Interuniversity Graduate School of
Psychometrics and Sociometrics

- Leiden University
- University of Amsterdam
- VU University Amsterdam
- University of Groningen
- Twente University
- Tilburg University
- Utrecht University
- K.U.Leuven

Annual report 2006

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Contents

Introduction

This report presents the activities, achievements and resources of the Interuniversity Graduate School of Psychometrics and Sociometrics (IOPS) for the year 2006.

Among the highlights of 2006 were two successful conferences, one hosted by Statistics Netherlands in Voorburg (June 2006), and the other hosted by the University of Amsterdam (December 2006). The organizers of the conference in Amsterdam included in their program a very timely and well-attended workshop on statistical methods in neuro imaging, with two invited speakers from abroad and two invited speakers from the Netherlands.
The harvest of PhD theses was modest compared to some previous years. There were three IOPS PhD students who finished their dissertation, as well as four other completed dissertations supervised by IOPS staff members.

IOPS was happy to welcome one new teacher, and five new postdocs, while the number of PhD projects in progress increased from 38 to 46, which is another record since the start of IOPS in 1987.

The year 2006 was extremely successful in terms of recognition for high quality work in psychometrics and sociometrics through scientific prizes, scholarships and grants awarded to IOPS members. We obtained 4 new Vidi grants, 4 new Open Competition grants, and one new Aspasia grant from the National Science Foundation NWO. These acquisitions bring the total share of NWO funded research projects up to 6 Venis, 4 Vidis, 1 Vici, 2 Aspasias, 21 Open Competions, and five other NWO grants. It appears that the conditions for fruitful methodological work on a national scale are improving.

1 Organization

1.1 Board

The IOPS Board consists of seven members delegated by the participating universities. At most three representatives of other research institutes may be appointed as an IOPS board member. Futhermore, the institute director and the dissertation students' representative attend the board meetings.

On 31 December 2006 the IOPS Board consisted of:
- Prof. dr J.A.P. Hagenaars, Chair, University of Tilburg
- Prof. dr P.M. Kroonenberg, Leiden University
- Prof. dr H.L.J. Van der Maas, University of Amsterdam
- Prof. dr J.M.F. Ten Berge, University of Groningen
- Prof. dr W. Dijkstra, VU University Amsterdam
- Prof. dr C.A.W. Glas, Twente University
- Prof. dr P.G.M. Van der Heijden, Utrecht University
- Prof. dr F. Tuerlinckx, K.U.Leuven
- Dr N.D. Verhelst, CITO (National Institute for Educational Measurement)
- Prof. dr J.G. Bethlehem, CBS (Statistics Netherlands)

Director
Prof. dr W.J. Heiser, Leiden University, was appointed IOPS Director as of 7 April 2006.

PhD representative
From 15 March 2005 till 14 December 2006, Joost Van Ginkel attended the board meetings on behalf of the dissertation students. On 14 December 2006, Marian Hickendorff was appointed as the new PhD representative for a period of 2 years (1 January 2007- 31 December 2008). She will be assisted by Marike Polak for a period of one year (2007).

Changes in the IOPS Board
- Prof. dr H.L.J. Van der Maas replaced prof. dr P.C.M. Molenaar (University of Amsterdam) as member of the Board. Dr D. Borsboom was appointed as permanent deputy for prof. dr H.L.J. Van der Maas.

- Prof. dr J.K. Vermunt (Tilburg University) was appointed as an extra (advisory) member in the IOPS Board.

Board meetings
The IOPS Board meets four times a year. In 2006 IOPS Board meetings were held on: 7 April, 18 May, 14 September, and 14 December 2006.

