

Cursussen Statistiek Courses in Statistics

2008-2009

PERMANENTE VORMING
IN DE WETENSCHAPPEN
CONTINUING EDUCATION
IN SCIENCE





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adres



Centrum voor Statistiek

ADRES Krijgslaan 281 - S9, 9000 Gent
URL <http://www.cvstat.UGent.be>



Center for Statistics
Centrum voor Statistiek

Instituut voor Permanente Vorming in de Wetenschappen

ADRES Krijgslaan 281 - S3, 9000 Gent
TELEFOON 09 264 44 26 FAX 09 264 85 90
E-MAIL Isabel.DeZutter@UGent.be
URL www.ipvw-ices.UGent.be



Institute for
Continuing Education
in Science



Instituut voor
Permanente Vorming
in de Wetenschappen

Wij aanvaarden de opleidingscheques
van de Vlaamse Gemeenschap.

Deze reeks includeert cursussen die zijn opgenomen
in de Doctoral Schools programma's.

Voorwoord

Statistiek is de laatste decennia onmisbaar geworden in heel wat takken van de wetenschap. Denk maar aan sociologen die oorzaken van gedrag natrekken, artsen en biowetenschappers die DNA-chips analyseren of de effectiviteit van nieuwe interventies evalueren, bio-ingenieurs die de kwaliteit van het milieu bewaken, industriëlen die de productiekwaliteit bijsturen, economen die financiële tijdreeksen bestuderen,... Met de komst van gebruiksvriendelijke software wordt het opslaan en manipuleren van data haast kinderspel. Veel minder evident is het om relevante en kwaliteitsvolle gegevens te verzamelen, om efficiënt informatie te onttrekken en niet misleid te worden door naïeve conclusies. Een techniek en de interpretatie van haar resultaten hangen immers fundamenteel samen met het design en de implementatie van de studie, vaak ook met bijkomende onderstellingen over een complexe datastructuur.

Het Centrum voor Statistiek van de Universiteit Gent, in samenwerking met het Instituut voor Permanente Vorming van de Faculteit Wetenschappen (IPVW), organiseert daarom elk jaar cursussen die inspelen op de noden van gebruikers van statistische methoden. Het aanbod richt zich vooral op het verwerven van inzicht in de basis van het statistisch onderzoek. Practica op pc stellen de kandidaat in staat om ook al doende te leren. Het doelpubliek bestaat uit professionelen en onderzoekers met een academische vorming. Of u nu kennis wil opfrissen, op de hoogte wil blijven van recente ontwikkelingen of belangstelling heeft voor een nieuw onderzoeksdomein, deze formule wil u in staat stellen om gericht kennis en vaardigheden op te doen. De nieuwe inzichten zullen uw bedrijf en uw onderzoek de extra voorsprong geven die het verdient. Ook de Vlaamse regering ziet zo'n training als een troef voor haar economisch beleid. Werkgevers kunnen genieten van financiële steun onder de vorm van de BEA-maatregel. Werknemers kunnen gebruik maken van de opleidingscheques. Meer informatie over deze 'stimulerende middelen' vindt u op de websites www.beaweb.be en www.vdab.be/opleidingscheques en via de link op de IPVW-website: www.ipvw-ices.UGent.be.

Tussen november 2008 en april 2009 wordt het pakket basismodules aangeboden, waarin statistische kennis gradueel wordt opgebouwd. Daarin wordt dit jaar de module "Applied Linear Regression" volledig vernieuwd en in het Engels aangeboden. Vooraf, in oktober 2008, geven twee modules een introductie tot het gebruik van de statistische softwarepakketten SPSS en SAS, waarvoor de Universiteit Gent een licentie heeft. Naar jaarlijkse gewoonte wordt dit programma aangevuld met een aantal meer gespecialiseerde cursussen. Halfweg januari wordt de driedaagse cursus "Multilevel Analysis for Grouped and Longitudinal Analysis" hernomen. In de eerste twee weken van april 2009 worden twee driedaagse cursussen ingericht: "Simulation Techniques" en "Multivariate Statistics". Ons programma sluiten we af, in april-mei 2009, met de module "Logistic Regression". Met uitzondering van module 1 worden dit jaar alle modules in het Engels gedoceerd. Ons doel blijft om iedereen maximaal te laten genieten van deze kans tot bijkomende opleiding.



mende opleiding. Het geheel verloopt in een gemoedelijke sfeer met ruime mogelijkheid tot interactie met de docenten. De IPVW-activiteiten waaraan een examen is verbonden worden ook opgenomen in het programma van de 'Doctoral Schools' die de UGent-doctoraatstudent ondersteunen bij zijn/haar onderzoek en opleiding.

Verder brengen we graag de volgende initiatieven onder uw aandacht:

Dit jaar is aan de Universiteit Gent het IOF¹ valorisatieconsortium Stat-Gent CRESCENDO gestart, in samenwerking met het Centrum voor Statistiek. Stat-Gent heeft tot doel de UGent statistiekexpertise te valoriseren via toepassingen voor overheid en industrie. Meer informatie hierover, ook over onze aanbieding van short courses in statistiek en over een meer doorgedreven Master opleiding in Statistische Data-Analyse, die wetenschappers uit diverse disciplines een grondige vorming aanbiedt in de methodes van de toegepaste statistiek, vindt u op de website van het Centrum voor Statistiek: www.cvstat.ugent.be.

Ook de Associatie Universiteit Gent (AUGent) organiseert jaarlijks een navormingscyclus ten behoeve van onderzoekers van de partnerinstellingen. In praktijkgerichte en interactieve sessies worden essentiële onderzoekscompetenties toegelicht. Meer informatie hierover vindt u via <http://navorming.augent.be>.

We hopen dat u het nieuwe aanbod kan smaken en wensen u alvast een leerrijk en productief jaar toe!

