

Contents

1	INTRODUCTION	3
2	PERSONNEL	5
3	THE INSTITUTE OF ACTUARIAL SCIENCE	10
4	PUBLICATIONS AND EDITING ACTIVITIES	11
	4.1 Discussion Papers	11
	4.2 Consulting Reports	21
	4.3 Published Papers	22
	4.4 Books published by members of the Institute	24
	4.5 Editing activities	25
5	SEMINARS, WORKSHOPS AND SHORT COURSES	26
	5.1 Statistics Seminars	26
	5.2 Joint Statistics and Econometrics Seminars	28
	5.3 Joint Statistics Seminars and Institut de Mathématique Pure et Appliquée	28
	5.4 Applied Statistics Workshops	28
	5.5 Doctoral Seminars	29
	5.6 Short courses	30
6	DOCTORATES	32
	6.1 Doctors honoris causa	32
	6.2 Doctoral dissertations	32
	6.3 Ph.D thesis in progress	32
7	CONTACT DAYS AND CONFERENCES	35
	7.1 FNRS contact day : “Statistical analysis of brain signals”	35
	7.2 FNRS contact day devoted to Insurance	36
	7.3 First Young Researchers Day (YRD)	37
8	ACADEMIC VISITS	39
9	CONFERENCES AND MEETINGS	41
10	RESEARCH PROJECTS UNDER CONTRACTS AND COOPERATION PROJECTS	46
11	ACTIVITIES IN APPLIED STATISTICS	49
	11.1 Services for the Université catholique de Louvain	49
	11.2 Applied research contracts	49
	11.3 Consulting for firms and public organisms	54
	11.4 Continued education for companies	54

1 INTRODUCTION

The following report briefly describes the results of the research activities concerning the year 2003.

Presentation

The Institut de statistique has been created in 1992. It coordinates and organises all the statistical activities at the Université catholique de Louvain: research, teaching and consulting.

Research

The research activities of the Institute cover a large number of fields. A major part of the activities are centered on mathematical statistics (semi- and non-parametric statistics, bayesian statistics, multivariate analysis, regression estimation, mixtures models, survival analysis, time series, ...) with important implications in various fields of application (econometrics, biostatistics, insurance, industrial statistics, transportation problems,...).

Since January 2002, the Institut de statistique has been the coordinator of an IAP network : “Statistical techniques and modeling for complex substantive questions with complex data”.

This network includes 6 institutions : Université catholique de Louvain (Belgium), Katholieke Universiteit Leuven (Belgium), Limburgs Universitair Centrum (Diepenbeek, Belgium), Université Libre de Bruxelles (Belgium), Aachen Technical University (Germany) and Université Joseph Fourier (Grenoble, France).

Teaching

In the field of teaching, the activity of the Institute is as follow:

- basic education
- second cycle education
- third cycle education.

Concerning the first and second cycle studies, the Institute is responsible for the organisation of probability and statistics courses offered at the university. Moreover, the Institute organises second and third cycle studies: the “diplôme d’études complémentaires en statistiques” (DEC), the “diplôme d’études approfondies en statistique” (DEA) with several orientations and the “doctorat en statistique”. Since the academic year 2002-2003, the Ph. D. degree has been organised within the context of the Graduate School in Statistics.

More information concerning the programs in statistics is available on the webpage <http://www.stat.ucl.ac.be/>.

Consulting

The Institute offers consulting services to researchers using statistics in their profession. This service includes discussions on statistical problems encountered by researchers working at other departments or laboratories of the Université catholique de Louvain. Consulting services are also offered to business cooperations searching for support in dealing with statistical questions. Furthermore, service courses (continued education) are provided for interested groups.

Other events of the year 2003

During this year, the Institut de statistique has organised several conferences (described in section 7 in this report) :

- An FNRS contact day, Group of Statistical Analysis, on April 11, 2003, Louvain-la-Neuve, on the theme Statistical Analysis of Brain Signals. This one-day conference was organised with the support of the FNRS and Eli Lilly ;
- An FNRS contact day on May 7, 2003, Louvain-la-Neuve, on the theme Actuarial Sciences. This one-day conference was organised with the support of the FNRS and of the reinsurer Secura Belgian Re ;
- The 1st Young Researchers Day (YRD) on May 19, 2003, Louvain-la-Neuve, on the themes Nonparametric Approaches in Survival Analysis and Synchronisation and Shape Analysis in Biostatistics. This meeting was supported by the Graduate School of Statistics of the Institut de statistique and by SAS. It was also a FNRS contact day, Group of Statistical Analysis.

Miscellany

Professor I. GIJBELS received a “Crédit aux Chercheurs” from the National Science Foundation, Belgium, for the period 2003 - 2006.

Professor I. VAN KEILEGOM was offered extramural fellowship of CentER, Faculty of Economics and Business Administration, Tilburg, The Netherlands, for a period of five years (until January 2009).

In December 2003, N. FRANCOIS received the Junior award for her oral presentation at the meeting Chimométrie 2003, Paris, France.

2 PERSONNEL

Academic Members

Michel DENUIT
Dominique DEPRINS
Irène GIJBELS
Bernadette GOVAERTS
Philippe LAMBERT (Academic Secretary)
Michel MOUCHART
Christian RITTER
Jean-Marie ROLIN
Léopold SIMAR (Chairman)
Ingrid VAN KEILEGOM
Rainer von SACHS

Associate Academic Members

Luc BAUWENS, Faculty of Economical, Social and Political Sciences
Patrick BOGAERT, Faculty of Biological, Agronomic and Environmental Engineering
Jean-Marie de KETELE (em.), Faculty of Psychology
Eric LE BOULENGE, Faculty of Sciences
Robert PEETERS (em.), Faculty of Economical, Social and Political Sciences
Annie ROBERT, Faculty of Medicine

Invited Academic Members

Libei CHEN
Gerda CLAESKENS, OSTC return grant
Anne DE FRENNE
Anne-Cécile GODERNIAUX

Emeritus Professor

José PARIS (em. 1998)

Researchers and Doctoral Students

Carlos ALMEIDA

Taoufik BOUEZMARNI

Natacha BROUHNS

Céline BUGLI

Nicolas BUYSE

Cindy COURTOIS

Aurore DELAIGLE

Véronique DELOUILLE

Antoine DELWARDE

Isabelle DE MACQ

Anouar EL GHOUC

Nancy FRANCOIS

Géry GEENENS

Cédric HEUCHENNE

Astrid JULLION

Maria KEY PRATO

Alexandre LAMBERT

Céline LE BAILLY DE TILLEGHEM

Xavier MARECHAL

Abderrahim OULHAJ

Oana PURCARU

Giovanna SANTAMARIA

Abdelouahid TAJAR

Bianca TEODORESCU

Sébastien VAN BELLEGEM

Marie VANDRESSE

Postdoctoral Researchers

Jérémie BIGOT

Seok-Oh JEONG

Abderrahim OULHAJ

Associate Researchers

Maria KEY PRATO (since September 1st, 2003)

Philippe VANDEN EECKAUT

François VANDENHENDE

Computer Scientists

Laurent Buset

Eric LECOUTRE

Jean-Luc MARRION (Responsible)

Jean-Marie ZELIS (Responsible of the University statistical server)

Administrative Responsible

Dominique ANDRE

Administrative Staff

Anne BALFROID

Anne-Marie BELLEMANS

Monique DESCAMPS

Sophie MALALI

Short Term Visitors

Michaël G. AKRITAS¹, Pennsylvania State University, University Park,
USA

Luiza BADIN², Academia de Studii Economice, Bucharest, Romania

¹Financed by the FNRS, Belgium

²Financed by an Inco-Copernicus project

Sylvain BAILLET³, CNRS, Paris, France
Peter BOIEIJINGA³, FORENAP Research Institute for Neurosciences,
Rouffach, France
Ricardo CAO-ABAD, Universidade La Coruña, Spain
Raymond CARROLL⁴, Texas A& M University, College Station, USA
Arthur CHARPENTIER, ENSAE, Paris, France
Daniela COCCHI⁵, University of Bologna, Italy
Rainer DAHLHAUS, University of Heidelberg, Germany
Michel DELECROIX, ENSAI, Bruz, France
Ian L. DRYDEN³, University of Nottingham, United Kingdom
Paul EILERS, University of Leiden, The Netherlands
Jiti GAO, University of Western Australia, Crawley
Wenceslao GONZALEZ MANTEIGA, University of Santiago de Com-
postela, Spain
Joël HOROWITZ⁴, Northwestern University, Evanston, USA
Alois KNEIP⁴, University of Mainz, Germany
Valentin KONAKOV, Academy of Sciences, Moscow, Russia
Sokbae Simon LEE, University College London, United Kingdom
Djamal LOUANI, University of Reims, France
Ian McKEAGUE⁶, Florida State University, USA
Guy NASON, Bristol University, United Kingdom
Erich NEUWIRTH, University of Vienna, Austria
Byeong PARK, Seoul National University, South Korea
Valentin PATILEA⁷, University of Orleans, France
Peihua QIU⁶, University of Minnesota, Minneapolis, USA
Cesar SANCHEZ SELLERO, University of Santiago de Compostela,
Spain

³Financed by the FNRS, Belgium

⁴Financed by the Institut de mathématique pure et appliquée (MAPA), UCL

⁵Financed by the Socrates Program, EU

⁶Financed by the Graduate School in Statistics

⁷Financed by an Inco-Copernicus project

Ernesto SAN MARTIN⁸, Pontifica Universidad de Chile, Santiago
Robin SICKLES, Rice University, Houston, USA
Lukas STEINMANN, University of Zurich, Switzerland
Konstantinos TRIANTIS, Virginia Tech University, USA
Claus WEIHS, University of Dortmund, Germany
Paul W. WILSON, University of Texas, Austin, USA
Valentin ZELENYUK, National University “Kyiv-Mohyla Academy”,
Ukraine

Doctoral Visitors

Abdelaati DAOUIA, GREMAQ, Toulouse, France
Cinzia DARAIO, Scuola Superiore S. Anna, Pisa, Italy
J.C.P. FERNANDEZ, E.U. Enxeneria Tecnica Industrial, Vigo, Spain
Angelina MAZZOCHETTI, University of Bologna, Italy

⁸Financed by an OSTC project (promoter: M. Mouchart)

3 THE INSTITUTE OF ACTUARIAL SCIENCE

Since 2002, the Institute of Actuarial Science is run by the Institut de statistique in collaboration with the UCL Business School (IAG).

