Mathematisches Forschungsinstitut Oberwolfach

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Resampling Methods for Checking Models and Statistical Hypotheses

August 31st – September 6th, 2003

The meeting was organized by Rudolf Beran (Davis), Arnold Janssen (Düsseldorf) and Georg Neuhaus (Hamburg). It was attended by 45 participants from 13 countries all over the world. The talks covered a broad spectrum of recent statistical problems and procedures where resampling methods are applied. Resampling procedures, like the bootstrap and permutation tests, are frequently used to establish and carry out data driven statistical inference. The models are typically of high dimension or of nonparametric type. Then naturally the question about the quality of these procedures arises. These questions are usually solved within the asymptotic set up of statistics. Special topics were:

- the bootstrap and model check
- permutation tests for testing different kind of hypotheses
- distribution free methods for regression
- applications for censored data

Especially for the last item applications in medicine were discussed. It was very successful to bring more applied researchers together with colleagues from mathematical statistics. This combination was very stimulating for further research and discussions. The conference benefits from the Oberwolfach concept with fewer but longer presentations. We spent much time with long discussions. At this stage we like to mention a survey talk about support vector machines. The topic has a lot of connections to computer science and mathematics for engineers. A lot of new scientific contacts were formed, initiating quite a number of collaborations. The meeting was a great success. The stimulating atmosphere of the Forschungsinstitut leads to an extensive exchange of ideas.

Abstracts

Permutation tests: conditional limit theorems and multivariate applications

Helmut Strasser (Wien)

In this talk limit theorems for the conditional distributions of linear test statistics are presented. The assertions are conditioned on the sigma-field of permutation symmetric sets. The limit theorems are concerned both with the conditional distributions under the hypothesis of randomness and under general contiguous alternatives with independent but not identically distributed observations. The proofs are based on results on limit theorems for exchangeable random variables. The limit theorems under contiguous alternatives are consequences of a LAN-result for likelihood ratios of symmetrized product measures. The results have implications for statistical applications. By example it is shown that minimum variance partitions which are defined by observed data (e.g. by LVQ) lead to asymptotically optimal adaptive tests for the k-sample problem.

Decision-theoretic properties of partitioned sample spaces

Klaus Pötzelberger (Wien)

Let $E = (\Omega, \mathcal{F}, (P_t)_{t \in T})$ denote an experiment. The complexity of the experiment may be reduced by replacing $\mathcal{F}$ by a finite field $\tilde{\mathcal{F}} \subseteq \mathcal{F}$, which leads to the experiment $F = (\Omega, \tilde{\mathcal{F}}, (P_t)_{t \in T})$. $\tilde{\mathcal{F}}$ is identified with a finite partition $\mathcal{B} = (B_1, \ldots, B_m)$ of Ω. A reduced experiment which is maximal with respect to the information semiorder on the set of all reduced experiments with the size of the corresponding partition being at most m is called admissible. We give characterizations of admissible experiments and of the corresponding field $\tilde{\mathcal{F}}$.

The problem of characterizing admissible subfields is directly connected with the following problem. Let P be a Borel probability measure on a suitable Banach space ($\mathbb{R}^{|T|}$ if T is finite). Characterize the maximal elements $\mu \in \mathcal{M}(P, m)$ with respect to the Bishop-De Leeuw order $\preceq$, where $\mu \in \mathcal{M}(P, m)$ if and only if $\mu \preceq P$ and $|\mathrm{supp}(\mu)| \leq m$.

The results are relevant for procedures based on a data-driven partition of the sample space.

Statistical challenges in survival and event history analysis: complicated sampling frames and summary statistics

Niels Keiding (Kobenhavn)

This talk presented a series of examples of survival and event history analysis under complicated sampling frames, all initiated by taking a cross-sectional sample through a population subject to morbidity and mortality in calendar time. I also gave an introduction to current work (lead by P.K.Andersen in our department) using regression analysis of pseudo-observations (known from jackknife methodology) to obtain regression models for secondary summary measures such as transition probabilities in multi-state models.

The complicated sampling frames were all illustrated by Lexis diagrams. Three examples concerning incidence were given:

- incidence estimation from current status data
- retrospective incidence estimation using inverse probability weighted estimates based on independent survival information

- interaction between life history events based on retrospective incidence data in a prevalent sample

and two examples on mortality:
- time to pregnancy estimated from current duration data
- mortality estimation from prevalent cohort data.