1.2 Office

Since 1 October 2000 the IOPS Graduate School holds office at Leiden University. The secretariat is accommodated at:
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1.5 Advisory board

The Advisory Board was founded in 1996 and consists of nine members: three experts from outside the Netherlands, two IOPS staff members outside the IOPS Board, two experts from research institutes outside the universities, and two IOPS dissertation students. Members of the advisory board are to give advice (both on request and on own initiative) on IOPS matters. The following persons were member of the IOPS Advisory Board on 31 December 2006:

Experts from outside the Netherlands
- Prof. dr J. Gower, Open University, Milton Keynes, United Kingdom
- Prof. dr L.J. Hubert, University of Champaign-Urbana, USA
- vacancy

IOPS staff members outside the IOPS board
- Prof. dr R.J. Mokken, University of Amsterdam
- Prof. dr W. Molenaar, University of Groningen

Experts from research institutes outside the universities
- Prof. dr M. Wedel (Nederlandse Vereniging van Marktonderzoekers)
- Vacancy

IOPS PhD students
- Drs M.G. Polak, Leiden University
- Drs V.D. Schmittmann, University of Amsterdam

1.6 International cooperation

Since 1991 IOPS is officially cooperating with the following European institutions:
- Conservatoir National des Arts et Métiers SNAM, Paris, France
- Institut für Psychologie, Freie Universität, Berlin, Germany
- Faculty of Social Sciences, University of Copenhagen, Denmark
- Department of Social Sciences, University of Umeå, Sweden
- Department of Statistics and Mathematical Sciences SAMS
- London School of Economics and Institute of Education, United Kingdom
- University of London, United Kingdom.

These institutions have signed a Cooperative Agreement and have assigned a coordinator to implement the agreement. The coordinators are:

- Prof. dr P. De Boeck, Belgium
- Prof. dr G. Saporta, France
- Prof. dr H. Feger, Germany
- Prof. dr I. Wedman, Sweden
- Prof. dr H. Goldstein, Institute of Education, United Kingdom

K.U.Leuven

In February 2003, Leiden University and K.U.Leuven signed an official cooperation agreement between IOPS Interuniversitary Graduate School and K.U.Leuven. By this agreement K.U.Leuven became an official IOPS member university. Leuven research groups involved in this agreement were the Department of Sociology, Data Collection and Analysis and the Department of Psychology. In September 2006, this agreement was renewed by a decision of the the Vice-chancellor of Leuven University.

2 Staff

The members of the staff belong to the participating universities. There are two categories of staff members: *teachers* and *postdocs*. Both require acknowledgment in their field according to, among others, international publications. Teachers have (co-)responsibility of dissertation research. Postdocs have obtained their PhD less than five years ago, and do not necessarily have (co-)responsibility of dissertation research. The Dutch research institutes are evaluated by the KNAW (Royal Dutch Academy for Sciences) every six years. IOPS staff members are evaluated by the IOPS Board before the KNAW evaluation.

Associated staff
In 1994, the establishment of graduate schools and the rearrangement of staff members as a result of this, caused IOPS to introduce a new category of staff for those who - for formal reasons - could not be a regular IOPS staff member. The requirements for associated teachers and associated postdocs are identical to those of regular teachers and postdocs. Dissertation students of these associated teachers can be admitted to IOPS as an external dissertation student.

2.1 Professorships

As of 1 March 2006, Dr Ger Snijkers (Utrecht University, Faculty of Social Sciences / Statistics Netherlands Heerlen) was appointed professor to a dedicated chair “Business Survey Methodology” by Statistics Netherlands.

2.2 Staff meetings

Staff meetings are held twice a year during the IOPS conferences. In 2006 two staff meetings took place, one on 19 May and one on 14 December 2006.

2.3 Staff changes

Teachers admitted to IOPS in 2006
- Dr ing Paul Eilers, Leiden University

Postdocs admitted as IOPS teachers in 2006
- Dr Marieke Timmerman, University of Groningen

Teachers leaving IOPS in 2006
- Prof. dr Peter Molenaar, University of Amsterdam
- Prof. dr W.E. Saris, University of Amsterdam
- Dr Willem Van der Kloot, Leiden University

Postdocs admitted to IOPS in 2006
- Dr L. Arends, Erasmus University (associated postdoc)
- Dr Laurence Frank, Utrecht University
- Dr Ellen Hamaker, Utrecht University
- Dr David Hessen, Utrecht University
- Dr Irene Klugkist, Utrecht University

Postdocs leaving IOPS in 2006
- Dr W.P. Krijnen, University of Amsterdam
- Dr Melinda Mills, VU University Amsterdam
- Dr Frank Rijmen, K.U. Leuven