The Institute organizes the actuarial studies in Louvain-la-Neuve. This two-year programme at Master's level allows to get a diploma recognised by the Belgian Society of Actuaries to become a fully qualified actuary, as well as by the Belgian Regulatory Authorities to be certified Appointed Actuary. The Institute also develops research programs in the field and offers services to the community.

Those readers interested in a thorough description of the activities of the Institute of Actuarial Science are invited to send an email to info@actu.ucl.ac.be or to browse the website <http://www.actu.ucl.ac.be> where more information is available.

4 PUBLICATIONS AND EDITING ACTIVITIES

The Institute publishes a Discussion Papers series and a Reprint series. The papers in both series are the output from the statistical research activities. Many collaborations (national and international) are going on with researchers from abroad. The following Discussion Papers and Reprints were issued during the period concerned by this report.

4.1 Discussion Papers

0301. DE MACQ, I. and L. SIMAR, Hyper-rectangular space partitioning trees : a practical approach.

The process of computation of classification trees can be characterized as involving three basic choices : the type of splits considered in the growing process, the criterion to be optimized at each step of the process, and the way to get right-sized trees. Most implementations are ordinary binary trees, i.e. trees whose successive cuts are made by hyper-planes perpendicular to the axes, while most of the literature concerns the various possible criteria and pruning methods. L. Devroye, L. Györfy and G. Lugosi (1996) define and consider the remarkable theoretical properties of a binary tree classifier whose prominent feature is the particular type of splits used in its construction : at a given node, partitioning is made by hyper-rectangles rather than hyper-planes. We propose an approximation of the solution for the complex optimization problem involved to allow insights on the practical advantages of those trees. Then we compare the performance of our algorithm with some leading algorithms for ordinary binary trees, namely CART and C4.5 as implemented in the Splus "tree" procedure and in SAS's Entrepise Miner respectively. For this purpose, data sets which traditionally enhance the weaknesses of classification trees are used, as well as data sets commonly used for comparisons.

0302. CEBRIAN, A.C., DENUIT, M. and Ph. LAMBERT, Analysis of bivariate tail dependence using extreme value copulas : an application to the SOA medical large claims database.

The aim of this work is to analyze the dependence structure between losses and ALAE's relating to large claims using extreme value copulas. We propose a procedure to select and estimate the copula based on a parametric estimation of the dependence function. An application to the evaluation of reinsurance premiums is performed in group medical insurance. It clearly enhances the relevance of the approach.

0303. PITREBOIS, S., DENUIT, M. and J-F. WALHIN, Setting a bonus-malus scale in the presence of other rating factors : Taylor's work revisited.

In this paper, we propose an analytic analogue to the simulation procedure described in Taylor (1997). We apply the formulas to a Belgian data set and discuss the interaction between a period and a posteriori ratemakings.

0304. DENUIT, M. and S. LANG, Nonlife ratemaking with bayesian GAM's.

This paper aims to propose modern ratemaking techniques based on Generalized Additive Models (GAM's). The method accounts for discrete, continuous, categorical and spatial risk factors in a Bayesian framework. It uses computer-intensive simulation methods for statistical inference. Numerical illustrations based on a Belgian automobile portfolio enhance the interest of the approach.

0305. DELOUILLE, V., JANSEN, M. and R. von SACHS, Second generation wavelet methods for denoising of irregularly spaced data in two dimensions.

We treat bivariate nonparametric regression, where the design of experiment can be arbitrarily irregular. Our method uses second-generation wavelets built with the lifting scheme: starting from a simple initial transform, we propose to use some predictor operators based on a generalization in two dimensions of the Lagrange interpolating polynomial. These predictors are meant to provide a smooth reconstruction. Next, we include an update step which helps to reduce the correlation amongst the detail coefficients, and hence stabilizes the final estimator. we use a Bayesian thresholding algorithm to denoise the empirical coefficients, and we show the performance of the resulting estimator through a simulation study.

0306. BOUEZMARNI, T. and O. SCAILLET, Consistency of asymmetric kernel density estimators and smoothed histograms with application to income data.

We consider asymmetric kernel density estimators and smoothed histograms when the unknown probability density function f is defined on $[0, +\infty)$. Uniform weak consistency on each compact set in $[0, +\infty)$ is proved for these estimators when f is continuous on its support. Weak convergence in L_1 is also established. Finally we prove that the asymmetric kernel density estimator and the smoothed histogram converge in probability to infinity at $x = 0$ when the density is unbounded at $x = 0$. Monte Carlo results and an empirical study of the shape of a highly skewed income distribution based on a large micro-data set are finally provided.

0307. SIMAR, L. and P.W. WILSON, Estimation and inference in two-stage, semi-parametric models of production processes.

plethora papers have used multi-stage estimation procedures where non-parametric estimates productive efficiency obtained the first stage and then regressed environmental variables subsequent stage in attempts account exogenous factors that might affect firms' performance. None these papers have described coherent data-generating process (DGP). Moreover, conventional approaches to inference employed these papers invalid due complicated, unknown serial correlation among estimated efficiencies. We first describe a DGP wherein firms' efficiencies influenced environmental variables. We then propose single a double bootstrap procedure; both permit valid inference, double bootstrap procedure improves statistical efficiency the second-stage regression. We examine the statistical performance of estimators using Monte Carlo experiments.

0308. BOUEZMARNI, T. and J.M. ROLIN, Bernstein estimator for unbounded density function.

The nonparametric estimation for an unknown probability density function f with a known compact support $[0, 1]$ not necessarily bounded at $x = 0$ is considered. For such class of density functions, we consider the Bernstein estimator. The uniform weak consistency and the uniform strong consistency on each compact I in $(0, 1)$ are established for the Bernstein estimator. We prove also the almost sure convergence to infinity at $x = 0$ of the Bernstein estimator when the density function f is unbounded at $x = 0$. To select the optimal bandwidth parameter of the Bernstein estimator, the least squares cross-validation and the likelihood cross-validation methods are developed.

0309. DENUIT, M. and J. DHAENE, Simple characterizations of comonotonicity and countermonotonicity by extremal correlations.

In this pedagogical note, it is shown how extremal values of classical measures of association like Pearson's correlation coefficient, Kendall's τ , Spearman's ρ and Gini's γ , characterize comonotonicity and countermonotonicity. The link between zero-correlation and mutual independence is also examined.

0310. VAN BELLEGEM, S. and R. von SACHS, Locally adaptive estimation of sparse evolutionary wavelet spectra.

We introduce a wavelet-based model of local stationarity. This model enlarges the class of locally stationary wavelet processes and contains processes whose spectral density function may change very suddenly in time. A notion of time-varying wavelet spectrum is uniquely defined as a wavelet-type transform of the autocovariance function with respect to so-called autocorrelation wavelets. This leads to a natural representation of the autocovariance which is localised on scales. One particularly interesting subcase arises when

this representation is sparse, meaning that the nonstationary autocovariance process may be decomposed in the autocorrelation wavelet basis using few coefficients. We present a new test of sparsity for the wavelet spectrum. It is based on a non-asymptotic result on the deviations of a functional of a periodogram. The power of the test is discussed. We also present another application of this result given by the pointwise adaptive estimation of the wavelet spectrum. Properties of this estimator in homogeneous and inhomogeneous regions of the wavelet spectrum are studied.

0311. PITREBOIS, S., DENUIT, M. and J.F. WALHIN, Fitting the Belgian Bonus-Malus system.

We show in this paper how to obtain the relativities of the Belgian Bonus-Malus System, including the special bonus rule sending the policyholders in the malus zone to initial level after four claim-free years. The model allows for a priori tarification. It is applied to a real-life portfolio.

0312. GIJBELS, I., Inference for nonsmooth regression curves and surfaces using kernel-based methods.

In this paper we review kernel-based methods for detecting discontinuities in an otherwise smooth regression function or surface. In case of a possible discontinuous curve the interest might be in detecting the discontinuities, their jump sizes and finally to estimate the discontinuous curve. Alternatively, one might be uniquely interested in estimating directly the discontinuous curve preserving the jumps. A brief discussion on available kernel-based methods for testing for a continuous versus a discontinuous regression function, and for detecting discontinuities in regression surfaces is also provided.

0313. DARAIO, C. and L. SIMAR, Introducing environmental variables in non-parametric frontier models : a probabilistic approach.

This paper proposes a general formulation of a nonparametric frontier model introducing external environmental factors that might influence the production process but are neither inputs nor outputs under the control of the producer. A representation is proposed in terms of a probabilistic model which defines the data generating process. Our approach extends the basic ideas from Cazals, Florens and Simar (2002) to the full multivariate case. We introduce the concepts of conditional efficiency measure and of conditional efficiency measure of order- m . Afterwards we suggest a practical way for computing the nonparametric estimators. Finally, a simple methodology to investigate the influence of these external factors on the production process is proposed. Numerical illustrations through some simulated examples and through a real data set on Mutual Funds show the usefulness of the approach.

0314. VAN KEILEGOM, I., A note on the nonparametric estimation of the bivariate distribution under dependent censoring.

Consider the random vector (T_1, T_2) , and assume that both T_1 and T_2 are subject to random right censoring. We propose new estimators of the bivariate and marginal distributions of T_1 and T_2 . The estimators do not require the common assumption of independence between the vector of survival and censoring times, but allow for a certain type of dependent censoring. The proposed estimator of the marginal distribution generalizes the estimator of Cheng (1989). The estimators have intuitive, closed form expressions and are easy to compute. The weak convergence of the estimators is obtained. As an application we discuss the estimation of the regression coefficients in a polynomial regression model, when both the response and the covariate are subject to censoring.

0315. PARK, B.U., SICKLES, R.C. and L. SIMAR, Semiparametric efficient estimation of dynamic panel data models.

This paper extends the semiparametric efficient treatment of panel data models pursued by Park and Simar (1994) and Park, Sickles, and Simar (1998, 2003) to a dynamic panel setting. We develop a semiparametric efficient estimator under minimal assumptions when the panel model contains a lagged dependent variable. We apply this new estimator to analyze the structure of demand between city pairs for selected U. S. airlines during the period 1979 I to 1992 IV.

0316. BADIN, L. and L. SIMAR, Confidence intervals for DEA-type efficiency scores: how to avoid the computational burden of the bootstrap.