Asymptotic normality of the Student t-statistic and its bootstrap versions

David Mason (Newark)

Let $X, X_1, X_2, \ldots,$ be i.i.d.nondegenerate random variables with common distribution function F. Consider the Student t–statistic $T_n = \sqrt{n}\overline{X}_n/s_n$, where $\overline{X}_n = n^{-1}\sum_{i=1}^n X_i$ and $s_n^2 = (n-1)^{-1}\left(\sum_{i=1}^n X_i^2 - n\left(\overline{X}_n\right)^2\right)$, for $n \geq 2$. Giné, Goetze and Mason (1997) proved that T_n converges in distribution to a standard normal random variable Z if and only if F is in the domain of attraction of a normal law, written $F \in DN$, and $EX = 0$. In a related problem, Mason and Shao (2001) showed that the distribution of the bootstrapped Student t-statistic converges in probability to Z if and only if $F \in DN$. A general approach is described, which yields alternative proofs of both of these results.

Frequentist model averaging in comparison with the bootstrap

Gerda Claeskens (Texas)

(joint work with Nils Lid Hjort)

Closely related to checking the fit of a model is the selection of a good model. In the setting that the true data generating process is in a local neighbourhood to the null, or minimal model, properties of model selection mechanisms are studied. In such a situation of local models, the asymptotic distribution of post-model selection estimators and of the more general frequentist model averaging estimators is obtained. Part of the procedure requires the estimation of the model departure distance. The question arises whether the bootstrap can work in this model choice framework. The answer turns out to be negative.

Multicategory Classification: The Multicategory Support Vector Machine and the Multichotomous Penalized Likelohood Estimate

Grace Wahba (Madison)

We describe two modern methods for statistical model building and classification, penalized likelihood methods and and support vector machines (SVM's). Both are obtained as solutions to optimization problems in reproducing kernel Hilbert spaces (RKHS). A training set is given, and an algorithm for classifiying future observations is built from it. The (k-category) multichotomous penalized likelihood method returns a vector of probabilities $(p_1(t), \cdots p_k(t))$ where t is the attribute vector of the object to be classified. The multicategory support vector machine returns a classifier vector $(f_1(t), \cdots f_k(t))$ satisfying $\sum_\ell f_\ell(t) = 0$, where $max_\ell f_\ell(t)$ identifies the category. The two category SVM's are very well known, while the multi-category SVM (MSVM) described here, which includes modifications for unequal misclassification costs and unrepresentative training sets, is new.

We describe applications of each method: For penalized likelihood, estimating the 10-year probability of death due to several causes, as a function of several risk factors observed in a demographic study, and for MSVM's, classifying radiance profiles from the MODIS instrument according to clear, water cloud or ice cloud. Some computational and tuning issues are noted.

Resampling methods in change point analysis

Marie Huskova (Praha)

The talk concerns applications of permutation arguments for detection changes in location and linear models. It appears that the approximations for the critical values based on permutational principle provides works surprisingly well. This supported both theoretical results and results of the simulation study.

The talk will be based on a number of results listed below.

References

[1] J. Antoch and M. Hušková: itPermutation tests in change point analysis. Statistics and Probability Letters 53, 33, 2001, 33 – 46.

[2] J. Antoch and M. Hušková: Detection of structural changes in regression. Accepted for publication in Tatra Mountains Publications.

[3] I. Berkes, L. Horváth, M. Hušková and J.Steinebach: Applications of permutations to the simulations of critical values. Accepted for publication in the Journal of Nonparametric Statistics, 2003.

[4] M. Hušková and J. Picek: M-tests for detection of structural changes in regression. In Statistical data Analysis Based on the L_1-Norm and Related Methods, ed. Y. Dodge , Birhäuser, Basel, (2002), pp. 213 – 229.

[5] M. Hušková: Permutation principle and bootstrap in change point analysis-review paper. Accepted for publication in a special volume for Miklós Csörgő, 2003.