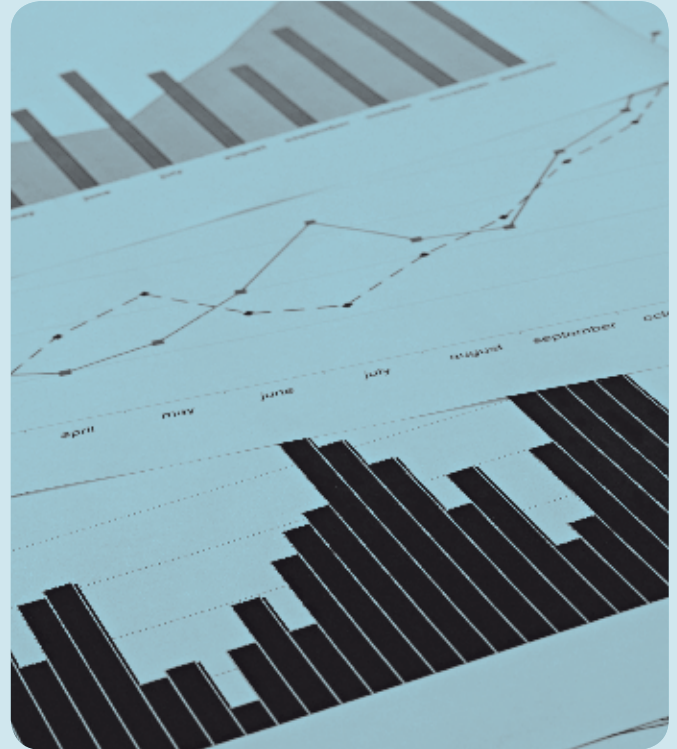
¹ Industrieel OnderzoekFonds

Introduction

Statistics has become indispensable in many branches of science. Sociologists and psychologists searching to explain behaviour, biologists analysing DNA-chips, clinicians evaluating new interventions, bio-engineers monitoring the environment, managers performing quality control, economists studying time series, ... they all rely on statistical methods. Today's user-friendly software allows anyone to store and manipulate data quite easily. It remains a challenge however, to gather relevant, high-quality data and retrieve information efficiently to draw accurate inference. Without training and due professionalism one runs a high risk of arriving at misleading conclusions. One must recognise how the appropriate statistical technique and justified interpretation depend fundamentally on the design and conduct of a study in combination with any assumptions about the data structure.

To meet the needs of users of statistical methods, the Centre for Statistics of Ghent University in co-operation with the Institute for Continuing Education of the Faculty of Science (ICES) organises a yearly series of courses. The goal is to train users of statistical software, providing them with insight in the basics of statistical research. Practical sessions on PC's allow participants to obtain this through hands-on experience. Our courses are aimed at professionals and participants with an academic training, who wish to refresh their knowledge, keep it up to date or discover new areas of research. The program is designed to offer specific knowledge and skills through separate modules. The new insights will give your company or research the extra edge it needs. The Flemish Community regards continuing training as an important element of its economic policy. Employers are granted financial support through the government's introduction of the BEA-measure and employees can use training vouchers. More information about these stimulating initiatives can be found on the websites: www.beaweb.be and www.vdab.be/opleidingscheques (both in Dutch) or via the link on the ICES-website: www.ipvw-ices.UGent.be (English).

From November 2008 to April 2009, the program offers a classic series of basic modules which gradually build up statistical knowledge and techniques. This year, the module "Applied Linear Regression" is completely renewed and will be presented in English. Leading into these basic modules, two courses in October 2008 introduce the statistical software SPSS and SAS, for which Ghent University has a campus licence. Every year, the program offers an additional number of more specialised courses. Half-way January the three-day course "Multilevel Analysis for Grouped and Longitudinal Analysis" is retaken. In the first two weeks of April 2009 we organise two three-day courses. In the first week the subject of "Simulation Techniques" will be tackled and in the second week we offer a course on "Multivariate Statistics". We close our program, in April-May 2009, with a much requested course dealing with "Logistic Regression". With exception of the first module all modules this year are taught in English to give international candidates the opportunity to participate. Classes take place in a pleasant



atmosphere with ample opportunity to interact with lecturers. ICES-activities that include an exam will also be incorporated in the program of the Doctoral Schools, which support UGent doctoral students with their research and training. Also, we would like to bring the following initiatives to your attention:

This year, the IOF² valorisation consortium Stat-Gent CRESCENDO has started at Ghent University, in collaboration with the Center for Statistics. Stat-Gent aims at valorising UGent statistical expertise through applications in government and industry. For more information about this consortium, about short courses in statistics organised by the Center for Statistics and on the Masters program in Statistical Data-Analysis, which offers a more thorough training in the methods of practical statistics to scientists in diverse areas, visit our website www.cvstat.ugent.be.

The Ghent University Association (AUGent) also organises a yearly training aimed at researchers of the partner institutes. In practical and interactive sessions essential research competences are illustrated. More information about this initiative can be found on <http://navorming.augent.be>.

Hoping the new program meets your expectations, we wish you an enjoyable and productive learning experience!

² Industrial Research Fund

MODULE 1 – Inleiding tot SPSS

Dhr. Kris Erauw

Beschrijving

We leven in een kennismaatschappij. Heel veel mensen verzamelen gegevens of willen bepaalde ideeën met onderzoeksbevindingen ondersteunen. Denk aan de jongeren in een stedelijke jeugdraad die in hun jeugdwerkbeleidsplan de geformuleerde beleidslijnen moeten ondersteunen met onderzoeksbevindingen; of aan de voorzitter van een oudercomité die de standpunten van ouders op een wetenschappelijk verantwoorde manier wil bevragen. Het verzamelen en opslaan van al die gegevens is vaak niet zo evident als het lijkt. Zeker niet als het de bedoeling is de gegevens later op een professionele manier te verwerken.

Deze lessenreeks is erop gericht data in een bruikbare vorm te verzamelen, de ingezamelde data in SPSS op te slaan en met SPSS de eerste beschrijvende statistieken te produceren.

De verschillende lessen in de reeks zijn ervaringsgericht opgevat. De deelnemers worden met een aantal problemen geconfronteerd waarna mogelijke oplossingen besproken en gedemonstreerd worden.

Les 1

Data en dataverzameling: data in SPSS invoeren en definiëren, data uit andere programma's importeren en gebruiken.

Les 2

Elementaire bewerkingen: samenvattende statistieken en voorstellingen genereren, variabelen herschrijven en combineren, databestanden bewerken en combineren.

Les 3

Gemiddelden vergelijken: grafische voorstelling van gemiddelden, t-toetsen en one-way variantie-analyse.

Les 4

Meer uit je databestand halen: de eerste stappen in lineaire regressie.

Data

6, 7, 9 en 10 oktober 2008 telkens van 17u tot 20u.

Plaats

PC-klas 1 van de Faculteit Psychologische en Pedagogische Wetenschappen, Henri Dunantlaan 1, Gent.

Doelpubliek

Deze practica zijn bedoeld voor alle personen die gegevens verzamelen en/of opslaan, met de bedoeling deze statistisch te analyseren en te interpreteren.

Toelatingsvoorwaarden

Geen

Lesmateriaal

Documentatie- en oefeningbundel.