One important issue in statistical inference is to provide confidence intervals for the parameters of interest. Once the statistical properties of the estimators have been established, the corresponding asymptotic results can be used for constructing confidence intervals. However, in nonparametric efficiency estimation, the asymptotic properties of DEA estimators are only available for the bivariate case (Gijbels et al., 1999). An appealing alternative is the bootstrap method and a general methodology for applying bootstrap in nonparametric frontier estimation is provided by Simar and Wilson (1998, 2000b). Nevertheless, all the procedures involving bootstrap method are based on a large number of data replications, and in frontier estimation this approach also implies performing DEA (i.e. solving linear programs) a large number of times. Hence, a more simple and less computing intensive technique is always welcome. In this paper we propose a simple procedure for constructing confidence intervals for the efficiency scores. We consider some classical confidence intervals for an endpoint of a distribution and we show how these results can be adapted to the problem of frontier estimation. We provide an algorithm for constructing similar confidence intervals for the efficiency scores. Then some Monte Carlo experiments estimate the coverage

probabilities of the obtained intervals. The results are quite satisfactory even for small samples. We then illustrate the approach with a real data set when analyzing the efficiency of 36 Air Controllers in Europe.

0317. KNEIP, A., SIMAR, L. and P.W. WILSON, Asymptotics for DEA estimators in non-parametric frontier models.

Non-parametric data envelopment analysis (DEA) estimators based linear programming methods have been widely applied analyses productive efficiency. The distributions these estimators remain unknown except the simple case of input one output. This paper derives the asymptotic distribution DEA estimators under variable returns-to-scale. addition, bootstrap procedures (one based sub-sampling, the other based smoothing) shown provide consistent inference. smooth bootstrap requires smoothing irregularly-bounded density inputs and outputs well smoothing the DEA frontier estimate. Both bootstrap procedures allow dependence inefficiency process output levels and the mix inputs case input-oriented measures, inputs levels and mix of outputs the case output-oriented measures.

0318. STEINMANN, L. and L. SIMAR, On the comparability of efficiency scores in nonparametric frontier models.

Data envelopment analysis (DEA) is widely used in the field of academic research, in business consulting and in a regulatory context. Usually it is the aim to estimate efficiency scores of decision making untis (DMU). The attempt to infer from a sample on the true, but unknown production technology males it a typical estimation procedure. Banker (1993) and Kneip, Park and Simar (1998) prove that the estimators obtained by DEA are biased, but under certain assumptions are consistent. Efficiency estimates obtained by DEA therefore seem to be suited for hypothesis testing, e.g. for comparison of mean efficiency between groups of observations. However, under certain circumstances - that will be analyzed in this paper - mean efficiency of groups of observations are biased to a different degree and thus differences in mean efficiency are also biased. Without bias correction, hypothesis tests of mean efficiencies between groups are then erroneous. In this paper an endicator is proposed to detect non-comparable mean efficiency scores. The procedure is illustrated in Monte Carlo simulations and applied to a real workd data set.

0319. FRANCOIS, N., GOVAERTS, B. and B. BOULANGER, Optimal designs for inverse prediction in nonlinear calibration models.

Calibration models are intended to link a quantity of interest X (e.g. the concentration of a chemical compound) to a value Y obtained from a measurement device. In this context, a major concern is to build calibration models that are able to provide precise (inverse) predictions for X from measured responses Y. This paper aims at answering the following question : which experiments should be run to set up a (linear or nonlinear) calibration

curve that maximises the inverse prediction precisions ? The well known class of optimal designs is presented as a possible solution. The calibration model setup is first reviewed in the linear case and extended to the heteroscedastic nonlinear one. In this general case, asymptotic variance and confidence interval formulae are derived for inverse predictions. Two optimality criteria are then introduced to quantify a priori the quality of inverse predictions for a given experimental design. The VI criterion is based on the integral of the inverse prediction variance over the calibration domain and the GI criterion on its maximum value. Algorithmic aspects of the optimal design generation are discussed. In a last section, the methodology is applied to 4 possible calibration models (linear, quadratic, exponential and four parameters logistic). VI and GI optimal designs are compared to classical D, V and G optimal designs. Their predictive quality is also compared to the one of simple traditional equidistant designs and it is shown that, even if these last designs have very different shapes, their predictive quality are not far from the optimal design ones. Finally, some simulations evaluate small sample properties of asymptotic inverse prediction confidence intervals.

0320. DELAIGLE, A. and I. GIJBELS, Boundary estimation and estimation of discontinuity points in deconvolution problems.

This paper studies estimation of the boundary of the support of a density function when only a contaminated sample from the density is available. Estimation of the boundary of the support is a first necessary step when estimating a density with support different from the whole real line, since then modifications of the usual kernel type estimators are needed for consistent estimation of the density at the endpoints of its support. Apart from this, boundary estimation is also of interest on its own, since it is the basic problem in, for example, frontier estimation in efficiency analysis in econometrics. The method proposed in this paper can also be used for estimating locations of discontinuity points of a density in the same deconvolution context. We establish the asymptotic law of the proposed estimator as well as approximate expressions for its mean squared error, and this for various types of error densities. These expressions then serve to discuss rates of convergence of the estimator and also shed some light on theoretical choices of the bandwidth parameter involved. An illustration of the method is given.

0321. ALMEIDA, C. and M. MOUCHART, Identification of polychoric correlations : a copula approach.

The traditional model underlying the polychoric correlations among ordinal variables is revisited. This model relies on the idea of considering ordinal variables as discretization of corresponding continuous latent variables. The non-identification of the marginal distributions of the latent vector naturally leads to a copula approach; by so-doing, the role of the multivariate normality hypothesis of the latent vector is re-assessed.

0322. ALMEIDA, C. and M. MOUCHART, A note on a copula approach to polychoric correlations.

Polychoric correlations among ordinal variables rest on the interpretation of the ordinal variables as discretization of latent continuous “ideally measured” variables and the assumption that these corresponding latent variables are jointly normally distributed. As the marginal distribution of these latent variables are arbitrary, for not being identified, the copula concept is a natural tool for the specification of the dependence structure. The role of the multivariate normality hypothesis is reexamined from a copulistic specification.

0323. SIMAR, L., How to improve the performances of DEA/FDH estimators in the presence of noise?

In frontier analysis, most of the nonparametric approaches (DEA, FDH) are based on envelopment ideas which suppose that with probability one, all the observed units belong to the attainable set. In these “deterministic” frontier models, statistical theory is now mostly available. In the presence of noise, this is no more true and envelopment estimators could behave dramatically since they are very sensitive to extreme observations that could result only from noise. DEA/FDH techniques would provide estimators with an error of the order of the standard deviation of the noise. In this paper we propose to adapt some recent results on detecting change points, to improve the performances of the classical DEA/FDH estimators in the presence of noise. We show by simulated examples that the procedure works well when the noise is of moderate size, in term of noise to signal ratio. It turns out that the procedure is also robust to outliers.

0324. SIMAR, L. and V. ZELENYUK, Statistical inference for aggregates of Farrell-type efficiencies.

In this study, we merge results directions in efficiency analysis research -the Aggregation and the Bootstrap- applied, as an example, to one of the most popular point-estimators of individual efficiency : the Data Envelopment Analysis (DEA) estimator. A natural context of the methodology developed here is a study of efficiency of a particular economic system (e.g., an industry) as a whole, or a comparison of efficiencies of distinct groups within such a system (e.g., private vs. public or regulated vs. non-regulated firms, etc.) Our methodology is justified by the (neo-classical) economic theory and is supported by carefully adapted statistical methods.

0325. BIGOT, J., Landmark-based registration of 1D curves and functional analysis of variance with wavelets.

This paper is concerned with the problem of the alignment of multiple sets of curves and their comparison with FANOVA techniques. A nonparametric

approach is proposed to estimate the zero-crossings lines of the continuous wavelet transform of a 1D signal observed with noise. A new tool, the “structural intensity”, is introduced to represent the locations of the significant landmarks of an unknown curve via a probability density function. This technique yields an automatic landmark-based registration method to synchronize a set of curves. A fixed-effects FANOVA model is then used to test the significance of main/interaction effects and to show the usefulness of curve alignment. Some real examples arising from the biomedical area are used to illustrate the methodology.

0326. DAOUIA, A. and L. SIMAR, Robust nonparametric estimators of monotone boundaries.

This paper revisits some asymptotic properties of the robust nonparametric estimators of order- m and order α quantile frontiers and proposes isotonized version of these estimators. Previous convergence properties of the order- m frontier are extended (from weak uniform convergence to complete uniform convergence). Complete uniform convergence of the order- m (and of the quantile order $-\alpha$) nonparametric estimators to the boundary is also established, for an appropriate choice of m (and of α , respectively) as a function of the sample size. The new isotonized estimators share the asymptotic properties of the original ones and a simulated example shows, as expected, that these new versions are even more robust than the original estimators. The procedure is also illustrated through a real data set.

0327. VAN BELLEGEM, S. and R. von SACHS, On adaptive estimation for locally stationary wavelet processes and its applications.

The class of locally stationary wavelet is a wavelet-based model for covariance nonstationary zero-mean time series. This paper presents an algorithm for the pointwise adaptive estimation of their time-varying spectral density. The performance of the procedure is evaluated on simulated and real time series. Two applications of the procedure are also presented and evaluated on real data. The first is a test of local significance for the coefficients of the so-called wavelet periodogram. The second is a new test of covariance stationarity.

0328. OMBAO, H., von SACHS, R. and W. GUO, SLEX analysis of multivariate non-stationary time series.

We propose to analyze a multivariate non-stationary time series using the SLEX (Smooth Localized Complex EXponentials) library. The SLEX library is a collection of bases; each basis consists of the Slex waveforms which are orthogonal localized versions of the Fourier complex exponentials. In our procedure, we first build a family of multivariate SLEX models such that every model has a spectral representation in terms of a unique SLEX basis. The SLEX family provides a flexible representation for non-stationary random processes because every SLEX basis is localized in both time and frequency.

The next step is to select a model using a penalized log energy criterion which we derive in this paper to be the Kullback-Leibler distance between a model and the empirical time series. In our procedure, we apply SLEX principal components analysis to obtain a decomposition of a possibly highly cross-correlated multivariate data set into non-stationary components with uncorrelated (non-redundant) spectral information. The best model is then selected by computing the log energy criterion based on the SLEX principal components. The proposed SLEX analysis for multivariate non-stationary time series closely parallels traditional Fourier analysis of stationary time series. Hence, our method gives results that are easy to interpret. Moreover, the SLEX method uses computationally efficient algorithms and hence can easily handle massive data sets. We illustrate the SLEX method by its application to a multivariate brain waves data set recorded during an epileptic seizure.

0329. MOUCHART, M. and M. VANDRESSE, A measure of market imperfection by frontier analysis.

In this paper, we propose an empirical method to measure the market imperfection and the bargaining power of the agents, by extending the methods of frontier analysis. A case study in the field of freight transport illustrates the proposed method.