IOPS staff members per 1 January 2006

On 1 January 2006, the IOPS staff consisted of 93 members:
47 regular teachers;
11 associated teachers;
21 regular postdocs;
10 associated postdocs (associated postdoc);
4 honorary emeriti members

IOPS staff members per 31 December 2006

On 31 December 2006, the IOPS staff consisted of 94 members:
46 regular teachers;
11 associated teachers;
21 regular postdocs;
11 associated postdocs
5 honorary emeriti members

2.4 List of staff members

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2.6 List of honorary emeriti members

- Prof. dr Gideon Mellenbergh, email: g.j.mellenbergh@uva.nl
- Prof. dr Robert Mokken, email: mokken@science.uva.nl
- Prof. dr Ivo Molenaar, email: w.molenaar@rug.nl
- Prof. dr W.E. Saris, email: w.saris@telefonica.net
- Prof. dr Hans Van der Zouwen, email: j.van.der.zouwen@fsw.vu.nl

3 Scientific awards and grants

3.1 Awards and grants honored to IOPS staff members

3.1.1 Scientific awards

In 2006, the following IOPS staff members were honored with a scientific award:

- **Van Duijn,** Marijtje (2006), University of Groningen.
  Fulbright Senior Scholarship. Center for Statistics in the Social Sciences, Department of Statistics, University of Washington, Seattle, WA, USA, August 2005 - August 2006. Host: Mark Handcock.
- **Viechtbauer,** Wolfgang (2006), Maastricht University.
  Best article by a junior scientist. Award by the European Association of Methodology.
- **Wagenmakers,** Eric-Jan (2006), University of Amsterdam.
  New Investigator Award. The annual award by the Society for Mathematical Psychology will be presented at the 2007 Mathematical Psychology meeting in Irvine, USA. The award is given “for exceptional published research in the field of mathematical psychology by a new investigator".
- **Wagenmakers,** Eric-Jan (2006), University of Amsterdam.
  Paul Bertelson Early Career Award. The biennial award by the European Society for Cognitive Psychology (ESCoP) will be presented at the 2007 ESCoP conference in Marseille, France. The Paul Bertelson award is designed to honor scientists at a relatively early stage of their scientific career, who have made an outstanding contribution to European Cognitive Psychology.

3.1.2 NWO grants

3.1.2.1 NWO Veni, Vidi, Vici grants

The Veni, Vidi, and Vici grants are part of the NWO Innovational Research Incentives Scheme [Vernieuwingsimpuls]. The followoing IOPS researchers were awarded:

- **De Rooij,** Mark (2006), Leiden University
  Grant: Vidi grant
  Project: Modelling individual differences in change patterns

Period: 1 September 2006 - 1 September 2011
Budget: € 405.600

- **Dusseldorp,** Elise (2002), Leiden University
  Grant: Veni grant
  Project: Modelling interactions as small trees in regression and classification
  Period: 1 November 2002 - 1 May 2006
  Budget: € 135.200

- **Fox**, Jean-Paul (2004), Twente University
  Grant: Veni grant
  Project: Multilevel Item Response Theory Models
  Period: 1 November 2004 - 1 November 2007
  Budget: € 135.200

- **Hamaker**, Ellen (2005), Utrecht University
  Grant: Veni grant
  Project: Time series analysis to study nonstationary psychological processes
  Period: 1 January 2006 - 1 December 2009
  Budget: € 200.000

- **Hoijtink**, Herbert (2005), Utrecht University
  Grant: Vici grant
  Project: Learning more from empirical data using prior knowledge
  PhD students: Joris Mulder, and Floryt van Wesel
  Period: 2006 - 2011
  Budget: € 1.250.000

- **Huizenga,** Hilde (2006), University of Amsterdam
  Grant: Vidi grant
  Project: The association between intelligence and performance variability: a new statistical neuroscientific approach
  Postdoc: to be appointed
  PhD student: Wouter Weeda
  Period: March 2006 - March 2011
  Budget: € 405.600

- **Moerbeek**, Mirjam (2003), Utrecht University
  Grant: Veni grant
  Project: Powerful and cost-efficient designs for multilevel and longitudinal intervention studies in the social sciences
  Period: 1 September 2003 - 1 April 2008
  Budget: € 135.200

