is well-motivated by a huge number of examples which reappear in part II in connection with maximum likelihood estimation. In particular, all kinds of censoring models are treated, and a deconvolution model constitutes a further example. The problems have the following common feature: The statistician is not able to observe the outcome of the original model, only the values of a certain statistic T are observable. The family of distributions of T now has a new tangent that is usually given by a score operator which leads to a reduced Fisher information. On the basis of LeCam's famous local asymptotic normality (LAN), one obtains infinite dimensional convolution theorems of Hájek-LeCam type and minimax theorems. Van der Vaart's differentiability theorem for implicitly defined functions is also stated. A more comprehensive monograph is now available [1] where general semiparametric models are treated. [*Reviewer's remark*: A proof of Hellinger differentiability of distributions of T (Proposition 1.1) can be found in the German textbook by H. Witting [2], *Satz* 1.193.]

The second part deals with nonparametric maximum likelihood (ML) estimation which is based on P. Groeneboom's lectures, in which he indicated how ML estimators work for all those examples discussed earlier. Two algorithms can be used to find the ML estimators: EM algorithms (maximizing conditional expectrations) and convex minorant algorithms. The following section studies consistency and the asymptotic distribution of these estimators. Each section contains exercises. The book is a good lecture notes volume that is useful for graduate students who have completed a basic course in mathematical statistics. It is remarkable that various concrete examples are studied in detail.

References

1. Bickel PJ, Klaassen CAJ, Ritov Y, Wellner JA (1993). Efficient and adaptive estimation for semiparametric models. Johns Hopkins Series in Mathematical Sciences, Johns Hopkins University Press, Baltimore
2. Witting H (1985) Mathematische Statistik I. Teubner, Stuttgart

P. Mand, M. Huskova: Asymptotic Statistics, Physica-Verlag Heidelberg, 1994, X/474 pp., DM 140,00

Reviewed by L. Rüschendorf, Freiburg

This volume is part one of the proceedings of the fifth Prague Symposium on asymptotic statistics held from September 4 to 9, 1993. The second part is to be published in Vol. 30 of *Kybernetika*.

As in the preceding conferences and proceedings, a very broad view is given of the developments in the field. The editors have not tried to organize the book according to certain subjects, but rather give in alphabetical order a series of 10 invited and 32 contributed papers. One can find a general and conceptual description of set indexed processes, asymptotic distribution and decision theory, nonparametric and robust estimation, change points in time series, the asymptotics of recursions, Kernel estimation, and many others.

As a consequence of the history of these conferences, one can observe a certain focus on developments in the field of rank statistics, M-estimators, and stochastic programming. There are comparatively few papers on asymptotic statistical analysis, construction of efficient estimators and confidence intervals in concrete high dimensional and nonparametric models. Also the (empirical) Bayes-oriented approach and its recent fields of applications are not very visible in this collection.

The papers in this volume seem to be typically of good quality. The interested reader will find recent developments of mainly methodological kind in various fields. It would have been welcomed if the papers could have been organized according to subjects of interest.