0330. MOUCHART, M. and J. ROMBOUITS, Clustered panel data models : an efficient approach for nowcasting from poor data.

Nowcasting regards the inference on the present realization of random variables, on the basis of information available until a recent past. This paper proposes a modelling strategy aimed at a best use of the data for nowcasting based on panel data with severe deficiencies, namely short times series and many missing data. The basic idea consists of introducing a clustering approach into the usual panel data model specification. A case study in the field of R&D variables illustrates the proposed modelling strategy.

0331. BOUEZMARNI, T., MESFIOUI, M. and J-M. ROLIN, L_1 rate of convergence of asymmetric kernel density estimators and smoothed histograms.

The authors consider the Smoothed histograms (Gawronski and Stadtmuller (1980)) and the Gamma kernel density estimator (Chen 2000) for an iid sample of a density defined on $[0, +\infty)$. They give the asymptotic behavior, the lower and upper bound of the expected average absolute error of this estimator on each compact. The general formula of the asymptotic behavior, the lower and upper bound of the expected average absolute error for the generalized kernel estimates will be established.

0332. HEUCHENNE, C. and I. VAN KEILEGOM, Polynomial regression with censored data based on preliminary nonparametric estimation.

Consider the polynomial regression model $Y = \beta_0 + \beta_1 X + \dots + \beta_p X^p + \sigma(X)\epsilon$, where $\sigma^2(X) = \text{Var}(Y|X)$ is unknown, and ϵ is independent of X and has zero mean. Suppose that Y is subject to random right censoring. A new estimation procedure for the parameters β_0, \dots, β_p is proposed, which extends the classical least squares procedure to censored data. The proposed method is inspired by the method of Buckley and James (1979), but is, unlike the latter method, a non-iterative procedure due to nonparametric preliminary estimation of the conditional regression function. The asymptotic normality of the estimators is established. Simulations are carried out for both methods and they show that the proposed estimators have usually smaller variance and smaller mean squared error than the Buckley-James estimators. The two estimation procedures are also applied to a medical and an astronomical data set.

0333. EINMAHL, J.H.J. and I. VAN KEILEGOM, Goodness-of-fit tests in non-parametric regression.

Consider the nonparametric regression model $Y = m(X) + \epsilon$, where the function m is smooth, but unknown, and ϵ is independent of X . We construct omnibus goodness-of-fit tests, based on n independent copies of (X, Y) , for the independence of ϵ and X and establish asymptotic results for the proposed tests statistics. We investigate their finite sample properties through a simulation study and present an econometric application to household data. One testing procedure is based on differences of neighboring Y 's, whereas the other one makes use of an estimator of m . The proofs are based on delicate weighted empirical process theory.

0334. GIJBELS, I., Monotone regression.

In nonparametric regression the objective is to explore the relationship between an explanatory variable and the variable of interest. Sometimes it is plausible to assume that the regression function is monotone. We review nonparametric methods for estimating a monotone regression function, as well as testing procedures for testing for monotonicity. A brief discussion on related estimation and testing problems is given.

4.2 Consulting Reports

- CR0301 MOUCHART, M. and J. ROMBOUTS, Econometric models for nowcasts on R & D variables, subcontracting from CAMIRE (Luxembourg) for Eurostat.
- CR0302 MOUCHART, M. and L. SIMAR, Efficiency analysis of air navigation services provision (II): further insights, consulting report for Eurocontrol, Brussels.

- CR0303 MOUCHART, M. and J. ROMBOUITS, Evaluating and updating econometric Models for Nowcasts on R&D variables, subcontracting from CAMIRE (Luxembourg) for Eurostat.
- CR0304 VAN BELLEGEM, S. and P. VANDEN EECKAUT, Assessment of the concentration level of chemical substances in river network - Part V - A model for trend estimation adapted to monitoring data, study for EuroChlor.
- CR0305 DELAIGLE, A., GOVAERTS, B. et J. HOEFFELMAN (Elia), Etude des champs magnétiques sous les lignes à haute tension de Belgique.

4.3 Published Papers

184. MOUCHART, M. and E. SAN MARTIN. Specification and identification issues in models involving a latent hierarchical structure. *Journal of Statistical Planning and Inference*, 111, 143-163, 2003.
186. DONOHO, D.L., MALLAT, S., von SACHS, R. and Y. SAMUELIDES. Locally stationary covariance and signal estimation with macrotiles. *IEEE Transactions on Signal Processing*, 51, 3, 614-627, 2003.
188. DENUIT, M., LEFEVRE, Cl. and Ph. PICARD. Polynomial structures in order statistics distributions. *Journal of Statistical Planning and Inference*, 113, 151-178, 2003.
189. VANDENHENDE, F. and Ph. LAMBERT. Improved rank-based dependence measures for categorical data. *Statistics & Probability Letters*, 63, 157-163, 2003.
190. PURCARU, O. and M. DENUIT. Dependence in dynamic claim frequency credibility models. *Astin Bulletin*, 33, 1, 23-40, 2003.
191. BROUHNS, N. and M. DENUIT. Actuarial modelling of longitudinal claims data through GAMM's : some methodological results. *Deutsche Gesellschaft für Versicherungs-und Finanzmathematik e.V*, 26, 1, 25-39, 2003.
192. CEBRIAN, A.C., DENUIT, M. and Ph. LAMBERT. Generalized pareto fit to the society of actuaries' large claims database. *North American Actuarial Journal*, 7, 3, 18-36, 2003.
193. FROGNIER, A-P. et M. MOUCHART. La wallonie : l'impact des positions sociales, des clivages et des enjeux sur le vote en 1999. Dans *Elections : La rupture? Le comportement des Belges face aux élections de 1999. A-P. Frogner et A-M. Aish, Bruxelles : De Boeck*, 13-27, 2003.
194. VANDENHENDE, F., LAMBERT, Ph. and N. RAMADAN. Statistical models for the analysis of controlled trials on acute migraine. *Pharmaceutical Statistics*, 2, 199-210, 2003.

195. FLAHAUT, B., MOUCHART, M., SAN MARTIN, E. and I. THOMAS. The local spatial autocorrelation and the kernel method for identifying black zones. A comparative approach. *Accident Analysis and Prevention*, 35, 991-1004, 2003.
196. OULHAJ, A. and M. MOUCHART. Partial sufficiency with connection to the identification problem. *METRON. International Journal of Statistics*, LXI, 2, 267-283, 2003.
197. SIMAR, L. Detecting outliers in frontier models : a simple approach. *Journal of Productivity Analysis*, 20, 391-424, 2003.
198. GIJBELS, I. Inference for nonsmooth regression curves and surfaces using kernel-based methods. *Recent Advances and Trends in Nonparametric Statistics*, 183-201, 2003.
199. ZHANG, J. and I. GIJBELS. Sieve empirical likelihood and extensions of the generalized least squares, *Scandinavian Journal of Statistics*, 30, 1-24, 2003.
200. HALL, P. and I. VAN KEILEGOM. Using difference-based methods for inference in nonparametric regression with time series errors, *Journal of Royal Statistical Society, Series B*, 65, Part 2, 443-456, 2003.
201. AKRITAS, M.G. and I. VAN KEILEGOM. Estimation of bivariate and marginal distributions with censored data, *Journal of Royal Statistical Society, Series B*, 65, Part 2, 457-471, 2003.
202. DU, Y., AKRITAS, M.G. and I. VAN KEILEGOM. Nonparametric analysis of covariance for censored data, *Biometrika*, 90, 2, 269-287, 2003.
203. CHEN, X., LINTON, O. and I. VAN KEILEGOM. Estimation of semiparametric models when the criterion function is not smooth, *Econometrica*, 71, 5, 1591-1608, 2003.
204. PITREBOIS, S., DENUIT, M. and J.-F. WALHIN. Setting a bonus-malus scale in the presence of other rating factors: Taylor's work revisited. *Astin Bulletin*. 33, 2, 419-436, 2003.
205. PITREBOIS, S., DENUIT, M. and J.-F. WALHIN. Tarification automobile sur données de panel. *Mitteilungen der Schweiz Aktuarvereinigung*. 1, 51-81, 2003.
206. PITREBOIS, S., DENUIT, M. and J.-F. WALHIN. Fitting the Belgian Bonus-Malus system. *Belgian Actuarial Bulletin*. 3, 1, 58-62, 2003.
207. CEBRIAN, A., DENUIT, M. and Ph. LAMBERT. Analysis of bivariate tail dependence using extreme value copulas: an application to the SOA medical large claims database. *Belgian Actuarial Bulletin*. 3, 1, 33-41, 2003.

208. DENUIT, M. and J. DHAENE. Simple characterizations of comonotonicity and countermonotonicity by extremal correlations. *Belgian Actuarial Bulletin*. 3, 1, 22-27, 2003.
209. DELWARDE, A. and M. DENUIT. Importance de la période d'observation et des âges considérés dans la projection de la mortalité selon la méthode de Lee-Carter. *Belgian Actuarial Bulletin*. 3, 1, 1-21, 2003.
210. BROUHNS, N., GUILLEN, M., DENUIT, M. and J. PINQUET. Bonus-malus scales in segmented tariffs with stochastic migration between segments. *The Journal of Risk and Insurance*. 70, 4, 577-599, 2003.
211. DENUIT, M., LEFEVRE, C. and M. MESFIOUI. On spline approximation for bivariate functions of increasing convex type. *Revue d'Analyse Numérique et de Théorie de l'Approximation*. 32, 2, 145-159, 2003.
212. GIJBELS, I. and U. GURLER. Estimation of a change point in a hazard function based on censored data. *Lifetime Data Analysis*. 9, 395-411, 2003.
213. FRYZLEWICZ, P., VAN BELLEGEM, S. and R. von SACHS. Forecasting non-stationary time series by wavelet process modelling. *The Annals of the Institute of Statistical Mathematics*. 55, 4, 737-764, 2003.
215. CLAESKENS, G. and I. VAN KEILEGOM. Bootstrap confidence bands for regression curves and their derivatives, *The Annals of Statistics*, 31, 6, 1852-1884, 2003.
216. PARK, B., SICKLES, R. and L. SIMAR. Semiparametric efficient estimation of AR(1) panel data models, *Journal of Econometrics*, 117, 2, 279-311.
217. VAN BELLEGEM, S., FRYZLEWICZ, P. and R. von SACHS. A wavelet-based model for forecasting non-stationary processes. *Inst. Phys. Conf. Ser.* 173, 955-958, 2003. *Paper presented at 24th Int. Coll. Group Theoretical Methods in Physics*, Paris, France, July 2002.
218. TILQUIN, P., VAN KEILEGOM, I., COPPIETERS, W., LE BOULENGE, E. and P.V. BARET. Non-parametric interval mapping in half-sib designs : use of midranks to account for ties. *Genet. Res., Camb.* 81, 221-228, 2003.
219. CLAESKENS, G. and I. VAN KEILEGOM, Bootstrap confidence bands for regression curves and their derivatives. *The Annals of Statistics*. 31, 6, 1852-1884, 2003.

