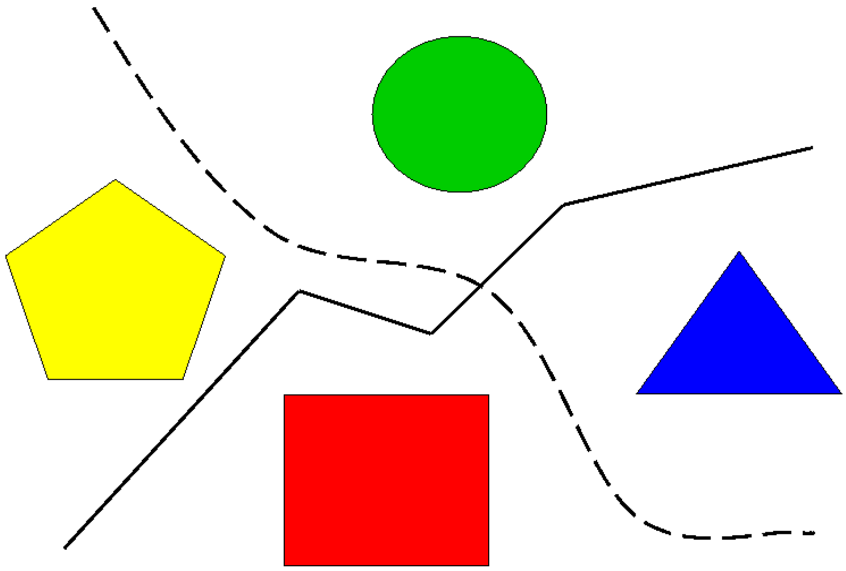
technische universität dortmund

Fakultät Statistik

6. Herbstkolloquium des Graduiertenkollegs "Statistische Modellbildung"



Statistische Modellbildung

Zu diesem Kolloquium wird eingeladen

Freitag / Samstag, 20./21. November 2009

UNIVERSITÄTSKOLLEG BOMMERHOLZ

- Lehr- und Weiterbildungsstätte der Universität Dortmund -

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Statistische Modellbildung

6. Herbstkolloquium des Graduiertenkollegs "Statistische Modellbildung"

Freitag, 20. November 2009

Abfahrt nach Witten: ab Dortmund gegen 14.00 Uhr

Vortragsprogramm I

15:15	**Begrüßung** **Prof. Dr. Joachim KUNERT**	
15:30	**Dr. Andreas FALDUM** *IMBEI, Universitätsmedizin* *Johannes Gutenberg-Universität Mainz*	**Strategies for including patients recruited during interim analysis of clinical trials**
16:15	**Dr. Harald BINDER** *Institut für Medizinische Biometrie und Medizinische Informatik* *Universitätsklinikum Freiburg* *Freiburger Zentrum für Datenanalyse und Modellbildung* *Albert-Ludwigs-Universität Freiburg*	**Estimating regression models by likelihood-based boosting**
17:00	**Dr. Marco GRZEGORCZYK** *Fakultät Statistik* *Technische Universität Dortmund*	**Modelling non-stationary gene regulatory processes**

Diskussion zu den Projektbereichen

19:00 **Posterausstellung:**
Präsentation der Dissertationsprojekte im Kolleg, Diskussion in Arbeitsgruppen

Samstag, 21. November 2009

Vortragsprogramm II

9:00	**Dr. David GINSBOURGER** *Centre d'Hydrogéologie et de Géothermie* *Université de Neuchâtel, CH*	**Towards Gaussian Process-based Optimization with Finite Time Horizon**
9:45	**Dr. Olivier ROUSTANT** *Ecole des Mines, Département 3MI* *St.Etienne, F*	**Computation of Sobol indices with a Gaussian Process metamodel**
10:30	***Pause***	

Vortragsprogramm III

11:00	**Prof. Dr. Dibyen MAJUMDAR** *Department of Mathematics, Statistics and Computer Science* *University of Illinois at Chicago, U.S.A.*	**Optimal designs for two level factorial experiments with binary response**
11:45	**Dr. Michael MEYNERS** *Nestlé Research Center* *Lausanne, CH*	**Statistical inference for Temporal Dominance of Sensations (TDS) data**
12:30	***Pause***	
13:15	***Gruppenfoto auf der Terrasse (wetterabhängig)***	

Vortragsprogramm IV

13:30	**Prof. Dr. Anurag BANERJEE** *Department of Economics and Finance* *Durham University, U.K.*	**Sensitivity of statistics against nuisance parameters: Measurement and solution**
14:15	**Prof. Dr. Christian KLEIBER** *Wirtschaftswissenschaftliches Zentrum* *Universität Basel, CH*	**A majorization approach to Condorcet jury theorems**
15:00	**Prof. Dr. Rafael WEISSBACH** *Wirtschafts- und Sozialwissenschaftliche Fakultät, Universität Rostock*	**A Likelihood Ratio test for Stationarity of Rating transitions**
15:30	***Kaffeetrinken, Abschlussbesprechung und Diskussion***	

Sensitivity of statistics against nuisance parameters: Measurement and Solution

Anurag Banerjee
Department of Economics and Finance
Durham University, U.K.