- **Raijmakers**, Maartje (2006), University of Amsterdam
  Grant: Vidi grant
  Project: The dynamics of rule learning in infants and preschoolers
  Period: 1 April 2007 - 1 April 2012
  Budget: € 405.600

- **Stegeman**, Alwin (2005), University of Groningen
  Grant: Veni grant
  Project: The Candecomp/Parafac decomposition and its application to neuro-imaging data
  Period: July 2005 - May 2009
  Budget: € 200.000

- **Timmerman,** Marieke (2003), University of Groningen
  Grant: Veni grant
  Project: The assessment of reliability in component analysis
  Period: November 2003 - May 2008 (part-time, bases on 3 years full time)
  Budget: € 200.000

- **Wagenmakers**, Eric-Jan (2006), University of Amsterdam
  Grant: Vidi grant
  Project: Modeling the relation between speed and accuracy [Rot maar vlot].
  Period: 1 June 2007 - 1 June 2012
  Budget: € 600.000

3.1.2.2 NWO Aspasia grants

With the Aspasia grants, NWO stimulates the promotion of female researchers in higher ranking. The following IOPS researchers were awarded:

- **Huizenga**, Hilde (2003), University of Amsterdam
  Project: EEG/MEG analysis: source analysis, network analysis, and high power MANOVAs.
  Period: December 2003 - March 2006
  Fte: One postdoc, two years
  Budget: € 120.595

- **Raijmakers,** Maartje (2006), University of Amsterdam
  Period: April 2007 - 2012
  Budget: € 100.000

3.1.2.3 NWO Open Competition grants

The Open Competion is subsidy programme for the advancement of innovative and high-quality scientific research in the social and behavioural sciences. The following IOPS researchers received an Open Competion grant by NWO. Details of the research projects can be found in Chapter 4:

- **Berger,** Martijn (2006), Maastricht University
  Project: Optimal designs for fMRI experiments
  PhD student: Bärbel Maus
  Period: 1 October 2006 - 1 October 2010
  Budget: € 176.714

- **Berger,** Martijn (2004), Maastricht University
  Project: Powerful and robust designs for longitudinal multilevel studies
  PhD student: Shirley Ortega Azurdy
  Period: 1 September 2004 - 1 September 2008
  Budget: € 166.721

- **Boomsma**, Anne (2005), University of Groningen
  Project: A comparison between factor analysis and item response theory modeling in scale construction.
  PhD student: Janke Ten Holt
  Period: 1 September 2005 - 15 July 2010
  Budget: 169.529

- **Boomsma,** Anne (2004), University of Groningen
  Project: Inference for non-experimental designs
  PhD student: M.C.E. Aussems
  Period: September 2004 - 1 September 2008
  Budget: € 166.721

- **Borsboom,** Denny (2006), University of Amsterdam
  Project: Admissible statistics and latent variable theory
  PhD student: Annemarie Zand-Scholten
  Period: 1 June 2006 - 1 June 2010
  Budget: € 176.714

- **Gelissen**, John, & **Vermunt,** Jeroen (2005), Tilburg University
  Project: Bias and equivalence in cross-cultural survey research: An analysis of instrument comparability in the SPVA survey
  PhD student: Meike Morren
  Period: 1 February 2007 - 1 February 2011
  Budget: € 176.714

- **Glas,** Cees (2005), Twente University
  Project: The use of item response theory in personality assessment
  PhD student: Anke Weekers
  Period: 15 August 2005 - 15 August 2009
  Budget: € 169.529

- **Kelderman,** Henk (2005), VU University Amsterdam
  Project: Measurement and prediction in culturally heterogeneous populations
  PhD student: Annette Maij-de Meij
  Period: 1 November 2002 - 25 October 2007
  Budget: € 147.123

- **Mellenbergh,** Gideon (2001), University of Amsterdam
  Project: Measurement invariance of computerized adaptive, standard computerized and paper-and-pencil polytomous-items testing
  PhD student: Michiel Hol
  Period: 1 May 2001 - 1 May 2006
  Budget: € 148.241

- **Moerbeek**, Mirjam (2006), Utrecht University
  Project: Robustness issues for cluster randomized trials.
  PhD student: Elly Korendijk
  Period: 1 September 2006 - 1 September 2011
  Budget: € 181.348