Prijs

De deelnameprijs bedraagt 325 EUR voor deelnemers uit de private sector, 175 EUR voor UGent-personeelsleden en personeel uit de non-profit, social-profit en overheidssector. Een gereduceerde prijs van 125 EUR geldt voor doctoraatsstudenten. In deze prijs is o.a. het lesmateriaal ingesloten.

MODULE 2 – Introduction to SAS

Dr. Anita Prinzie

Course description

The amount of data stored in data warehouses grows exponentially every day. This high-dimensional and often noisy data is stored with the aim to eventually extract useful patterns and information on which strategies can be based. However, the data as stored in a data warehouse is typically not suitable for immediate analysis. The data might be noisy, data might be stored across different tables or more rich information could be extracted by creating your own variables. Hence, before any information can be extracted and modeled, a first time-consuming task involves the manipulation of the data (missing-value imputation, creation of new variables) stored in multiple tables to obtain an analysis table appropriate for subsequent statistical analyses like regression analysis, analysis of variance or survival analysis. This course aims to empower you to manipulate huge data warehouses by learning the SAS programming language. Whereas other software packages like SPSS are offering limited capabilities to handle and manipulate high-dimensional data, with the SAS language you are in total control of data manipulation. In addition to data manipulation, we will illustrate by hands-on practice how you can use SAS statistical procedures to subsequently analyse/model your data. Unlike the interactive SAS Enterprise Miner, the SAS language provides more flexibility to define model parameters and facilitates easy replication of analyses. After finishing this course, you will be able to perform data manipulation and basic statistical analyses using the SAS programming language.

Dates and venue

October 14, 16, 21 and 23, 2008 from 5:30 p.m. to 9:00 p.m., at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

This course will benefit investigators/data analysts from diverse areas in charge of analysing potentially high-dimensional data stored in a data warehouse. It is most suited to anyone working with high-dimensional data (either in terms of number of instances and/or number of variables). However, if you are working with low-dimensional data, you too will benefit from this course as mastering the SAS programming language delivers you more control to manipulate your data in order to create new variables and to replicate your work in a convenient way.

Course prerequisites

Participants should have experience in basic statistics at a level equivalent to the “Introductory Statistics” course of this program.

Course material

Copies of lecture notes.

Optional but highly recommended programming manual: “The Little SAS® Book: A Primer”, Lora D. Delwiche & Susan J. Slaughter, 3rd ed., (2003), SAS Publishing.

Fees

The registration fee amounts to 325 EUR for participants of the private sector, 175 EUR for employees of Ghent University, the government, the non-profit and social-profit sector. A special rate of 125 EUR applies to doctoral students. The book is optional but recommended and can be bought at the additional cost of 45 EUR (+ 6% VAT). Please indicate this clearly on the registration form.

MODULE 3 – Introductory Statistics

Basics of Statistical Inference

Prof. dr. Maria Ysebaert

Course description

This course aims to provide insight into basic statistical concepts with emphasis on practical applications. Mathematical formulae will be kept to a minimum. The theory and the methods of analysis will be extensively illustrated with examples relating to a wide variety of different fields.

We start with concise graphical and numerical descriptions of data obtained from observational or experimental studies. The most common and frequently used probability distributions of discrete and continuous variables will be presented. Statistical inference draws conclusions about a population based on sampled data. Chance variations are taken into account such that a level of confidence is attached to these conclusions. We present the reasoning behind significance tests for the comparison of observed data with a hypothesis, the validity of which we want to assess. We apply this procedure to data obtained either from one or from two populations. The correct use of the t-test will be discussed. Nonparametric methods are considered as a possible alternative in case the requirements of the t-test are not met. We cover the basic concepts of hypothesis testing for categorical data, including the chi-square test. Quite often the relationship between two variables, where the outcome of one variable is seen as depending on the value of the other, is the focus of scientific interest. We will give an introduction to linear regression analysis, where a regression line based on observations obtained in a sample describes this relation.

Dates and venue

October 28, November 4, 18 and 25, December 2, 9 and 16, 2008 from 5:30 p.m. till 9:30 p.m. (each lecture is followed by a hands-on practical session) at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

This course will benefit investigators from diverse areas, research scientists, clinical research associates, and, in general, anyone who comes in contact with data handling and who wants to acquire insight into basic statistical methods or who feels that his/her knowledge and practice of statistics needs refreshing. No extensive background in mathematics is required.

Exam

Participants can, if they wish, take part in an exam at a date which will be specified later. A certificate from Ghent University will be issued to participants with a university degree at the bachelors level or an equivalent degree upon succeeding in this test. As such this course can be incorporated in a doctoral training program.

Course prerequisites

The course is open to all interested persons.

Course material

Copies of lecture notes.

Recommended handbooks are:

Book 1: "Fundamentals of Biostatistics", Bernard Rosner, 6th ed. (2005), Thomson Learning.

Book 2: "Introduction to the Practice of Statistics", David S. Moore & George P. McCabe, 5th ed. (2005), W.H. Freeman and Co.

Fees

The registration fee amounts to 700 EUR for participants of the private sector, 300 EUR for employees of Ghent University, the government, the non-profit and social-profit sector. A special rate of 200 EUR applies to doctoral students. The books are optional and can be bought at the additional cost of 70 EUR per book (+ 6% VAT). Please indicate this clearly on the registration form.

MODULE 4 – Analysis of Variance

Prof. dr. Maria Ysebaert

Course description

Analysis of variance (ANOVA) is a statistical tool used in the comparison of means of a random variable in populations that differ in a characteristic (factor), e.g. treatment, age, sex, subject, etc. First, we cover one-way ANOVA, where only one factor is of concern. Depending on the type of the factor, the conclusions pertain to just those factor levels included in the study (fixed factor model), or the conclusions extend to a population of factor levels of which the levels in the study are a sample (random effects model). In two-way and multi-way ANOVA (populations differ in more than one characteristic), the effects of factors are studied simultaneously to obtain information about the main effects of each of the factors as well as about any special joint effects (factorial design). In nested designs, where each level of a second factor (mostly a random factor) occurs in conjunction with only one level of the first factor, analysis of variance enables us to extract the variability induced by the nested factor from the effects of the main factor. For correct analysis of the data in multi-way ANOVA, not only the linear model and the type of factor have to be considered but, also, the assumptions that must be satisfied.

In this course we will focus on correct execution of data analysis and understanding the results of this analysis. We will provide insight into the conclusions and pay attention to expressing these conclusions in a correct and understandable way. The different methods will be extensively illustrated with examples from scientific studies in a variety of fields.