Econometric estimates or decisions are applicable if they are not sensitive to small changes of "nuisance" parameters. The statistic which measures these violations is called a sensitivity measure. We define such a measure and analyse its properties. If the measure suggests that when the sensitivity statistic is "small", we need not change the assumptions on the nuisance parameters. We also to propose a correction factor for the statistic of interest if we find "large" sensitivity. We shall define such an estimator and analyse its properties.

Estimating regression models by likelihood-based boosting

Harald Binder (1,2)
1) Institut für Medizinische Biometrie und Medizinische Informatik, Universitätsklinikum Freiburg
2) Freiburger Zentrum für Datenanalyse und Modellbildung, Albert-Ludwigs-Universität Freiburg

Boosting techniques are based on the powerful idea of fitting several predictive models in a stepwise procedure, where each fit improves for observations that were fitted badly by the previous fits. An overall fit then is obtained by combining all fitted models. Given that each fit is additive in the covariate effects, the overall fit will be an additive regression model, providing simple structure. Likelihood-based boosting incorporates previous boosting steps as an offset into maximum likelihood estimation. Therefore, it is applicable to many classical regression models, allowing for estimation where standard maximum likelihood techniques fail. This will be illustrated using application examples with high-dimensional covariate vectors. Specifically, predictive survival models will be built from gene expression data. There, the proposed boosting techniques also allow to incorporate various sources of additional knowledge.

Strategies for including patients recruited during interim analysis of clinical trials

Andreas Faldum
Universitätsmedizin der Johannes Gutenberg-Universität Mainz
Institut für Medizinische Biometrie Epidemiologie und Informatik

In clinical trials a periodical check of safety and efficacy data is often needed. For organizational reasons it is rarely desirable to stop a trial during such an interim analysis. Therefore, new study patients are included in the trial while the interim analysis is ongoing. Disregarding the additional information provided by these interim patients would be unsatisfactory, especially for an office of regulatory affairs. Consequently, the rules for group sequential or adaptive decisions must be adjusted to the recruitment of interim patients.
In the context of two prospective randomised adaptive trials, different modifications of the conditional error function are discussed to consider the analysis of interim patients. The impact of the proposed modifications on power and sample size is demonstrated. With an adequate consideration of interim patients the maximum sample size can be reduced considerably and a sufficient conditional power of the second stage is guaranteed.

Towards Gaussian Process-based Optimization with Finite Time Horizon

David Ginsbourger
Centre d'Hydrogéologie et de Géothermie
Université de Neuchâtel, CH

During the last decade, Kriging-based sequential algorithms like EGO and its variants have become reference optimization methods in computer experiments. Such algorithms rely on the iterative maximization of a sampling criterion, the expected improvement (*EI*), which takes advantage of Kriging conditional distributions to make an explicit trade-off between promizing and uncertain search space points. We have recently worked on a multipoints *EI* criterion meant to simultaneously choose several points, which is useful for instance in synchronous parallel computation. The research results that we wish to present on the occasion of this talk concern sequential procedures with a fixed number of iterations. We claim that maximizing the 1-point criterion at each iteration (*EI* algorithm) is suboptimal. In essence, the latter amounts indeed to considering the current iteration as the last one. During this talk, the problem of optimal strategy for finite horizon sequential optimization will be formulated, its solution will be provided in terms of multipoints *EI*, and the suboptimality of the usual *EI* algorithm will be illustrated on the basis of a first counter-example.

Modelling non-stationary gene regulatory processes

Marco Grzegorczyk
Fakultät Statistik
TU Dortmund

One goal in systems biology is to infer regulatory networks from postgenomic data. Bayesian networks have been widely applied as a popular tool to this end. To obtain a closed-form expression of the marginal likelihood two probabilistic models with their respective conjugate prior distributions have been employed: the multinomial BDe and the Gaussian BGe scoring metric. These scores are restricted in that they either require a data discretisation (BDe) or can only capture linear relationships (BGe). In an earlier work we proposed a generalisation of BGe based on a combination of a mixture model and the allocation sampler. In the BGM model data points are allocated to different compartments (subsets) by a free individual allocation sampler, and the same single network structure is inferred for all compartments. Given the network structure each compartment is modelled separtately and independently with the Gaussian BGe model. The fixation of the network allows for some information sharing among compartments. This work specialises the BGM model with respect to dynamic gene regulatory networks by replacing the free allocation model by a changepoint process that takes the time structure into account. We also show that discrete counterparts of the free allocation model BGM and the novel changepoint process model BGMD, which employ the multinomial BDe score for modelling the data compartments, can be used for inferring non-stationary regulatory proceeses from discrete expression data.