- **Moors,** Guy, & **Vermunt,** Jeroen (2006), Tilburg University
  Project: Question format and response style behaviour in attitude research
  PhD student: Natalia Kieruj
  Period: 1 September 2007 - 1 September 2011
  Budget: € 181.871

- **Sijtsma,** Klaas, **Emons,** Wilco, & **Van Assen**, Marcel (2006), Tilburg University
  Project: Person-misfit in Item Response Models explained by means of nonparametric and multilevel logistic regression models
  PhD student: vacancy
  Period: 2007 - 2011
  Budget: € 181.871

- **Sijtsma,** Klaas, & **Emons,** Wilco (2005), Tilburg University
  Project: Minimal requirements of the reliability of tests and questionnaires
  PhD student: Gabby Vande Voort
  Period: 1 March 2007 - 1 March 2011
  Budget: € 181.871

- **Sijtsma,** Klaas, & **Van der Ark** (Andries) (2005), Tilburg University
  Project: Detection of outliers in test and questionnaire and survey data
  PhD student: Wobbe Zijlstra
  Period: 1 September 2005 - 1 September 2009
  Budget: € 169.529

- **Snijders,** Chris, & **Van Assen,** Marcel (2005), TU Eindhoven / Tilburg University
  Project: Development and application of learning models to behaviour in interdependence situations
  PhD student: W. van der Horst
  Period: 1 September 2005 - 1 September 2009
  Budget: € 169.529

- **Stokman,** Frans, & **Van Assen,** Marcel (2002), University of Groningen / Tilburg University
  Project: Externalities in exchange networks
  PhD student: Jacob Dijkstra
  Period: 1 February 2004 - 1 February 2007
  Budget: € 121.508

- **Van Assen,** Marcel (2004), Tilburg University
  Project: The evolution of exchange networks
  PhD student: G. Dogan
  Period: 1 January 2005 - 1 January 2009
  Budget: € 166.721

- **Van der Maas,** Han (2006), University of Amsterdam
  Project: Development of cognitive expertise in chess
  Proposers: Han Van der Maas, Eric-Jan Wagenmakers, & Frenk Van Harreveld
  PhD student: Daan Zult
  Period: 1 November 2006 - 1 November 2010
  Budget: € 170.000

- **Van der Vaart,** Wander (2004), VU University Amsterdam
  Project: Reconstructing event histories in standardized survey research: Cognitive mechanisms and aided recall techniques
  PhD-student: Tina Glasner
  Period: 15 September 2004 - 15 September 2009
  Budget: € 173.521

- **Van Duijn,** Marijtje (2001), University of Groningen
  Project: Models for the analysis of social networks with multiple sources of variation
  PhD student: Bonne Zijlstra
  Period: 1 September 2001 - 22 May 2006
  Budget: € 158.573

- **Vermunt,** Jeroen (2004), Tilburg University
  Project: Models for the analysis of social networks with multiple sources of variation
  PhD student: Olga Lukociene
  Period: 1 September 2004 - 1 August 2009
  Budget: € 166.721

3.1.2.4 Other NWO grants

- **Hagenaars,** Jacques (2005), Tilburg University
  Grant: [Investeringen NWO-middelgroot]
  Project: COMPSOC: exploiting, documenting, and enriching COMParative data from large-scale surveys in the SOCial sciences
  Researchers: J.A.P. Hagenaars, A.R.C.M. Luijkx, M.J.J. Huys, J. De Vries, R.N. Eisinga, P.M. De Graaf, N.D. De Graaf, T. Huyts, R. Van Os, M. Van Rooy, B. Todosijevic, F. Klerx-Van Mierlo, A.P.W. Hanssen
  Period: 1 September 2005 - 1 September 2008
  Budget: € 470.000

- **Snijders,** Tom (2006), University of Groningen
  Grant: Grant by NWO EUROCORES (European Science Foundation Collaborative Research Programmes Scheme)
  Project: Models for the evolution of networks and behavior
  Researcher: C.E.G. Steglich
  Period: 1 September 2006 - 1 September 2010
  Budget: € 209.361