Comparing K cumulative incidence functions through resampling methods

Li Xing Zhu (Hong Kong)

(joint work with K.C. YUEN, D. ZHANG)

Tests for the equality of k cumulative incidence functions in a competing risks model are proposed. Test statistics are based on a vector of processes related to the cumulative incidence functions. Since their asymptotic distributions appear very complicated and depend on the underlying distribution of the data, two resampling techniques, namely the well-known bootstrap method and the so-called random symmetrization method, are used to approximate the critical values of the tests. Without making any assumptions on the nature of dependence between the risks, the tests allow one to compare k risks simultaneously for $k \geq 2$ under the random censorship model. The tests are fully nonparametric and do not require arbitrary partitions of the sample space. Tests against ordered alternatives are also considered. Simulation studies indicate that the proposed tests perform very well with moderate sample size. A real application to cancer mortality data is given.

Testing parametric regression: function-parametric martingales and distribution free methods

Estate Khmaladze (Wellington)

Let $b(\alpha)$, $\alpha \in L_2$, be a Brownian motion of some Hilbert space L_2 and V be a certain Volterra operator on L_2. Then $\omega(\alpha)$, defined by $b(\alpha) - b(V\alpha) = \omega(\alpha)$ is again a Brownian motion on L_2. In the "'usual"' time $t \in \mathbb{R}$ it means that one adds a very smooth random curve to the Brownian motion $b(t)$ and still obtains a Brownian motion $\omega(t)$ identical to $b(.)$ in distribution. In the talk we showed how to obtain such transformation in general ($t \in \mathbb{R}^p$) and how this leads to efficient but asymptotically distribution free tests in the general parametric regression problem.

Nonparametric inference for multivariate volatility functions

Wolfgang Polonik (Davis)

An approach for constructing multivariate statistical methods for investigating volatility of financial time series in multivariate settings is presented. The approach leads to procedures that extract information about qualitative features of the volatility function, as for instance constant volatility or "smiling faces". Formal testing methods as well as diagnostic plots are derived.

Problems in Quantum Statistical Information

Richard D. Gill (Utrecht)

After sketching the recent development of "Quantum Information" I will explain the basic model, stochastic in nature, revolving around the notions of states; of operations, measurements and instruments on states; and of product states and entanglement. Statistical problems arise when we suppose that the state depends on an unknown parameter. The main aim of the statistician is to design measurements which maximally extract information about the unknown state. The situation becomes most interesting when we possess N identical copies of the unknown state. We may then compare various measurement strategies: each state measured separately, in the same way; adaptive measurements, the states are measured sequentially, each one in a way which might depend on the preceding outcomes; LOCC measurements in which measured states may also be recycled and measured again; and finally the most general "entangled" measurements of the joint (product) system. LOCC means: local [quantum] operations [on separate particles], classical communication [between them].

Here one meets the phenomenon of superadditivity of information, where joint measurements can give several times more information than anything possible with LOCC measurements (Gill and Massar, *Phys. Rev. A* **61**, 2000; Gill, *IMS Mono. bf 36*, 2002).

A closely related topic is the use of entanglement in the problem of reconstructing an unknown quantum operation. My student Manuel Ballester (*Phys. Rev. A*, to appear) has recently shown that entangled measurements of an entangled input to an unknown unitary operation on a qubit can provide three times as much information as the best that can be done with LOCC measurements (or with non-entangled inputs), even though this measurement strategy is only using twice as many probe qubits, half of which go nowhere near the quantum black box which we are trying to estimate.

Yet another topic is quantum tomography (Gill & Guţă, subm. *J. Roy. Statist. Soc. B*) which seems to offer a challenging nonparametric inverse statistical problem. We conjecture a range of convergence rates from semiclassical ($\sqrt{(\log n/n)}$), through geometric ($n^{-1/p}$, $2 < p < \infty$) to logarithmic ($\sqrt{(1/\log n)}$) with the latter phase transition occurring at "detector efficiency $= \frac{1}{2}$".

Finally I mention some statistical problems involving missing data in the design of experiments meant to prove "quantum nonlocality" or "contextuality". An annotated list of 15 open problems will be appearing soon on my web pages
`http://www.math.uu.nl/people/gill`.

P-value curves, a graphical tool for model selection - with applications to the recovery of the star distribution of the Milky Way

Axel Munk (Göttingen)
(joint work with N. Bissantz)

In the first part of the talk the difficulty of interpreting p-values of classical goodness of fit tests is discussed. This is done for regression, however, it applies to other settings as well. It is shown, that often the type II error is more important than the type I error. P-value curves are introduced, which allow to estimate the type II error for a given goodness of fit statistic. This forces the statistician to discuss with the subject matter scientist the merit of the used goodness of fit statistic as an empirical measure between model and data.