A majorization approach to Condorcet jury theorems

Christian Kleiber
Wirtschaftswissenschaftliches Zentrum
Universität Basel, CH

The partial order of majorization is omnipresent in applied mathematics, statistics and various fields of application. It suggests comparing two given vectors, for example representing the incomes of two populations, by comparing the partial sums of their ordered entries. Among other applications, majorization can be used to study probability inequalities for sums of heterogeneous Bernoulli variables. These arise in the context of the 'Condorect jury theorem', a political science theorem about the relative probability of a given group of individuals arriving at a correct decision. This talk shows how majorization inequalities can shed new light on Condorcet jury theorems for heterogeneous juries.

Optimal designs for two level factorial experiments with binary response

Dibyen Majumdar
Department of Mathematics, Statistics and Computer Science
University of Illinois at Chicago, U.S.A.

We consider the problem of finding locally D-optimal designs for two level factorial experiments with binary response using a generalized linear model. The optimal designs are obtained using analytic and computational methods. The optimal designs depend on the initial values of the parameters and the choice of the link function. The robustness of the designs is studied. In this talk we will focus on the case of two factors. This is ongoing work with Abhyuday Mandal and Jie Yang.

Statistical inference for Temporal Dominance of Sensations (TDS) data

Michael Meyners
Nestlé Research Center
Lausanne, CH

Temporal dominance of sensations (TDS) is a recently developed sensory test procedure. Throughout a certain period, subjects are asked to judge continuously which out of a few attributes (up to 8, say) is the dominant one, and also to rate the intensity of the dominant attribute. Usually considered periods of interest include the mastication period and the aftertaste period.

Up to now, statistical analysis is confined to a description of the data, the depiction of the average dominance curves, and some rough cut-off limits based on the binomial law. We propose an appropriate and valid set of statistical tests that allows the investigation of overall differences as well as of differences between pairs of products. Next to a general test, inferential methods per attribute, per time point and per attribute by time point are suggested. All tests are based on the general notion of randomization tests (cf. Edgington & Onghena, 2007), and they are valid level-α tests by themselves. Without correction for multiplicity, the set of tests of course does not respect the family-wise significance level. Strict corrections (like Hommel's, 1988) or corrections based on the false discovery rate (Benjamini & Hochberg, 1995) can be applied to the findings to reduce the risk or incidence rate of false positive results.

To start the presentation, the concept of TDS will be introduced. We then motivate the assumption that the time periods are standardized across subjects and products, such that each observation has a fixed number of time

points. The impact of this assumption will be briefly discussed. Furthermore, we confine ourselves to the pure choice of attributes and neglect the intensity scores for the remainder, but will discuss some generalizations in this regard towards the end of the presentation.

We describe how the TDS sequences are unfolded to data matrices with a single non-zero entry per time point (column). The sum of the Euclidean distances between these matrices is determined and serves as a test statistic for the global test. Similar statistics can be used for pairwise comparisons and for inference by attribute or time point. Re-randomizations are used to determine the null distribution and p values for each hypothesis under consideration, taking the original restrictions of the randomization into account. We also propose a simple graphical method to summarize the many p values derived from this approach (usually at least hundreds, but more often several thousands). An application to real data is shown to give reasonable and easily interpretable results.

- Benjamini, Y., & Hochberg, Y. (1995). Controlling the false discovery rate: a practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society Series* B, **57**, 289–300.
- Edgington E, & Onghena P (2007). *Randomization tests*. 4th ed., Chapman & Hall/CRC.
- Hommel, G. (1988). A stagewise rejective multiple test procedure based on a modified Bonferroni test. *Biometrika*, **75**, 383–386.

Computation of Sobol indices with a Gaussian Process metamodel

Olivier Roustant
Ecole des Mines, Département 3MI
St-Etienne, F

When using time expensive computer codes, performing a global sensitivity analysis directly on the code may be untractable. To overcome that problem, an approach is to replace the code by a quick-to-evaluate metamodel. In this talk we focus on the famous Gaussian process (GP) model, coming from kriging, and address some computations issues. First, when replacing the code by the GP mean, we explain how to obtain analytical expressions of Sobol indices, under suitable assumptions. We give the computation details for the indices corresponding to main effects and interactions. In the second part, we discuss some extensions - what's happening when adding a linear trend to the model? When replacing the code by the global GP (and not only its mean)? - and some practical limitations.

A Likelihood Ratio Test for Stationarity of Rating Transitions

Rafael Weißbach
Wirtschafts- und Sozialwissenschaftliche Fakultät
Universität Rostock

We study the time-stationarity of rating transitions, modelled by a time-continuous discrete-state Markov process and derive a likelihood ratio test. For multiple Markov processes from a multiplicative intensity model, maximum likelihood parameter estimates can be written as martingale transform of the processes, counting transitions between the rating states, so that the profile partial likelihood ratio is asymptotically chi-square-distributed. An application to an internal rating data set reveals highly significant instationarity.