4.4 Books published by members of the Institute

FLORENS, J.P., MOUCHART, M. and J.M. ROLIN. *Elements of Bayesian Statistics*, 544 pp, Marcel Dekker: New York, 1990.

HÄRDLE, W. and L. SIMAR (editors). *Computer Intensive Methods in Statistics*, 175 pp, *Statistics and Computing, I*, Physica-Verlag: Berlin, 1993.

HÄRDLE, W., KLINKE, S. and B.A. TURLACH. *XploRe: An Interactive Statistical Computing Environment*, 387 pp, *Statistics and Computing*, Springer-Verlag: New York, 1995.

FAN, J. and I. GIJBELS. *Local Polynomial Modelling and its Applications*, 341 pp, Chapman and Hall: London, 1996.

KAAS, R., GOOVAERTS, M.J., DHAENE, J., and M. DENUIT. *Modern Actuarial Risk Theory*, Kluwer Academic Publishers: Dordrecht, 2001.

WUNSCH, G., MOUCHART, M. and J. DUCHÊNE (editors). *The Life Table : Modelling Survival and Death*, book series : *European Studies of Population*, vol. 11, Kluwer Academic Publishers : Dordrecht, 2002.

HÄRDLE, W. and L. SIMAR. *Applied Multivariate Statistical Analysis*, 486 pp., Springer Verlag: Berlin, 2003.

4.5 Editing activities

Michel DENUIT

Proceedings Editor for *Insurance: Mathematics and Economics*
Editor of *Belgian Actuarial Bulletin*
Associate Editor Australian and New-Zeeland Journal of Statistics
Member of the Advisory Board of the Wiley Encyclopedia of Actuarial Science.

Irène GIJBELS

(Associate) Editor of *Journal of Multivariate Analysis*.
Associate Editor of *Journal of Computational and Graphical Statistics*.
Associate Editor of *Statistica Sinica*.

Philippe LAMBERT

Co-editor of *B-Stat News*.

Léopold SIMAR

Associate Editor of *Journal of Productivity Analysis*

Ingrid VAN KEILEGOM

Associate Editor of *Journal of the Royal Statistical Society - Series B*

5 SEMINARS, WORKSHOPS AND SHORT COURSES

A statistics seminar is organised each week. A diversity of subjects is presented at this seminar. Speakers are mainly coming from outside the University and visitors of the Institute are among the contributors.

From time to time, a joint statistics and econometrics seminar, organised in collaboration with CORE, takes place. At those occasions statisticians and econometricians meet and have extra opportunities to discuss on common research interests and elaborate joint research.

Further, an applied statistics workshop is organised by the Institute on a regular basis. At this applied statistics workshop, emphasis is on talks in which an applied statistical problem is presented.

There is also the doctoral seminar which is an extra stimulant for Ph.D students and other young researchers.

5.1 Statistics Seminars

1. January 31, 2003, Rik LOPUHÄÄ, Delft University of Technology, The Netherlands.
Nonparametric estimation of a decreasing density
2. February 14, 2003, Laszlo GYORFI, Technical University of Budapest, Hungary.
Nonparametric prediction
3. February 28, 2003, Paul EILERS, Leiden University Medical Centre, The Netherlands.
Just say no ! to kernel smoothers
4. March 7, 2003, Valentin KONAKOV, Academy of Science, Moscow, Russia.
Some applications of Gaussian random fields in multivariate kernel density estimation
5. April 4, 2003, Chris A. J. KLAASSEN, University of Amsterdam, The Netherlands.
Service by appointment
6. May 9, 2003, Paul JANSSEN, Limburgs Universitair Centrum, Diepenbeek, Belgium.
The shared frailty model
7. May 9, 2003, Yi LI, Harvard University, USA.
Inference on clustered survival data using imputed frailties
8. October 3, 2003, Jiti GAO, The University of Western Australia, Crawley.
Model selection in semiparametric time series regression

9. October 17, 2003, Wolfgang WEFELMEYER, University of Siegen, Germany.
Exploiting independence of innovations in time series
10. October 24, 2003, Wenceslao GONZALEZ MANTEIGA, University of Santiago de Compostela, Spain.
Space-time dependency modeling using general classes of flexible stationary variogram models
11. October 24, 2003, Cesar SANCHEZ SELLERO, University of Santiago de Compostela, Spain.
Almost sure representation of the estimator of the population size under truncation, with applications
12. October 31, 2003, Rainer DAHLHAUS, University of Heidelberg, Germany.
Statistical inference for time-varying ARCH processes
13. October 31, 2003, Jérémie BIGOT, Université catholique de Louvain, Belgium.
A scale-space approach to landmark detection and curve alignment with wavelets
14. November 7, 2003, Djamel LOUANI, Université de Paris 6 & Université de Reims, France.
Uniform L_1 -distance large deviations in nonparametric density estimation
15. November 14, 2003, Sokbae Simon LEE, University College London, United Kingdom.
Estimating panel data duration models with censored data
16. November 28, 2003, Arthur CHARPENTIER, Ecole Nationale de la Statistique et de l'Administration Economique, Paris, France.
Multivariate extreme values: limiting results for copulas
17. December 5, 2003, Davy PAINDAVEINE, Université Libre de Bruxelles, Belgium.
Non parametric procedures for testing elliptical randomness
18. December 12, 2003, Seok-Oh JEONG, Université catholique de Louvain, Belgium.
Risk management based on adaptive volatility model and generalized hyperbolic levy processes
19. December 19, 2003, Michel MOUCHART, Université catholique de Louvain, Belgium.
Ignorable missingness

5.2 Joint Statistics and Econometrics Seminars

1. February 7, 2003, Valentin ZELENYUK, National University "Kyiv-Mohyla Academy", Ukraine.
Statistical foundation for aggregate efficiencies
2. March 14, 2003, Bas J. M. WERKER, Tilburg University, The Netherlands.
Stochastic volatility models with transaction time risk
3. March 21, 2003, Luc BAUWENS, Université catholique de Louvain, Belgium.
Dynamic latent factor intensity model

5.3 Joint Statistics Seminars and Institut de Mathématique Pure et Appliquée

1. March 28, 2003, Alois KNEIP, University of Mainz, Germany.
Bootstrap methods in frontier models
2. September 19, 2003, Raymond J. CARROLL, Texas A& M University, College Station, USA.
Variability is not always a nuisance parameter

5.4 Applied Statistics Workshops

1. January 31, 2003, Bart BAESENS, Katholieke Universiteit Leuven, Belgium.
Using data mining techniques for developing credit-risk evaluation models
2. February 14, 2003, Peter GOOS, Katholieke Universiteit Leuven, Belgium.
The optimal design of blocked experiments
3. February 28, 2003, Benoît BECK, Ely Lilly, Mont-Saint-Guibert, Belgium.
Statistics for pre-clinical R & D in pharmaceutical industry: new challenges and new opportunities for statisticians
4. March 14, 2003, Christian RITTER and Maria KEY PRATO, Université catholique de Louvain and Shell Chemicals, Belgium.
From foam doctor to formul8 (exploiting a small data mine)
5. March 28, 2003, Daniela COCCHI, University of Bologna, Italy.
A stratified model for the analysis of ozone trends in an urban area
6. September 26, 2003, Claus WEIHS, University of Dortmund, Germany.
Statistical analysis of musical time series: automatic transcription and voice prints
7. September 26, 2003, Sébastien VAN BELLEGEM, Université catholique de Louvain and Conservatoire Royal de Mons, Belgium.
The stochastic music: a focus on Xenakis music

8. October 17, 2003, Christian RITTER, Université catholique de Louvain and Shell Chemicals, Belgium.
Using free relational data bases in day-to-day statistical work with emphasis on MySQL
9. November 21, 2003, Ron WEHRENS, University of Nijmegen, The Netherlands.
Multivariate regression in *R*: the PLS.PCR toolbox
10. November 21, 2003, Erich NEUWIRTH, University of Vienna, Austria.
R-Excel
11. December 12, 2003, Timothy E. O'BRIEN, Loyola University Chicago, USA.
Statistical modelling and experimental design strategies for detecting drug and similar compound synergy

5.5 Doctoral Seminars

1. February 7, 2003, Céline BUGLI, Institut de statistique, UCL, Belgium.
Statistical analysis of electroencephalograms
2. February 21, 2003, Natacha BROUHNS, Institut de statistique, UCL, Belgium.
The Poisson log-bilinear mortality projection model
3. March 7, 2003, Isabelle DE MACQ, Institut de statistique, UCL, Belgium.
Boosting HSP classification trees
4. March 21, 2003, Taoufik BOUEZMARNI, Institut de statistique, UCL, Belgium.
Nonparametric density estimation
5. April 4, 2003, Sébastien VAN BELLEGEM, Institut de statistique, UCL, Belgium.
Adaptive estimation of sparse evolutionary wavelet spectra
6. June 6, 2003, Nancy FRANCOIS, Institut de statistique, UCL, Belgium.
Statistical analysis of time-intensity curves in sensory studies
7. June 6, 2003, Maria KEY PRATO, Institut de statistique, UCL, Belgium.
Cleaning artifacts from rat's arterial pressure profiles using wavelets
8. September 19, 2003, Carlos ALMEIDA, Institut de statistique, UCL, Belgium.
A first approach to Bayesian encompassing specification testing under partial observability
9. October 3, 2003, Gery GEENENS, Institut de statistique, UCL, Belgium.
Single-index modelling of conditional probabilities in two way contingency tables

10. November 7, 2003, Oana PURCARU, Institut de statistique, UCL, Belgium.
On the stochastic increasingness of future claims in the Bühlmann linear credibility premium
11. November 14, 2003, Céline LE BAILLY de TILLEGHEM, Institut de statistique, UCL, Belgium.
Using QSAR models for lead optimisation: the impact of prediction error
12. November 28, 2003, Bianca TEODORESCU, Institut de statistique, UCL, Belgium.
Generalized linear conditional models under left truncation and right censoring
13. December 5, 2003, Anouar EL GHOUGH, Institut de statistique, UCL, Belgium.
Empirical likelihood for dependent censored data
14. December 19, 2003, Cédric HEUCHENNE, Institut de statistique, UCL, Belgium.
Censored regression using preliminary kernel smoothing