In the second part of the talk this is illustrated by the problem of reconstruction of the star distribution of the Milky Way. In particular, classical hypotheses yield a model which is rather unlikely from a physicists point of view, in contrast our approach yields evidence of a four spiral arm model.

Nonparametric Comparison of Two Samples of Interval-Censored Data

Lutz Dümbgen (Bern)

In the first part of the talk I review the setting of interval-censored data and discuss the computation of nonparametric maximum likelihood estimators. Three particular versions are

(i) the unrestricted,
(ii) the concave and
(iii) the unimodal

MLE of a c.d.f.. A general optimization algorithm covering these problems is presented. Thereafter I describe modifications in order to compare two (sub-)samples via a Monte-Carlo permutation test.

Nonparametric Bayesian methods

Aad W. van der Vaart (Amsterdam)

We started with results for general sequences of statistical experiments, characterized by the existence of tests with exponential error probabilities for testing the true parameter versus a ball of radius $\epsilon * \xi$ ($\xi < 1$) separated by at least epsilon from the truth. Such experiments were earlier considered by Le Cam and Birge, who proved the existence of estimators with a rate of convergence characterized by the equation $D(\epsilon_n) \sim n\epsilon_n^2$, for D the local entropy or "Le Cam dimension" of the experiment. To obtain a result on asymptotic concentration of posterior distributions, we need in addition a condition that ensures that certain neighbourhoods of the true parameter contain sufficient prior mass. We specialized the general results to independent observations, Markov chains, the white noise model and Gaussian time series. After this we discussed more concrete examples of priors, in particular priors obtained from mixing given distributions with Dirichlet process weights, and series expansion priors. We closed the talk with results on adaptation by Bayesian methods, consisting of putting a prior on each model in a given list of models and next weights on the index of the list. If the true density belongs to a given element from the list, then given appropriate weights, the posterior distribution may concentrate at the truth at the rate of this given model.

Semiparametrically efficient permutation tests

Marc Hallin (Bruxelles)

Semi-parametric models typically involve a finite-dimensional parameter $\theta \in \Theta \subset \mathbb{R}^k$, along with an infinite-dimensional nuisance parameter f. Quite often, the submodels corresponding to a fixed value of θ, possess a group structure that induces a maximal invariant σ-field $\mathcal{B}(\theta)$. In classical examples, where f denotes the density of some independent and identically distributed innovations, $\mathcal{B}(\theta)$ is the σ-field generated by the ranks of the residuals associated with the parameter value θ. It is shown that semi-parametrically efficient distribution-free inference procedures can generally be constructed from parametrically optimal ones by conditioning on $\mathcal{B}(\theta)$; this implies, for instance, that semi-parametric efficiency (at given θ and f) can be attained by means of rank-based methods. The same procedures, when combined with a consistent estimation of the underlying nuisance density f, yield conditionally distribution-free semi-parametrically efficient inference methods, for example, semi-parametrically efficient permutation tests. Remarkably, this is achieved without any explicit tangent space or efficient score computations, and without any sample-splitting device.

Efficient prediction in nonlinear autoregressive models

Wolfgang Wefelmeyer (Siegen)
(joint work with Ursula U. Müller (Bremen) and Anton Schick (Binghamton))

For time series driven by independent observations, the classical estimators are typically far from efficient. In such models, it is better not to use the observations directly. Instead, estimation should be based on residuals, i.e. on pseudo-observations. We illustrate this point with the problem of prediction in nonlinear autoregressive models. Conditional expectations given past observations in such models are usually estimated directly by kernel estimators, or by plugging in kernel estimators for transition densities. We show that appropriate smoothed and weighted von Mises statistics of residuals estimate conditional expectations at better, parametric, rates and are asymptotically efficient. The proof is based on a uniform stochastic expansion for smoothed and weighted von Mises processes of residuals.