Dates and venue

January 6, 13, 20 and 27, February 3, 10 and 17, 2009 from 5:30 p.m. to 9:30 p.m. (each lecture is followed by a hands-on practical session) at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

This course will benefit investigators from a diversity of areas, who need to use statistical methods in the collection and handling of data in their research, in particular for assessing the effect of e.g. different treatments.

Exam

Participants can, if they wish, take part in an exam. A certificate from Ghent University will be issued to participants with a university degree at the bachelor level or an equivalent degree upon succeeding in this test. As such this course can be incorporated in the doctoral training program.

Course prerequisites

Participants are expected to have an active knowledge of the basic principles underlying statistical strategies, at a level equivalent to the "Introductory Statistics" course of this program. In the first session, on January 6, these principles will be briefly reviewed. This review session is open to interested participants of subsequent modules. Participants who have recently followed the introductory course are exempt from that first session.

Course material

Copies of lecture notes.

Recommended handbook: "Applied Linear Statistical Models", Michael H. Kutner, Christopher J. Nachtsheim, John Neter & William Li, 5th ed. (2004), McGraw-Hill.

Fees

The registration fee amounts to 700 EUR for participants of the private sector, 300 EUR for employees of Ghent University, the government, the non-profit and social-profit sector. A special rate of 200 EUR applies to doctoral students. The book is optional and can be bought at the additional cost of 70 EUR (+ 6% VAT). Please indicate this clearly on the registration form.

MODULE 5 – Multilevel Analysis for Grouped and Longitudinal Data

Prof. dr. Joop Hox

Course description

Social research often concerns relationships between individuals and the social contexts to which they belong. Individuals and their social contexts can be conceptualised as a hierarchical structure, with individuals nested within groups. Classical examples are educational research, with pupils nested within schools, and cross-national research, with individuals nested within their national units. Such systems can be observed at two levels, and as a result we have data with group level variables and individual level variables. To analyse such hierarchical structures, we need multilevel modeling, which allows us to study the relationships between variables observed at different levels in the hierarchical structure.

Multilevel modeling can also be used to analyse data from longitudinal research, by viewing measurement occasions as being nested within respondents. This has several advantages compared to more classical approaches to longitudinal data. In addition, multilevel models have been generalised to cover situations where data do not have a simple multilevel structure, such as cross-classified data or multiple-membership models.

This short course is intended as a basic and nontechnical introduction to multilevel analysis. It starts with a description of some examples, and shows why multilevel models are necessary if the data have a hierarchical structure. It then covers the basic theory of two- and three-level models. Next it explains how multilevel models can be applied to analysing longitudinal data, and why and when this may be an attractive analysis approach, as compared to more classical analysis methods such as multivariate analysis of variance (Manova). Further topics are multilevel logistic models to analyse data where the outcome variable is dichotomous or a proportion, and multilevel multivariate modeling to analyse where there are multiple outcome variables.

Dates and venue

January 12, 13 and 14, 2009 from 9 a.m. till 4 p.m. at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent. The course includes three computer labs, where multigroup and longitudinal data are analysed. The computer labs in the course use the SPSS Mixed procedure, which is available in SPSS starting with version 11.5 procedure, which is available in SPSS starting with version 11.5.

Target audience

This course will not only benefit applied researchers in the behavioral and social sciences, but whoever deals with data with a hierarchical or multilevel structure.

Exam

For more information about the exam connected to this module, please consult the ICES website.

Course prerequisites

The course assumes reasonable familiarity with analysis of variance and multiple regression analysis, but prior knowledge of multilevel modeling is not assumed.

Course material

Copies of course notes.

The course is based on: J.J. Hox (2002), "Multilevel Analysis. Techniques and Applications", Mahwah, NJ, Lawrence Erlbaum Associates.

Fees

The registration fee amounts to 700 EUR for participants of the private sector, 300 EUR for employees of Ghent University, the government, the non-profit and social-profit sector. A special rate of 200 EUR applies to doctoral students. The fee includes i.a. the lecture notes. The book is optional and can be bought separately at the price of 35 EUR (+ 6% VAT). Please indicate this clearly on the registration form.

MODULE 6 – Applied Linear Regression

Dr. ir. Geert De Meyer

Course description

Linear regression addresses how a continuous dependent variable is affected by one or more continuous predictors. The fact that many practical problems deal with continuous variables (e.g. income, blood pressure, temperature) makes linear regression a popular tool, and most of us will be familiar with the concept of drawing a line through a set of data. The first two sessions of this module introduce the conceptual framework of this method using the simple case of a single predictor. Formulas and technicalities are kept to a minimum and main focus will be on interpretation of results and assessing model validity. This includes confidence statements on the predictor effect (hypothesis tests and confidence intervals), using the regression model to predict future results, and verification of model assumptions. In session 3 and 4 the conceptual framework will be expanded to accommodate more than one predictor leading to the multiple linear regression model. How to deal with these complex models in general and how to come to the most simple model starting from a large number of predictors will be discussed in detail. In these complex linear models special attention will be given to interpreting individual predictor effects, as these can be complicated by underlying relations between predictors (confounding). Session 5 covers design of experiments (DoE) as a case example of multiple linear regression. DoE is a popular process improvement methodology used for practical problem solving in science and industry. The last session will briefly touch on problems where the linear regression model is not appropriate and needs to be replaced by related approaches such as nonlinear models and mixed models. Different aspects will be illustrated with case examples from the instructors practical experience, and students are encouraged to bring examples from their work.

Dates and venue

February 24, March 3, 10, 17, 24 and 31, 2009 from 5:30 p.m. to 9:30 p.m. (each lecture is followed by a hands-on practical session) at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

The course targets researchers who need to analyse incomplete data sets and are seeking practical tools to handle missing data in their own analyses.

Exam

Participants can, if they wish, take part in an exam. A certificate from Ghent University will be issued to participants with a university degree at the bachelor level or an equivalent degree upon succeeding in this test. As such this course can be incorporated in a doctoral training program.

Course prerequisites

Participants are expected to have an active knowledge of the basic principles underlying statistical strategies, at a level equivalent to the "Introductory Statistics" course of this program. The first session of module 4, "Analysis of Variance", on January 6, 2009, in which these principles will be briefly reviewed, is free and open to all participants of one or more modules of this year's statistics program.

Course material

Copies of lecture notes.

Recommended handbook: "Applied Linear Statistical Models", Michael H. Kutner, Christopher J. Nachtsheim, John Neter & William Li, 5th ed. (2004), McGraw-Hill.