5.6 Short courses

During the spring 2003, short courses were given by invited professors (see section 2. of this report) within the activities of the Graduate School in Statistics :

- Alois KNEIP, University of Mainz, Germany, (March, April 2003).
“Functional data analysis with applications in biometrics and econometrics”
- Joel HOROWITZ, Northwestern University, Evanston, USA (May, June 2003).
“Bootstrap methods for cross-sectional and time-series data”
- Persi DIACONIS, Stanford University, USA ; Chaire de la Vallée Poussin, Department of Mathematics, UCL, Belgium, (May 2003).
“On coincidences”
“The mathematics of shuffling cards (I) and (II)”
“What do we know about the metropolis algorithm ?”
- Raymond J. CARROLL, Texas A & M University, College Station, USA, (September, October 2003).
“Nonparametric and semiparametric regression for longitudinal and clustered data”
“Functional data analysis for colon carcinogenesis experiments”
- Jiti GAO, The University of Western Australia, Crawley, (October 2003).
“Recent developments in semiparametric time series regression: a personal overview”

“Simultaneous model specification testing in nonparametric and semiparametric time series econometrics”

“Nonparametric estimation and comparisons in stochastic short-term interest rate models”

- Paul EILERS, Leiden University, The Netherlands, (December 2003).
“The power of penalties”

6 DOCTORATES

6.1 Doctors honoris causa

Peter HALL, Australian National University, Canberra (1997)

Luc DEVROYE, McGill University, Montréal, Canada (2002)

6.2 Doctoral dissertations

Aurore DELAIGLE (January 29, 2003)

“Kernel estimation in deconvolution problems”

Promoter: Irène GIJBELS

Abdelouahid TAJAR (February 20, 2003)

“Measuring and modelling dependence”

Co-Promoters: Michel DENUIT and Jean-Marie ROLIN

Abderrahim OULHAJ (May 5, 2003)

“Partially sufficient statistics and identification in conditional models”

Promoter: Michel MOUCHART

François VANDENHENDE (December 9, 2003)

“Copula models for the analysis of longitudinal ordinal responses in clinical trials on acute migraine ”

Promoter: Philippe LAMBERT

Sébastien VAN BELLEGEM (December 16, 2003)

“Adaptive methods for modelling estimating and forecasting locally stationary processes”

Promoter: Rainer von SACHS

6.3 Ph.D thesis in progress

Carlos ALMEIDA

“Structural equation modeling with categorical ordered variables”

Promoter: Michel MOUCHART

Taoufik BOUEZMARNI

“Bernstein polynomials estimate for unbounded density”
Promoter: Jean-Marie ROLIN

Natacha BROUHNS

“An integrated ratemaking tool for life and non life insurance”
Promoter: Michel DENUIT

Céline BUGLI

“Statistical analysis of evoked potentials in electroencephalograms”
Promoter: Philippe LAMBERT

Isabelle DE MACQ

“Classification trees and methods based on projections”
Promoter: Léopold SIMAR

Anouar EL GHOUC

“Empirical likelihood with incomplete data”
Promoter: Ingrid VAN KEILEGOM

Nancy FRANCOIS

“Statistical analysis of time intensity curves in sensory analysis”
Co-Promoters: Bernadette GOVAERTS and Philippe LAMBERT

Gery GEENENS

“Testing for conditional independence in contingency tables”
Promoter: Léopold SIMAR

Cédric HEUCHENNE

“Nonparametric regression with censored data : several applications”
Promoter: Ingrid VAN KEILEGOM

Maria KEY PRATO

“Detection and quantification of treatment effect on blood pressure profile curves”

Promoter: Philippe LAMBERT

Alexandre LAMBERT

“Nonparametric estimation of discontinuous functions and surfaces”

Promoter: Irène GIJBELS

Céline LE BAILLY DE TILLEGHEM

“Multiobjective optimization by computer simulations”

Co-Promoters: Bernadette GOVAERTS and Léopold SIMAR

Oana PURCARU

“Modeling dependence in actuarial science”

Promoter: Michel DENUIT

Bianca TEODORESCU

“Generalized linear conditional models under left truncation and right censoring”

Promoter: Ingrid VAN KEILEGOM

7 CONTACT DAYS AND CONFERENCES

7.1 FNRS contact day : “Statistical analysis of brain signals”

Louvain-la-Neuve, Belgium, April 11, 2003

Group of Statistical Analysis

Organisers : Céline BUGLI and Philippe LAMBERT, UCL, Belgium.

Supported by FNRS and Eli Lilly, Belgium

PROGRAM

Jean-Michel GUÉRIT, UCL, Belgium.

“EEG and evoked potentials: a window into brain function”

Sylvain BAILLET, CNRS, Paris, France

“Methods and models for electromagnetic brain mapping”

Peter BOELJINGA, Forenap-Research Institute for Neurosciences, Rouffach, France

“Neuropharmacology of cognitive event-related scalp potentials: how can we be sure that a drug exerts effects different from placebo ?”

Céline BUGLI, UCL, Belgium

“Statistical analysis of EEG: independent component analysis (ICA) of event-related potentials”

André MOURAUX, UCL, Belgium

“Joint time-frequency analysis of event-related potentials”

7.2 FNRS contact day devoted to Insurance

Louvain-la-Neuve, Belgium, May 7, 2003

Group of Actuarial Sciences

Organisers : Michel DENUIT and Oana PURCARU, UCL, Belgium.

Supported by FNRS and Secura Belgian Re

PROGRAM

Michel DELECROIX, CREST-ENSAI, Bruz, France

“Le modèle linéaire généralisé est-il encore utile en Actuariat ?”

Arthur CHARPENTIER, CREST-ENSAE, Paris, France

“Etude de la dépendance dans les queues de distributions”

Natacha BROUHNS, UCL, Belgium

“Présentation de l’outil de simulation Exsyspen et analyse de la mortalité des employés du secteur public”

Stéphane LOISEL, Université Claude Bernard Lyon 1, France

“La formule de Picard-Lefèvre et ses alternatives”

Claude LEFÈVRE, ULB, Belgium

“Ruine dans un modèle de risque (non-)homogène”

Sandra PITREBOIS, Secura Belgian Re, Brussels, Belgium

“Marketing et systèmes bonus-malus”

7.3 First Young Researchers Day (YRD)

Louvain-la-Neuve, Belgium, May 19, 2003

Organisers : Céline BUGLI, Anouar EL GHOUGH, Nancy FRANCOIS, Cédric HEUCHENNE, Maria KEY PRATO, Alexandre LAMBERT, Céline LE BAILLY de TILLEGHEM, Oana PURCARU, Bianca TEODORESCU and Sébastien VAN BELLEGEM, Université catholique de Louvain, Belgium

Supported by the Graduate School of Statistics of the Institut de statistique and by SAS. It was also a FNRS contact day, Group of Statistical Analysis.

The 1st YRD was concentrated around two topics :

- Nonparametric Approaches in Survival Analysis
- Synchronisation and Shape Analysis in Biostatistics

PROGRAM

Nonparametric approaches in survival analysis

Juan Carlos PARDO-FERNANDEZ, Universidade de Vigo, Spain (and visiting Institute of Statistics, UCL)

“Comparison of curves for censored and truncated data”

Roel BRAEKERS, LUC, Belgium

“A copula-graphic estimator for the conditional survival function under dependent censoring”

Cédric HEUCHENNE, UCL, Belgium

“Linear regression with censored data based on preliminary nonparametric estimation”

Michael G. AKRITAS, Pennsylvania State University, University Park, USA

“Fully nonparametric analysis of covariance with censored data”

Synchronisation and shape analysis in biostatistics

Florence NICOL, UCL, Belgium

“The registration problem in Functional Data Analysis”

Patrick LINDSEY, Eurandom, The Netherlands

“Time alignment of repeated measurements in the analyses of several veterinary clinical trials”

Anne-Marie van NEDERKASSEL, VUB, Belgium

“Correlation Optimised Warping. A pre-processing method to align fast chromatograms in order to allow further chemometrical treatment of the data”

Ian L. DRYDEN, University of Nottingham, United Kingdom

“Statistical shape analysis of points, functions, curves and surfaces ”

8 ACADEMIC VISITS

The members of the Institute visited other institutions and most of them presented seminars.

January 2003

Michel DENUIT, “Quelques problèmes récents en sciences actuarielles”, ENSAE, INSEE, Malakoff, Paris, France.

Sébastien VAN BELLEGEM, Universität Heidelberg, Germany.

Rainer von SACHS, “Multivariate spectral analysis of non-stationary EEG signals”, at the “Sonderforschungsbereich 475”, Universität Dortmund, Germany.

February 2003

Léopold SIMAR, Humboldt-Universität zu Berlin, Germany.

Léopold SIMAR, University of Texas, Austin, USA.

Sébastien VAN BELLEGEM, Universität Heidelberg, Germany.

March 2003

Nancy FRANCOIS, “Introduction aux courbes de temps-intensité”, Laboratoire de Brasserie et des industries alimentaires, UCL, Belgium.

Oana PURCARU, “Tarification de traités de réassurance à l’aide de copules Archimédiennes semi-paramétriques”, Séminaire Lyon-Lausanne, invited speaker, Lyon, France.

May 2003

Michel MOUCHART, Tilburg University, The Netherlands.

Léopold SIMAR, Université des Sciences Sociales, Toulouse I, France.

June 2003

Michel MOUCHART, “Ignorable missingness”, L.U.C., Diepenbeek, Belgium.

July 2003

Michel MOUCHART, Universidad de Cantabria, Santander, Spain.

Rainer von SACHS, UPENN, Philadelphia, USA.

Rainer von SACHS, University of Illinois, Urbana-Champaign, USA.

September 2003

Léopold SIMAR, “Nonparametric frontier models: recent developments”, invited talk, Santa-Anna School of Advanced Studies, Pisa, Italy.

October 2003

Léopold SIMAR, “Nonparametric frontier models: recent developments”, invited speaker, University of Lugano, Switzerland.

Ingrid VAN KEILEGOM, “Estimation of semiparametric models when the criterion function is not smooth”, Université Libre de Bruxelles, Belgium.

November 2003

Michel MOUCHART, intensive course on Panel Data, seminar and audit of the Faculty, University of Bologna, Italy.

Ingrid VAN KEILEGOM, “Empirical likelihood in some non-standard settings”, Université Libre de Bruxelles, Belgium.