Spacings and the Riemann zeta function

Paul Deheuvels (Bourg-la-Reine)
(joint work with G. Derzko)

Let $0 < U_{1,n} < \dots U_{n,n} < 1$ be the order statistics based upon the first $n \geq 1$ observations from an i.i.d. sequence of uniform $(0,1)$ r.v's. Set $U_{0,n} = 0$ and $U_{n+1,n} = 1$ for $n \geq 0$, and define the uniform spacings of order $n \geq 1$ by $S_{i,n} = U_{i,n-1} - U_{i-1,n-1}$. We consider the statistic

$$\mathcal{C}_n = \sum_{i=1}^{n-1} \{-\log(n\, S_{i,n})\}$$

introduced by Mozan (1951), Darling (1953) and Blumenthal (1968), and obtain its exact distribution for finite n by showing that, for $s < 1$,

$$E(exp(s\mathcal{C}_n)) = \Gamma(1-s)^n \{ \frac{n^{-ns}\Gamma(n)}{\Gamma(n(1-s))} \} \ .$$

This allows to evaluate the cumulants $K_{k,n}$ of $\mathcal{C}_n$ in closed form, and to show that, as $n \to \infty$,

$$K_{k,n} = n(k-1)! \{ \zeta(k) - \frac{1}{k-1} + O(1) \} \ \text{ for } \ k \geq 2 \ \text{ and } K_{1,n} = n\gamma + O(1) \ ,$$

where $\zeta(r) = \sum_{j=1}^{\infty} \frac{1}{j^r}$ $(r > 1)$ is Riemann's zeta function, and γ is Euler's constant. As $n \to \infty$, $n^{\frac{1}{2}}(\mathcal{C}_n - n\gamma) \xrightarrow{d} N(0, \frac{\pi^2}{6} - 1)$. An extended version of this result when the spacings are generated from r.v's with density f was studied by several authors, from Blumenthal (1968) to Shao and Hahn (1995). We provide the weakest possible conditions on f to render this limit law valid.

Reference: Deheuvels, P. and Derzko, G. (2003). Exact laws for sums of logarithms of uniform spacings. Austrian J. Statistics. 32 29-47

Adaptive Bayes fits to incomplete unbalanced multi-way layouts

Rudolf J. Beran (Davis)

This talk develops low-risk adaptive Bayes fits to large discrete multi-way layouts, possibly unbalanced or incomplete or both, whose factor levels may be ordinal or nominal or both. Prior distributions that express competing notions about the smoothness and about the interactions (in the ANOVA sense) among the unknown means yield candidate Bayes estimators of these means. Minimizing estimated frequentist risk under a general model for the observed multi-way layout selects the adaptive Bayes fit from the class of candidate Bayes estimators. As the number of factor levels tends to infinity, the risk of the adaptive Bayes fit converges to the minimum risk attainable over the candidate class.

Estimation and testing with interval censored data

Jon A. Wellner (Seattle)

Suppose that X is a random variable (a "survival time") with distribution function F and Y is an independent random variable (an "observation time") with distribution function G. Suppose that we can only observe (Y, Δ) where $\Delta = 1_{[X \le Y]}$, and our goal is to estimate the distribution function F. The Nonparametric Maximum Likelihood Estimator (NPMLE) $\widehat{F}_n$ of F was described in 1955 in papers by Ayer, Brunk, Ewing, Reid, and Silverman, and by C. van Eeden.

A further problem involves inference about the function F at a fixed point, say t_0. If we consider testing $H : F(t_0) = \theta_0$, then one interesting test statistic is the likelihood ratio statistic

$$\lambda_n = \frac{\sup_F L_n(F)}{\sup_{F:F(t_0)=\theta_0} L_n(F)} = \frac{L_n(\widehat{F}_n)}{L_n(\widehat{F}_n^0)}.$$

This involves the additional problem of *constrained* estimation: we need to find the NPMLE $\widehat{F}_n^0$ of F subject to the constraint $F(t_0) = \theta_0$. Inversion of the likelihood ratio tests leads to natural confidence intervals for $F(t_0)$.

Even though the problem of estimating F is non-regular, with associated rate of convergence $n^{-1/3}$ rather than the usual $n^{-1/2}$, the likelihood ratio statistic λ_n has a limiting distribution analogous to the usual χ_1^2 distribution for regular problems which is free of all nuisance parameters in the problem, and this leads to especially appealing tests and confidence intervals for $F(t_0)$.