Fees

The registration fee amounts to 700 EUR for participants of the private sector, 300 EUR for employees of Ghent University, the government, the non-profit and social-profit sector. A special rate of 200 EUR applies to doctoral students. The fee includes i.a. the lecture notes. The book is optional and can be bought at the additional cost of 70 EUR (+ 6% VAT). Please indicate this clearly on the registration form.

MODULE 7 – Introduction to Simulation Techniques

Dhr. Erik Spaepen

Course description

Today's researchers are often confronted with statistical models whose parameters have no closed-form estimators, or with situations where multiple sources of variation on the outcome must be accounted for, which complicates statistical inference. In such cases, simulations can be of great value. Simulating sample outcomes under population models allows the statistician to account, for instance, for all these different sources of variation. By running thousands of these simulations, one gets a spread of all possible sample outcomes from the model at hand. Analysing results and parameter estimates from the different simulated samples, then gives a solid representation of the (un)certainty regarding your specific situation. Sometimes individual simulations are facilitated by building them in a sequential manner, they are then called Monte Carlo simulations. This course will cover a variety of possible uses.

Part 1

Initially, we will look at why simulations are used and when these are appropriate. Basically, how does a standard simulation work? Also, the random numbers seed will be covered. This general overview will help you in detecting where simulations could be used for your specific research questions.

Part 2

This part will cover two specific resampling procedures, i.e. the Bootstrap and Jackknife, which are used to estimate variability around parameter estimates (e.g. a simple mean) in case the population does not follow a normal or other 'standard' distribution and the sample size is relatively small.

Part 3

Performing statistical inference using permutation methods or bootstrap techniques is also a very plausible alternative route in cases where a simple T-test or other standard statistical test procedure fails. We will see how to compare treatment groups using some simple examples.

Part 4

Power analyses (sample size calculations) are often performed using standard and well-known methods. They help us to predict what chance we have to find a statistically significant difference for a specific set of assumptions. One of these assumptions usually is the form of the distribution of your population(s). What if your distribution is known, but no standard formula exists to calculate sample size? By simulating your population(s) at different sample sizes, you simulate a possible scenario each time. In the end, you can analyse these scenarios to assess the power of your study.

Part 5

In health-economic evaluations, one is often confronted with data from multiple sources, and many influential parameters around an outcome. Furthermore, the standard cost-effectiveness is a ratio, i.e. delta costs divided by delta effect. As a ratio is difficult to model, simulations as performed in part 3 are necessary. Although closed form approximations exist, i.e. the Fieller Theorem, to assess the distribution of a ratio, the necessity to model many sources of variation at once still requires the use of simulations. Very often, these models are constructed in a spreadsheet, with ease-of-use for other parties as main advantage. We will also cover the use of Bootstrapping to determine cost-effectiveness, in case a full data set covering all sources of variation exists.

Dates and venue

April 6, 8 and 10, 2009 from 9:30 a.m. till 12:30 a.m. and from 1:30 p.m. to 4:30 p.m. at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

This course will benefit investigators from a diversity of areas, who need to use simulations to test their hypotheses or assess variability around certain parameters for which no closed form solution exists. Furthermore, researchers becoming familiar with health economic models might benefit from the introduction into Markov States models.

Exam

Participants can, if they wish, take part in an exam. The exam will consist of a home assignment with limited time, with practical exercises to be performed. A certificate from Ghent University will be issued to participants with a university degree at the bachelor level or an equivalent degree upon succeeding in this test. As such this course can be incorporated in a doctoral training program.

Course prerequisites

Participants are expected to have an active basic statistical knowledge and be familiar with SAS and a spreadsheet such as Excel at an intermediate-level.

Course material

Copies of lecture notes.

Fees

The registration fee amounts to 700 EUR for participants of the private sector, 300 EUR for employees of Ghent University, the government, the non-profit and social-profit sector. A special rate of 200 EUR applies to doctoral students. The fee includes i.a. the lecture notes.

MODULE 8 – Multivariate Statistics

Prof. dr. Stefan Van Aelst

Course description

This course focuses on exploratory techniques to analyse multivariate data sets. The goal is to get insight in the structure of the data and the relations among the variables. Often one aims to reduce the dimensionality of the data. A standard technique is principal components analysis that tries to find important combinations of variables. More elaborate techniques such as factor analysis and independent component analysis will be discussed as well. Discriminant analysis and classification techniques will be discussed to get insight in data that consists of several (known) groups and can be used to assign new observations to one of the possible groups. If a data set (possibly) consists of more than one group, but the group labels are unknown, then cluster analysis techniques can be used to identify groups in the data set. We will discuss both hierarchical and partitioning approaches to cluster analysis. Canonical correlation analysis aims to understand the relation between two different multivariate data sets. The course will mainly focus on data sets with measurements of continuous random variables. However, some extensions to other variable types will be discussed as well.

Dates and venue

April 14, 15 and 17, 2009 from 9:30 a.m. till 12:30 a.m. and from 1:30 p.m. to 4:30 p.m. at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

This course targets researchers from all areas who are confronted with exploratory analysis of multivariate data sets.

Exam

Participants can, if they wish, take part in an exam. A certificate from Ghent University will be issued to participants with a university degree at the bachelor level or an equivalent degree upon succeeding in this test. As such this course can be incorporated in a doctoral training program.

Course prerequisites

Participants are expected to be familiar with basic statistics concepts.

Course material

Copies of lecture notes.

Parts of the course will be based on "An R and S-Plus® Companion to Multivariate Analysis", Brian S. Everitt, 2nd ed., (2007), Springer. This book also contains a lot of information regarding the use of R/S-Plus software.

Fees

The registration fee amounts to 700 EUR for participants of the private sector, 300 EUR for employees of Ghent University, the government, the non-profit and social-profit sector. A special rate of 200 EUR applies to doctoral students. The fee includes i.a. the lecture notes. The book is optional and can be bought separately at the price of 50 EUR (+ 6% VAT). Please indicate this clearly on the registration form.

MODULE 9 – Logistic Regression

Prof. dr. Els Goetghebeur

Course description

For those familiar with linear regression and the analysis of tabulated discrete data, it is natural to move to the regression analysis of binary outcomes. This course shows how binary data can be modeled in terms of both categorical and continuous predictors. We start from 2x2 tables, which have been stratified to account for confounders and/or effect modifiers. We demonstrate how their analysis can be based on the more general logistic regression model. Not only cohort studies, but also case control studies fit into this framework. We continue with more complex models which may involve continuous predictors. We focus on interpretation of the parameters, adequacy of the model, inspection of unduly influencing observations and step-wise model building. We point to extensions of the methods to analyse outcomes with more than two discrete levels, and correlated outcomes, such as matched pairs. Standard software assumes that a sufficiently large sample has been obtained. When rare outcomes are being modeled, and cells in tables are sparsely populated, we must fall back on exact methods which are more computer intensive. We will demonstrate specialised software that allows to perform such analysis. Topics are illustrated with studies stemming mostly from the biological and/or medical research field.