Rainer von SACHS, “Adaptive estimation for locally stationary wavelet processes”, Universität Bern, Switzerland.

December 2003

Léopold SIMAR, Université des Sciences Sociales, Toulouse I, France.

9 CONFERENCES AND MEETINGS

The members of the Institute assisted and/or participated to the following conferences.

January 2003

Bernadette GOVAERTS, *Symposium on Environmental Statistics*, “From monitoring data to regional distributions : a practical methodology applied to water risk assessment”, invited speaker, Ghent, Belgium.

February 2003

Léopold SIMAR, *8th Annual Texas Econometric Camp*, “Parametric approximations of nonparametric frontiers”, invited keynote speaker, Frederichsburg, Texas, USA.

March 2003

Bernadette GOVAERTS, *Workshop on Availability, Interpretation and Use of Environmental Monitoring Data*, “Estimation of regional distribution of concentration level of chemical substances”, invited speaker, Brussels, Belgium.

Irène GIJBELS, *International Workshop on Statistical Modelling for Complex Data*, “Inference for curves and shape restrictions”, member of the scientific committee, invited speaker and chairman session, Diepenbeek, Belgium.

Cédric HEUCHENNE, *International Workshop on Statistical Modelling for Complex Data*, “Linear regression with censored data based on preliminary nonparametric estimation”, Diepenbeek, Belgium.

Alexandre LAMBERT, *International Workshop on Statistical Modelling for Complex Data*, “Automatic jump detection in regression surfaces”, Diepenbeek, Belgium.

Ingrid VAN KEILEGOM, *International Workshop on Statistical Modelling for Complex Data*, chairman session, Diepenbeek, Belgium.

April 2003

Michel DENUIT, *Colloque Assurances de Rentes: Approche Technique*, “Construction de tables de mortalité prospectives: propositions”, invited speaker, Paris, France.

Irène GIJBELS, *International Workshop on Statistical Modelling for Complex Data*, “Inference for curves and shape restrictions”, member of the scientific committee, invited speaker and chairman session, Diepenbeek, Belgium.

Alexandre LAMBERT, *International Workshop on Statistical Modelling for Complex Data*, “Automatic jump detection in regression surfaces”, Diepenbeek, Belgium.

Céline LE BAILLY de TILLEGHEM, *Spring meeting of the UK QSAR and chemoinformatics group*, “A fast exchange algorithm for designing focused libraries in lead optimisation”, Surrey, United Kingdom.

Ingrid VAN KEILEGOM, *International Workshop on Statistical Modelling for Complex Data*, chairman session, Diepenbeek, Belgium.

May 2003

Bernadette GOVAERTS, *Conference on new directions in Experimental Design*, “Optimal designs for inverse non linear calibration models DAE 2003”, Chicago, USA.

Sébastien VAN BELLEGEM, *Conférences de la Société Belge d’Analyse Musicale*, “La musique stochastique chez Iannis Xenakis: hasard ou volonté?”, invited speaker, Brussels, Belgium.

June 2003

Céline BUGLI, *Meeting of the Three Country Corner Local RSS group*, “Statistical analysis of electroencephalograms : application of independent component analysis to assess treatment effect on event related potentials”, invited speaker, Beerse, Belgium.

Michel DENUIT, *35èmes Journées de Statistique, Société Française de Statistique*, “Dépendance stochastique en sciences actuarielles”, invited speaker, Lyon, France.

Nancy FRANCOIS, *Meeting of the Three Country Corner Local RSS group*, “Statistical analysis of time-intensity curves in sensory analysis”, Beerse, Belgium.

Oana PURCARU, *7th International Congress on Insurance: Mathematics and Economics*, “Semi-parametric archimedean copula modelling in actuarial science”, Lyon, France.

July 2003

Léopold SIMAR, *Summer School 2003*, “Frontier models”. invited speaker, Technical University of Lisbon, Portugal.

August 2003

Bernadette GOVAERTS, *ENBIS Conference*, “Statistical process control in nested processes : an application in the photovoltaic industry”, Barcelona, Spain.

Irène GIJBELS, *54th Biennial Session of the International Statistical Institute*, “Testing for monotonicity: a review”, invited speaker in the invited paper session “Inference under shape restrictions”, Berlin, Germany.

Cédric HEUCHENNE, *54th Biennial Session of the International Statistical Institute*, “Estimation in censored linear regression via preliminary smoothing”, Berlin, Germany.

Alexandre LAMBERT, *54th Biennial Session of the International Statistical Institute*, “Automatic jump detection in regression surface”, Berlin, Germany.

Léopold SIMAR, *54th Biennial Session of the International Statistical Institute*, “Parametric approximations of nonparametric frontiers”, Berlin, Germany.

Sébastien VAN BELLEGEM, *Joint Statistical Meetings*, “Wavelet processes and adaptive estimation of sparse evolutionary wavelet spectra”, invited speaker and chairman session, San Francisco, USA.

Ingrid VAN KEILEGOM, *Joint Statistical Meetings*, “Empirical likelihood in some non-standard settings”, chairman session, San Francisco, USA.

Rainer von SACHS, *Joint Statistical Meetings*, organisation and discussant of invited session on “Recent developments in modeling and estimation of non-stationary time series”, San Francisco, USA.

September 2003

Céline BUGLI, *MSG Scientific Symposium*, “Statistical analysis of EEG: independent component analysis (ICA) of event-related potentials”, poster, Louvain-la-Neuve, Belgium.

Oana PURCARU, *First Brazilian Conference on Statistical Modelling in Insurance and Finance*, “Modelling dependence through copula” (joint course with Y. Goegebeur), Ubatuba, Brazil.

Léopold SIMAR, *7th European Workshop on Efficiency and Productivity Analysis*, “Estimation and inference in two-stage, semi-parametric models of production processes”, invited member of the scientific committee, Oviedo, Spain.

Sébastien VAN BELLEGEM, *Wavelets and Statistics, Watering the seed*, “Test of sparsity and other applications of the pointwise adaptive estimator of wavelet spectra”, Villard-de-Lans, Grenoble, France.

Ingrid VAN KEILEGOM, *Conference in Probability Theory and Mathematical Statistics dedicated to the Centenary of A. N. Kolmogorov*, “Empirical likelihood in some non-standard settings”, invited speaker, Tbilisi, Georgia.

Rainer von SACHS, *Wavelets and Statistics: Watering the seed*, “Adaptive estimation for locally stationary wavelet processes”, invited speaker, Villard de Lans, Grenoble, France.

October 2003

Céline BUGLI, *11th Annual Meeting of the Belgian Statistical Society*, “Flexible modelling of event-related potentials”, contributed paper, La Roche-en-Ardenne, Belgium.

Irène GIJBELS, *11th Annual Meeting of the Belgian Statistical Society*, La Roche-en-Ardenne, Belgium.

Bernadette GOVAERTS, *B-ENBIS meeting on "Data mining, time to catch up"*, Leuven, Belgium.

Bernadette GOVAERTS, *11th Annual Meeting of the Belgian Statistical Society*, La Roche-en-Ardenne, Belgium.

Cédric HEUCHENNE, *11th Annual Meeting of the Belgian Statistical Society*, “Polynomial regression with censored data”, poster session, La Roche-en-Ardenne, Belgium.

Alexandre LAMBERT, *11th Annual Meeting of the Belgian Statistical Society*, “Regression for discontinuous functions: bandwidth selection, direct and indirect approach”, poster session, La Roche-en-Ardenne, Belgium.

Céline LE BAILLY de TILLEGHEM, *11th Annual Meeting of the Belgian Statistical Society*, “A fast exchange algorithm for designing focused libraries in lead optimisation”, La Roche-en-Ardenne, Belgium.

Oana PURCARU, *11th Annual Meeting of the Belgian Statistical Society*, “Modelling stochastic dependence through archimedean copulas”, La Roche-en-Ardenne, Belgium.

Léopold SIMAR, *The Art of Semiparametrics*, “How to improve the performances of DEA/FDH estimators in the presence of noise”, invited speaker, Berlin, Germany.

Ingrid VAN KEILEGOM, *11th Annual Meeting of the Belgian Statistical Society*, chairman session, La Roche-en-Ardenne, Belgium.

December 2003

Céline BUGLI, *Challenges for the next 10 years in Biostatistics* (organized by the Biostatistics section of the SBS-BVS and the PSDM group of the Biometrics Section (BMS) of the Netherlands Society for Statistics), Beerse, Belgium.

Philippe LAMBERT, *Challenges for the next 10 years in Biostatistics*, (organized by the Biostatistics section of the SBS-BVS and the PSDM group of the Biometrics Section (BMS) of the Netherlands Society for Statistics), co-organiser, Beerse, Belgium.

Michel DENUIT, *Journée de Contact FNRS, Groupe Sciences Actuarielles "Insurance & Finance"*, "Nonlife ratemaking with Bayesian GAM's", Brussels, Belgium.

Nancy FRANCOIS, *Chimiométrie 2003*, "Analyse statistique des courbes de temps-intensité en analyse sensorielle", Paris, France.

Bernadette GOVAERTS, *Chimiométrie 2003*, "Plans d'expériences optimaux pour la prédiction inverse dans les modèles de calibration non linéaires", Paris, France.

10 RESEARCH PROJECTS UNDER CONTRACTS AND COOPERATION PROJECTS

This section discusses ongoing research projects and cooperation projects at the Institut de statistique that are financed by outside agencies in the form of grants or contracts.

Inco-Copernicus Project, “STEFAN CEL MARE Sectorial technical efficiency and financial analysis a comparative evaluation look for Moldavian and Romanian economics” (1998-2003)

Financing : European Community, Main Direction XII, Science, Research et Development.

Coordinators: L. SIMAR and Ph. VANDEN EECKAUT

Partners institutions: Academia de Studii Economice, Romania; State University of Moldova, Moldavia; Université des Sciences Sociales de Toulouse, France.

The objective of this project is to have a better evaluation of the economic performance of the productive activity of Romania and Moldavia during the important on-going process of privatisation.

Projet d’Actions de Recherche Concertées : “Semi- and non-parametric methods as tools for analyzing complex data structures” (1998-2003)

Financing : Ministry of Research and Education of the ‘Communauté française’ of Belgium.