In this talk I will describe the estimator $\widehat{F}_n$ and its constrained counterpart $\widehat{F}_n^0$, and discuss the asymptotic behaviour of these estimators and the log-likelihood ratio statistic $2 \log \lambda_n$. If time permits I will sketch the position of this problem in a wider context and briefly mention a number of open problems.

Bootstrap measures of prediction error for censored data models

Thomas Gerds (Freiburg)

The apparent error problem is most prominent when testing the predictive power of a regression model: measures of prediction error such as mean square error of prediction are typically underestimated when the estimator depends on the same data that was used for building the model and the predictions. Resampling is an approved method to control the problem.

In situations with censored response, in particular with right censored survival data, assessment of the predictive accuracy of regression models can be done with the Brier score. Nonparametric estimation of the prediction error, defined as the expected Brier score, is quite involved if the censoring mechanism depends on continuously distributed predictors. However, inverse probability of censoring weighted estimators, where the Stone-Beran estimator estimates the conditional censoring distribution, are seen to be regular Gaussian linear. Thus, development of bootstrap central limit theorems for these estimators appears to be an application of modern empirical process theory. Then resampling plans, such as Efron's 0.632 bootstrap estimate, can be investigated to reduce the apparent error bias, avoiding an undesirable split of the sample into build and validation data. Furthermore, bootstrap confidence intervals for prediction error shall be compared to estimates motivated by asymptotic expansions.

Tests for establishing compatibility of an observed genotype distribution with Hardy-Weinberg equilibrium in the case of a biallelic locus

Stefan Wellek (Mannheim)

The classical chi^2-procedure for the assessment of genetic equilibrium is tailored for establishing lack rather than goodness of fit of an observed genotype distribution to a model satisfying the Hardy-Weinberg law, and the same is true for the exact competitors to the large-sample procedure which have been proposed in the biostatistical literature since the late nineteen thirties. In this contribution, the methodology of statistical equivalence testing is adopted for the construction of tests for problems in which the assumption of approximate compatibility of the genotype distribution actually sampled with Hardy-Weinberg equilibrium (HWE) plays the role of the alternative hypothesis one aims to establish. The result of such a construction highly depends on the choice of a measure of distance to be used for defining an indifference zone containing those genotype distributions whose degree of disequilibrium shall be considered irrelevant. The first such measure proposed here is the Euclidean distance of the true parameter vector from that of a genotype distribution with identical allele frequencies being in strict HWE. The second measure is based on the (scalar) parameter of the distribution first introduced into the present context by W.L. Stevens (1938, *Annals of Eugenics* **8**, 377-383). The first approach leads to a nonconditional test (which nevertheless can be carried out in a numerically exact way), the second to an exact conditional test shown to be UMPU for the associated pair of hypotheses. Both tests are compared in terms of the exact power attained against the class of those specific alternatives under which HWE is strictly satisfied.

Statistical inference for Lévy-type stochastic volatility models using power variation

Jeannette Woerner (Oxford)

Stochastic volatility models for Lévy processes have become increasingly popular recently, since they combine the desirable properties of stochastic volatility models and pure jump Lévy processes. We provide consistency and asymptotic normality for an estimate of the integrated volatility based on the p-th power variation. This estimator is the sum of the p-th power of the absolute value of the returns of the log-price process using high frequency data, possibly irregularly spaced. In addition we discuss the negligibility of different mean processes including jumps or a fractional Brownian motion component. This can be interpreted as flexibility in modelling or robustness against additive noise. Furthermore, the same method can be used to estimate the scale parameter in purely discontinuous Lévy processes.

Collecting a batch of items on a warehouse carousel

Willem van Zwet (Leiden)

(joint work with Nelly Litvak)

A carousel is an automated storage and retrieval system that is widely used in modern warehouses. The system consists of a circular disk with a large number of shelves or drawers along its circumference. The disk can rotate in either direction past a picker who has a list of items to be collected from n different drawers. We model this process by assuming that the picker occupies a fixed position along a circle and that the n drawers to be visited are distributed independently and uniformly along the circle. The picker will take the shortest route from his starting position past each of the n drawers, possibly reversing the direction of the movement during the process. We determine the probability distribution of the shortest route and discuss its asymptotic behaviour as n tends to infinity. Along the way, we encounter a rather curious property of exponentially distributed random variables and a probability distribution with a most unusual behaviour linked to Jacobi's theta functions.

Edited by Heinz Weisshaupt

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