- **Snijders,** Tom (2002), University of Groningen
  Grant: Grant by NWO EUROCORES (European Science Foundation Collaborative Research Programmes Scheme)
  Project: The dynamics of networks and behavior. Integrated research program
  Details: The project has 1 postdoc project and 4 PhD projects. Snijders is main proposer and also project leader for the postdoc project and one PhD project.
  Postdoc: C.E.G. Steglich
  PhD student: M. Schweinberger
  Period: 2002 - 2006 (5 years)
  Budget: € 403.928

- **Van der Maas,** Han (2003), University of Amsterdam
  Grant: Evolution and Behaviour - Interdisciplinary Research Project by NWO
  Project: Integrating developmental psychology, dynamic systems theory and evolutionary theory
  PhD student: Annemie Ploeger
  Period: 1 September 2003 - 1 June 2008
  Budget: € 154.300

- **Van Geert,** P.L.C., & **Van der Maas,** Han (2005), University of Groningen / University of Amsterdam
  Grant: NWO Cognition Integrated Research Projects
  Project: A complexity approach to cognitive learning in young children: fundamental and applied aspects
  Project RuG: Socially situated dynamics of problematic cognitive learning
  Post-doc: H. Steenbeek (RuG), supervisor: P.L.C. Van Geert
  Project UvA: A time serial approach to cognitive measurement
  PhD student: Marthe Straatemeier (UvA), supervisors: Han Van der Maas, Brenda Jansen
  Period: 1 January 2005 - 31 December 2009
  Budget: € 457.000 and € 69.000 by University of Groningen

3.1.3 International grants

- **Dijkstra,** Wil (2005), VU University Amsterdam
  Grant: Grant by The Weinberg Group, Washington
  Project: Testing and Verification of Questionnaire procedures for the C-TOR project
  Period: April 2005 - June 2007
  Budget: € 150.000

- **Dijkstra,** Wil (2005), VU University Amsterdam
  Grant: Grant by The Weinberg Group, Washington
  Project: Quality assurance of Data Collection Procedures for the C-TOR project
  Period: April 2005 - 2010 (with probable prolongation)
  Budget: € 300.000

- **Dijkstra,** Wil (2005), VU University Amsterdam
  Grant: Grant by National Institute of Health, Bethesda, Maryland, U.S.A.
  Project: Verbal behaviors in computerized lifecourse surveys
  Primary investigator: Bob Belli, University of Nebraska
  Period: June 2005 - May 2007
  Budget: US $ 12.000

- **Snijders,** Tom (2003), University of Melbourne, Australia
  Grant: Discovery grant by the Australian Research Council (ARC)
  Proposers: Philippa Pattison, Garry Robins, & Tom Snijders
  Chief investigator: Philippa Pattison
  Project: Modelling dynamic interactive social processes.
  Period: 2003 - 2007
  Budget: AUS $ 246.250

- **Snijders,** Tom (2006), University of Melbourne, Australia
  Grant: Discovery grant by the Australian Research Council (ARC)
  Proposers: Philippa Pattison, Garry Robins, & Tom Snijders
  Project: Statistical models for social networks, network-based social processes and complex social systems.
  Period: 2006 - 2010
  Budget: AUS $ 710.000

- **Snijders**, Tom (2006), University of Groningen
  Grant: NWO/ESF grant in the ESF/ECRP/EUROCORES program: European Collaborative Research Projects (ECRP)
  Project: Models for the evolution of networks and behavior
  Fte's: 1 postdoc during 4 years
  Budget: € 209.361

- **Van der Linden,** Wim & **Glas,** Cees (2006), Twente University
  Grant: Research agreement with Law School Admission Council, Princeton, USA.
  Project: Item response models for continuous responses and their applications
  Period: 2005 - 2006
  Budget: US $ 174.000

- **Van der Vaart,** Wander (2005), VU University Amsterdam
  Grant: Grant by National Institute of Health, USA
  Project: Verbal Behaviors in Computerized Lifecourse Surveys.
  Primary investigator: Robert F. Belli, University of Nebraska
  Period: June 2005 - May 2007
  Budget: US $ 12.000

- **Wagenmakers**, Eric-Jan (2006), University of Amsterdam
  Grant: Consultancy, funded by Air Force Research Laboratory, Irvine, CA, USA
  Project: Modeling exploration and exploitation in structured environments
  Primary Investigators: Michael D. Lee & Mark Steyvers
  Period: December 2006 – December 2009
  Budget: $ 430.000