Promoters : I. GIJBELS, M. MOUCHART, L. SIMAR and R. von SACHS

Researcher : O. PURCARU

The aim of this project is to adapt and to use semi- and non-parametric methods to get a better understanding of the underlying properties of an observed phenomenon. The interest is essentially in complex processes hiding underlying structures which cannot be observed directly (change-points, missing or non-observed variables, complex functional structures, unknown support of densities, reconstruction of images). Semi- and non-parametric approaches allow for a flexible and robust interpretation of the data, since they impose less restrictive assumptions on the observed process. In this project we study these approaches and apply them to domains in which the flexibility and robustness are particularly useful.

“Advanced casualty ratemaking techniques” (2000-2003)

Financing : Université catholique de Louvain, FSR

Promoter : M. DENUIT

Researcher : N. BROUHNS

This research project aims to address the numerous problems related to the technical conception of non-life insurance products (especially car insurance). Initial risk selection, a priori risk classification and premium amounts determination as well as a posteriori ratemaking (including policy cancellation rules) are handled in an unified way within the same stochastic model.

“Nonparametric regression with censored data : several applications” (2001-2003)

Financing : Université catholique de Louvain, FSR

Promoter : I. VAN KEILEGOM

Researcher : C. HEUCHENNE

In this project a heteroscedastic regression model is considered in which the response is subject to right censoring. The nonparametric estimation of the unknown functions of this model has been studied in the literature. The aim of this project is to consider two applications. In the first one, a new least squares method for a polynomial regression model is proposed. For the second one, an ANCOVA model is considered and a new procedure to test the hypotheses of interest in this model is studied.

“Statistical techniques and modelling for complex substantive questions with complex data” (2002-2006)

Financing : Interuniversity Attraction Poles Programmes, Belgian Science Policy, Brussels, Belgium

Coordinators : I. GIJBELS and L. SIMAR

STAT researchers : J. BIGOT, G. GEENENS, S. O. JEONG, A. LAMBERT and B. TEODORESCU

Partners Institutions :

- Katholieke Universiteit Leuven, Belgium
- Limburgs Universitair Centrum, Diepenbeek, Belgium

- Université Libre de Bruxelles, Belgium
- Aachen Technical University, Germany
- Université Joseph Fourier, Grenoble, France

The point of departure of the network activities is that of a broad range of complex substantive data sets and questions arising in various disciplines (including psychology, biomedical sciences, economics, and climatology). The overall aim of our project then is to develop appropriate statistical models and techniques to deal with these data and questions.

“New management methods for insurance and finance risks” (2003-2004)

Financing : Université catholique de Louvain, FSR

Promoter : M. DENUIT

Researcher : C. COURTOIS

The aim is twofold : improving the management of insurance risks by insurance companies and the integration of actuarial and financial pricing methods.

11 ACTIVITIES IN APPLIED STATISTICS

The Institut de statistique is developing many contacts within the Université catholique de Louvain and with several companies in the field of applied statistics. In addition to the seminars organised weekly (see point 5), the members of the Institute participate to research contracts in applied statistics and offer consulting services to other departments and institutions of the University. They also offer some courses of continued education at the University and in companies.

The major activities are described below.

11.1 Services for the Université catholique de Louvain

The Institut de statistique offers a consulting service to the University community. Researchers of the others faculties receive advice concerning appropriate methodologies and suitable statistical packages for their specific problems. Hence, scientific collaborations between different disciplines are often created.

More information is available on the web page:

<http://www.stat.ucl.ac.be/ISconsultation>

The scientific members and the computer scientists of the Institute are developing their knowledge about the evolution of many statistical software and they often give advice in this context. The Institute hosts the "Statistical application server" used daily by UCL researchers and students for their statistical computations.

More information concerning this server is available on the web page:

<http://wwwsas.stat.ucl.ac.be>

11.2 Applied research contracts

"Automatic statistical analysis in the time-frequency domain" (2000-2003)

Financing : "The National Institute of Mental Health" (USA)

Promoter : R. von SACHS

In the collaborative project with biostatisticians (H. OMBAO, Department of Statistics, University of Illinois, Champaign, USA and W. GUO, School of Public Health, UPENN, Philadelphia) and neurologist (B. LITT, UPENN, Philadelphia) we try to improve the modelling and understanding of the evolution of epileptic seizure in the brain. The final goal of this research is to try to localize the centre of the seizure more precisely in order to improve the surgical treatment. In the first phase of the project (2/2000-1/2001) we have developed a new algorithm for

bivariate spectral analysis of EEG data which is more localized but still relatively close to the methods medical doctors are used to. In the second phase (2/2001-1/2003) we have generalised our method in order to treat multivariate EEG signals of higher dimension.

“Assessment of quality differences between freight transport modes”
(2001-2003)

Financing : Belgian Science Policy, Brussels, Belgium (Second multiannual scientific support plan for a sustainable development policy)

Promoter : M. MOUCHART

Researchers : A. OULHAJ, G. SANTAMARIA and M. VANDRESSE

The objective of this contract is to analyze the qualitative differences between means of long-distance freight transport: reliability, security, flexibility, punctuality, information, damages, etc. We will measure the impact of these qualitative factors concerning the decision of a transport mode and, if possible, we will evaluate the corresponding advantages (or costs).

“Analysis and interpretation of electroencephalograms (EEG) in drug discovery” (2001-2005)

Financing : Eli Lilly (October 2001 till August 2003)
FSR (September 2003)
FRIA (October 2003 - 2005)

Promoter : Ph. LAMBERT

Researcher : C. BUGLI

Electroencephalograms (EEG) can be used to improve the understanding of the effects of experimental drugs on the body. Such signals can for example be generated during a drug development process using human volunteers exposed to varying drug concentrations. EEG signals typically take the form of longitudinal continuous responses measured at high frequency during at most 10 minutes at various locations at the surface of the skull. Currently, very simple descriptive analyses of such data are undertaken. Typically, each signal (generated at one electrode) is subdivided in consecutive periods of (say) 2 seconds. It is assumed stationary in these small epochs and separately analyzed using Fourier transforms. The goal of the project is

- to evaluate the potential of independent component analysis.
- to develop functional data analysis models to analyse event related potentials.

- to illustrate the potential of these techniques to quantify the effect of a treatment on the brain.

EEG signals generated during cross-over trials where patients alternatively received a placebo and a drug reported to have a large and well understood effect on the brain are potential elements to use in that illustration.

“Actuarial models for pricing longevity risk reinsurance treaties” (2002-2003)

Financing : Secura Belgian Re, Brussels, Belgium

Promoter : M. DENUIT

Researcher : M. HADERER

This project aims to develop an actuarial model to price reinsurance treaties covering longevity risk in life annuities portfolios. The analysis of mortality forecasting errors will be used to project future cash flows and to study their variability.

“Analysis of the Quebecian RRQ mortality” (2002-2003)

Financing : RRQ, Quebec

Promoter : M. DENUIT

Collaborators : H. COSSETTE and E. MARCEAU, University of Laval, Quebec

Researchers : A. DELWARDE, UCL, Belgium, and F. GUILLOT (University of Laval, Quebec)

This work aims to compare the mortality experienced by members of the Quebecian RRQ to the general population. The possible influence of exogeneous factors will be assessed on the basis of observations relating to the period 1966-2000.

“Datawarehouse of civil servants : analysis of external needs” (2003-2004)

Financing : Belgian Science Policy, Brussels, Belgium

Promoter : M. DENUIT

Researcher : N. BROUHNS

The study aims to design a socio-economic datawarehouse relating to the pensions paid to civil servants. This information tool will be used by the Ministry of Finance to monitor financial aspects of these pensions.

“Mortality of civil servants : actuarial and demographic analysis” (2003-2004)

Financing : Belgian Science Policy, Brussels, Belgium

Promoter : M. DENUIT

Researcher : A. DELWARDE

The study aims to provide to the Ministry of Finance an actuarial and demographic support to the software Exsyspen used to forecast financial aspects of the pensions paid to civil servants.

“A model for trend estimation adapted to monitoring data” (2003-2004)

Financing : EUROCHLOR, Belgium

Promoter : Ph. VANDEN EECKAUT

Researcher : S. VAN BELLEGEM

This project is the last part of the second project between Euro Chlor and the Institute of Statistics. During the first collaboration between the Institute and Euro Chlor, we proposed an indicator for the estimation of slopes with monitoring data based on Sen’s indicator. This indicator was illustrated on the WRC database. The conclusions of this work were mixed.

On the positive side, the indicator is easy to understand and to compute, and it offers an adequate flexibility. On the negative side, we have problem to give a statistical interpretation of the results. The objective of our new proposal is to provide a statistical interpretation of the trend while maintaining a model which is as easy to interpret than the Sen’s indicator. We use a completely different way to discover the trend which, we believe, is well adapted to the objective.

“Longevity without assistance : evaluation of life expectancy without disability” (2003-2004)

Financing : BVVA Bank, Spain

Promoter : M. DENUIT

Collaborators : M. GUILLEN, University of Barcelona, Spain, and S. HABERMAN, City University of London, United Kingdom

This project wants to analyse the evolution of the mortality and of the dependence degree (need of an external help for disabled people) for old people in different countries of the European Union.

“Statistical analysis of PET scan data” (2003-2007)

Financing : Eli Lilly (October 2003 till September 2005)

Promoter : Ph. LAMBERT

Researcher : A. JULLION

The goal of this research is to build statistical longitudinal models for the analysis of Positron Emission Tomography (PET) scan data. In particular, we plan to set up methods leading to new definitions of receptor occupancy and enabling to quantify associated measures of precision.

The final tool will allow to visualize where the drug is acting on the brain and how that action is changing over time.

11.3 Consulting for firms and public organisms

The principal consulting contracts treated in 2003 are the following:

Client : Slegten S.A., Louvain-la-Neuve, Belgium
Subject : Developpement of prediction models for grinding media wear data.
STAT participant : C. RITTER

Client : Elia, Brussels, Belgium
Subject : Assessment of the magnetic field levels in the vicinity of the HV overhead power lines in Belgium
STAT participants : A. DELAIGLE and B. GOVAERTS

Client : Media Conseil, Brussels, Belgium
Subject : Probability analysis of the expected gain of a new lotery game.
STAT participant : J.M. ROLIN

Client : Eurocontrol, Brussels, Belgium
Subject : Efficiency Analysis of Air Navigation Services Provision
STAT participants : M. MOUCHART and L. SIMAR

Client : Techspace Aero, Liège, Belgium
Subject : Design and analysis of an experiment for the optimisation of strators brasing in the aerospace industry.
STAT participant : B. GOVAERTS

11.4 Continued education for companies

2 days of course on "S-Plus for pharmaceutical data analysis"
Society : UCB, Braine-l'Alleud , Belgium
STAT participants : C. BUGLI and B. GOVAERTS