Dates and venue

April 21 and 28, May 5 and 12, 2009, from 5:30 p.m. to 9:30 p.m. (lectures on May 5 and 12 will be followed by a hands-on practical session) at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

The course targets researchers, especially in the (bio)medical field, who need to analyse discrete data in the course of their investigations.

Exam

Participants can, if they wish, take part in an exam at a date, which will be specified later. A certificate from Ghent University will be issued to participants with a university degree at the bachelors level or an equivalent degree upon succeeding in this test. As such this course can be incorporated in a doctoral training program.

Course prerequisites

Participants should have an active knowledge of the basic principles of statistics and of linear regression as taught in modules 3 and 5 of this program. They should be familiar with the analysis of 2x2 tables. Some experience with statistical software such as SPSS, SAS or STATA is assumed.

Course material

Copies of lecture notes.

Recommended textbook: "Applied logistic regression", 2nd ed., D. Hoshmer, Jr. and A. Lemeshow (2000), Wiley.

Fees

The registration fee amounts to 400 EUR for participants of the private sector, 200 EUR for employees of Ghent University, the government, the non-profit and social-profit sector. A special rate of 100 EUR applies to doctoral students. The fee includes the lecture notes.

The book is optional and can be bought separately at the price of 110 EUR (+ 6% VAT). Please indicate this clearly on the registration form.

The teachers

Dhr. Kris Erauw is stafmedewerker bij de dienst onderwijs-ondersteuning van de Faculteit Psychologie en Pedagogische Wetenschappen aan de Universiteit Gent. Hij stond jarenlang mee in voor de begeleiding van studenten bij de vakken statistiek en methodologie, en bij het schrijven van hun scriptie. Daarnaast ondersteunt hij onderzoekers bij het ontwikkelen van een gepast onderzoeksopzet en bij het verwerken van hun data.

Dr. ir. Geert De Meyer holds a PhD in applied biological sciences and has more than 10 years experience in biotech R&D. Initially he was a researcher on topics in plant pathology (PhD) and plant breeding (Plant Genetic Systems). Later, when joining Innogenetics in 2001, his focus shifted to applied statistics for drug and diagnostic test development. He worked on topics such as pre-clinical research, clinical trials, analytical methods, biomarkers, quality control and process improvement. In 2006 he obtained a master in statistical data analysis, and started statistical consulting activities for biotech companies. Since June 2008 he is business developer for the IOF consortium Stat-Gent.

Prof. dr. Els Goetghebeur chairs the Center for Statistics and the curriculum committee for the Advanced Master of Statistical Data Analysis at Ghent University, where she is associate professor in the department of applied mathematics and computer science. She co-ordinates the valorisation consortium Stat-Gent CRESCENDO, recently launched to foster application of UGent statistical expertise in industry and government. She was adjunct associate professor in the department of biostatistics at the Harvard School of Public Health for the past 5 years. She teaches courses in basic statistics, linear regression and survival analysis and sometimes more specialised courses, e.g. on "Analysing noncompliance in clinical trials" and on "Causal Inference". Her research focuses on methodological problems encountered in the biomedical sciences. She has a special fondness for causal inference, survival analysis and a newly acquired taste for multiple testing for genetic associations.

Prof. dr. Joop Hox is Professor of Social Science Methodology at the department of Methodology and Statistics of the Faculty of Social Sciences at Utrecht University. As Methodology chair, he is responsible for the research, development and teaching carried out at the faculty in the field of social science methods and techniques. His research interests focus on two lines of work: data quality in social surveys and multilevel modeling. The two lines of research reinforce each other, for instance in using multilevel methods to model complex survey data. He has acted as reviewer for national and international journals in the fields of survey methodology and statistics, and has been guest editor

for special issues. His recent research focusses on survey nonresponse, interviewer effects, survey data quality, missing data problems, and multilevel analysis of regression and structural equation models.

Dr. Anita Prinzie is a postdoctoral researcher of the Research Foundation – Flanders (FWO) working as a guest researcher at Ghent University. She received her Master in Marketing Analysis and Planning and her doctoral title at Ghent University. In her doctoral research she studied the use of methods of sequential analysis for Customer Relationship Management. After this she worked as a guest researcher at Monash University, Australia. At the moment she teaches the SAS macro language course in Marketing Modeling and Engineering to students in the Master of Marketing Analysis program (UGent). Her current research interests encompass testing the external validity of her newly developed Random Multinomial Logit algorithm for choice analyses and the understanding and analysing of customer decision processes from a marketing action perspective.

Dhr. Erik Spaepen is an applied statistician with a paramedical background, working as an independent consultant in the pharmaceutical industry. Previously, he has been working as researcher for the University of Leuven (cardiovascular disease), as clinical data statistician for a medical device company, and as senior business analyst for a consulting company.

Prof. dr. Stefan Van Aelst is lecturer at Ghent University, Department of Applied Mathematics and Computer Science, Faculty of Sciences. He is responsible for statistics courses in Bachelor and/or Master programs in Mathematics, Computer Science and Geography. He also teaches courses in the Master of Statistical Data Analysis. His research focuses on the development of robust methods for statistical models.

Prof. dr. Maria Ysebaert is a biochemist who received her training at the UGent, the University of Oregon Medical School and the Nobel Institute in Stockholm. In her research correct statistical analysis has always been a priority. She is now a retired member of the Faculty of Veterinary Medicine, where she taught courses in biochemistry and in statistics at the graduate and postgraduate level. She is still active in the Center for Statistics of the UGent where she is involved in setting up its program in continuing education in statistics.

Practical information

Registration

Please use the registration form in this brochure or on our website: www.ipvw-ices.UGent.be.

Your registration is valid only upon receiving a confirmation mail from ICES. If you have not received this mail within a week, please contact ICES to double check.

The registration fee covers tuition, some or all of the course materials, use of auditoria and PCs, coffee and sandwiches.

Payment

The registration fee is due within 30 days following receipt of the invoice. Payment is possible through bank transfer **with clear statement of the structured message on the invoice.** All mentioned amounts, except books, are free from VAT.

Additional reduction

When 3 or more participants from the same company or institute enrol simultaneously for the same module(s), an additional overall reduction of 20% is granted, books not included. Therefore, please check before enrolling if anyone else at your institute or company might be interested or is already planning to participate. This reduction does not apply to (doctoral) students.

Cancellation

- **Participants** can cancel their registration only in writing and until 5 days before the start of the concerning module, in which case 25% of the registration fee will be retained. In case of cancellation within 5 days before the start of the module, the full registration fee is due.
- **ICES** reserves the right to cancel one or more modules in the event that less than 15 people enrol for the module in question, in which case the full registration amount for that module will be refunded.

VAT

All mentioned amounts for books are subject to 6% VAT. VAT does not apply to UGent-participants who enrol through use of a SAP internal order.

Financial support from the government: training vouchers and the BEA-measure

- **The training vouchers** (opleidingscheques) are an initiative of the Flemish community and can be ordered online by any employee living in the Flemish or Brussels Region. Please order them well in advance and send them to our office as soon as you receive them. Please do not write anything on the cheques.
- **Employers** on the other hand can make use of the **BEA-measure**. To avoid unpleasant additional administration please watch the clarifying demo presentation on the ICES-website before opening an account on beaweb.

For both initiatives see www.vdab.be/opleidingscheques for more information and placing orders.

Doctoral schools (Information for UGent doctorandi)

In 2007-2008, five Doctoral Schools were founded at the Ghent University. They are concentrated around the following domains of research:

- Arts, Humanities and Law
(Director: prof. Dominique Willems)
- Social and Behavioural Sciences
(Director: prof. André Vandierendonck)
- Natural Sciences
(Director: prof. Guido Vandenberghe)
- (Bioscience) Engineering
(Director: prof. Yvan Houbaert)
- Life Sciences and Medicine
(Director: prof. Jozef Vercruysse)

These institutions, in close consultation with the faculties, support doctorandi: on the one hand they organise specialised training and workshops in research skills and “transferable skills”, on the other hand they set up guest lectures, information sessions, promotional tasks and contacts with the industry.

See www.ugent.be/en/research/doctorschools for more information.

Dit formulier vindt u ook terug op onze website: www.ipvw-ices.UGent.be

Stuur dit formulier ten minste 4 werkdagen voor de start van de eerste geselecteerde module via post, fax of mail naar het IPVV. Plaatsen worden toegekend volgens chronologie van inschrijven.

Adres: IPVV – Krijgslaan 281, S3 – 9000 GENT Fax: +32 (0)9 264 85 90 E-mail: Isabel.DeZutter@UGent.be

Uw inschrijving wordt geldig zodra u van onze dienst een bevestigingsmail hebt ontvangen.

Naam: Voornaam:

Functie:

Bedrijf of instelling:

Adres:

Tel.: Fax: E-mail:

Geboortedatum*: / / 19 Geboorteplaats*: Geslacht*: M V

* Algemene informatie over het geslacht en de leeftijd van onze deelnemers wordt zonder namen meegedeeld aan Accor i.h.k.v. de opleidingscheques en wordt vermeld op de certificaten.

Verplicht voor UGent-deelnemers: SAP interne bestelnummer: 4 3

° Gelieve ook de goedgekeurde bestelbon zelf met dit inschrijvingsformulier mee te sturen.

Ja, ik schrijf me in voor de volgende module(s) van de cursus Statistiek 2008-2009 georganiseerd door het Centrum voor Statistiek i.s.m. het Instituut voor Permanente Vorming in de Wetenschappen:

- M1: Inleiding tot SPSS
- M2: Inleiding tot SAS** *Ik bestel:* Geen boek Boek (Delwiche & Slaughter)
- M3: Inleidende Statistiek. Basis van Statistische Gevolgtrekking** *Ik bestel:* Geen boek Boek 1 (Rosner) Boek 2 (Moore & McCabe)
- M4: Variantie-Analyse** *Ik bestel:* Geen boek Boek (Kutner et al.)
- M5: Multilevel Analyse** *Ik bestel:* Geen boek Boek (Hox)
- M6: Toegepaste Lineaire Regressie** *Ik bestel:* Geen boek Boek (Kutner et al.)
- M7: Inleiding tot Simulatietechnieken**
- M8: Multivariate Statistiek** *Ik bestel:* Geen boek Boek (Everitt)
- M9: Logistische Regressie** *Ik bestel:* Geen boek Boek (Hoshmer et al.)

** Deze cursussen worden in het Engels gedoceerd.

Het totale bedrag van mijn inschrijving komt op: EUR voor de modules (vrij van BTW), en
 EUR voor het/de boek(en) + 6% BTW

Financiële steun van de overheid:

- Ik heb opleidingscheques aangevraagd voor het totale bedrag van EUR (VDAB), of
- Ik heb een portefeuille geopend op BEAweb.be op . . . / . . . / 200 . voor het totale bedrag van
 EUR, met projectnummer: 200 . /BEA/

- Ik ben: tewerkgesteld in de industrie
 tewerkgesteld in de non-profit, social profit, overheidssector, onderwijs, ...
 een (doctoraat)student (Studentenkaartnummer:

FACTURATIE ADRES Naam:

Adres:

BTW nr: BE . . . / . . . / . . .

Door deze inschrijving verklaart u zich akkoord met onze betaal- en annulatievoorwaarden.

Datum: Handtekening:

This form can also be found on our website: www.ipvw-ices.UGent.be

Please send, fax or e-mail this form to ICES no later than 4 working days before the start of the first selected module. Acceptance is on a first-come, first-serve basis.

Address: ICES – Krijgslaan 281, S3 – 9000 GENT Fax: +32 (0)9 264 85 90 E-mail: Isabel.DeZutter@UGent.be

Your registration becomes valid after receiving email confirmation from our service.

.....
Last Name: First name:

.....
Function:

.....
Company or institute:

.....
Address:

.....
Phone: Fax: E-mail:

.....
Date of birth*: / / 19 Place of birth*: Gender*: M F

* General information about age and gender of our participants is sent without names to Accor within the framework of the training vouchers and is used on the certificates.

Required for UGent-participants: SAP internal order number: 4 3

° Please also send the approved internal order along with this registration form.

Yes, I enrol for the following module(s) of the course in Statistics 2008-2009 organised by the Center for Statistics in co-operation with the Institute for Continuing Education in Science:

- M1: Introduction to SPSS**
- M2: Introduction to SAS *I order:* No book Book (Delwiche & Slaughter)
- M3: Introductory Statistics: Basics of Statistical Inference *I order:* No book Book 1 (Rosner) Book 2 (Moore & McCabe)
- M4: Analysis of Variance *I order:* No book Book (Kutner et al.)
- M5: Multilevel Analysis *I order:* No book Book (Hox)
- M6: Applied Linear Regression *I order:* No book Book (Kutner et al.)
- M7: Introduction to Simulation Techniques
- M8: Multivariate Statistics *I order:* No book Book (Everitt)
- M9: Logistic Regression *I order:* No book Book (Hoshmer et al.)

** This course is taught in Dutch.

The total amount for my registration adds up to: EUR for the courses (free from VAT), and, EUR for the book(s) + 6% VAT

Financial support from the government:

- I have requested training vouchers for the total sum of EUR (VDAB), or
- I have opened an account on BEAweb.be on . . / . . / 200 . for the total sum of EUR, with project number: 200 . /BEA/

- I am: employed in the industry
 employed in the non-profit, social profit, government sector, schools, ...
 a (doctoral) student (Student card n°:

INVOICE ADDRESS Name:

Address:

VAT n°: BE . . . / . . . / . . .

By enrolling, you agree with our payment & cancellation procedure.

Date: Signature:

Stay informed of other ICES activities

In addition to the course in Statistics, ICES also organises a variety of other courses on scientific subjects in the framework of continuing education. To stay informed of our activities on a regular basis you can subscribe to our mailing list.

I want to receive more information about the following ICES-activities
 make changes to my subscription

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of the following ICES courses:

- Biological Basis of Our Behaviour*
- Continuing Education for Surveyors-Experts*
- Crystalline Rocks and Plate Tectonics*
- Introduction to Bio-informatics
- Introduction to Biotechnology*
- Statistics
- Synthetics: from 'plastic' to high tech materials*

* These courses are taught in Dutch.

of future ICES courses within these departments:

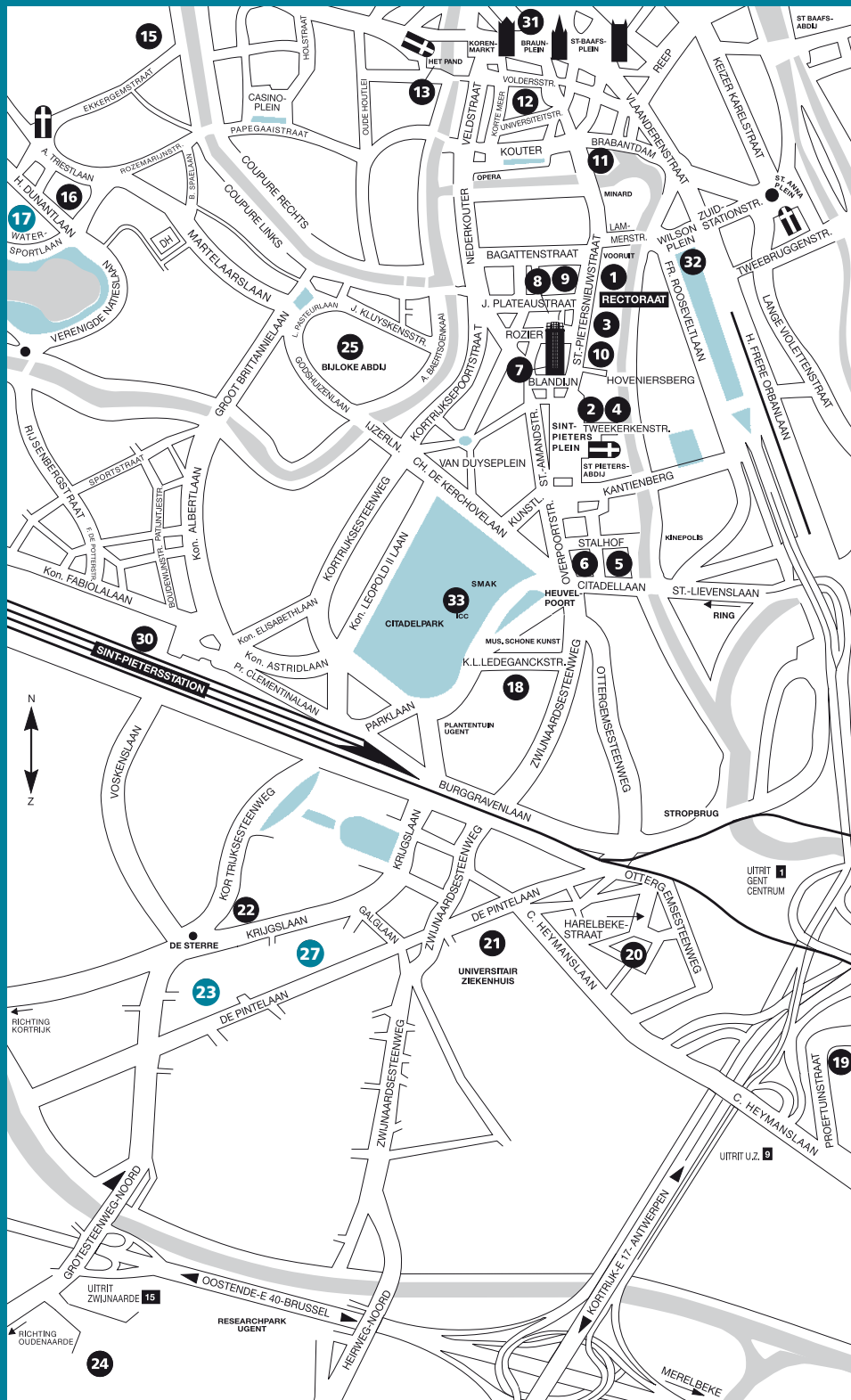
- Analytical chemistry
- Applied mathematics and computer science
- Biochemistry, physiology and microbiology
- Biology
- Geography
- Geology and soil science
- Inorganic and physical chemistry
- Molecular biology
- Molecular genetics
- Organic chemistry
- Pure mathematics and computer algebra
- Solid state sciences
- Subatomic physics and radiation physics

Your personal data is processed in accordance with the stipulations of the Law of December 8, 1992, safeguarding individual privacy in connection with the process of personal data, as altered in the Law of December 11, 1998.

Notities / Notes

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Course locations



- 17** Fac. of Psychology and Educational Sciences (PP), H. Dunantlaan 1
- 23** Fac. of Sciences (WE), Campus Sterre, Krijgslaan 281, building S9
- 27** Fac. of Sciences (WE), IPVW-ICES, Campus Sterre, Krijgslaan 281, building S3

- 2** Adviescentrum voor studenten
- 30** Station Gent Sint-Pieters

Voor alle verdere inlichtingen kan u zich wenden tot



**Faculteit
Wetenschappen**

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