3.1.4 Grants awarded to K.U.Leuven

- Paul **De Boeck &** Francis **Tuerlinckx** (2004), K.U.Leuven
  Grant: Grant by The National Fund for Scientific Research - Belgium [Fonds voor Wetenschappelijk Onderzoek - Vlaanderen]
  Project: Modelling of individual differences: An application to emotional responses in situations
  Period: 2004 - 2008
  Budget: € 56.800

- **Janssen**, Rianne, **Tuerlinckx,** Francis, **Vanden Noortgate,** Wim, & **De Fraine,** Bieke (2006), K.U.Leuven
  Grant: Grant by Flemish Department of Education [Vlaams Ministerie van Onderwijs en Vorming]
  Project: Strategische Beleidsondersteuning: Periodic assessment of pupil performance in compulsory education
  Period: 2006 - 2011
  Budget: € 875.412

- Iven **Van Mechelen** (2006), K.U.Leuven
  Grant: Grant by The National Fund for Scientific Research - Belgium [Fonds voor Wetenschappelijk Onderzoek - Vlaanderen]
  Project: HICLAS modelling of two- and three-mode rating data
  Period: 2004 - 2008
  Budget: € 56.800

- **Van Mechelen,** Iven, **De Boeck,** Paul, & **Tuerlinckx,** Francis (2005), K.U.Leuven
  Grant: Grant by Research Fund K.U.Leuven [Onderzoeksfonds K.U. Leuven]
  Project: Formal models for the structure and variability of emotions across contexts and time
  Period: 2005 - 2009
  Budget: € 265.200

- **Research Group Quantitative Psychology** (2006), K.U.Leuven
  Grant: Grant by Belgian Science Policy [Federaal Wetenschapsbeleid]
  Project: Statistical analysis of association and dependencies in complex data
  Period: 2007 - 2011
  Budget: € 80.000

- **Research Group Quantitative Psychology** (2006), K.U.Leuven
  Grant: Grant by Institute for the Promotion of Innovation by Science and Technology in Flanders (IWT). [Instituut voor de Aanmoediging van Innovatie door Wetenschap & Technologie in Vlaanderen]
  Project: Bioframe: An algorithmic framework for integrative modeling in systems biology
  Period: 2007 - 2010
  Budget: € 46.445

- **Research Group Quantitative Psychology** (2005), K.U.Leuven
  Grant: Grant by Research Fund K.U.Leuven [Onderzoeksfonds K.U. Leuven]
  Project: SymBioSys - KU Leuven Center for Computational Systems Biology
  Period: 2005 - 2010
  Budget: € 64.300 (approximately)

- **Research Group Quantitative Psychology** (2006), K.U.Leuven
  Grant: Grant by Research Fund K.U.Leuven [Onderzoeksfonds K.U. Leuven]
  Project: Missing data strategies
  Period: 2006 - 2007
  Budget: € 29.500

3.1.5 Other grants

- **Borsboom,** Denny (2006), University of Amsterdam
  Grant: ICTO grant for developing a Wiki-application for use in methodological education
  Period: January 2007 - January 2008
  Budget: € 20.000

- **Borsboom,** Denny (2006), University of Amsterdam
  Grant: NWO-grant for a visit of Dr B. Haig to the University of Amsterdam
  Period: 7 June - 11 August 2006
  Budget: € 1.193

- **Bouwmeester,** Samantha (2006), Erasmus University Rotterdam
  Grant: Toptalentbeurs, grant by Erasmus University
  Period: Startdate: March 2006
  Budget: € 29.172

- **Glas,** Cees (2006), Twente University
  Grant: Research cooperation with OECD
  Project: PISA (Program for International Student Assessment), Cycle 2009, Core B.
  Period: November 2006 - November 2010
  Budget: € 100.000

- **Glas,** Cees (2006), Twente University
  Grant: NUFFIC PhD grant by Netherlands Organization for International Cooperation in Higher Education (NUFFIC)
  Project: Item analysis of entry test for admission to BSc engineering
  PhD student: Muhammad Naveed Khalid
  Period: March 2006 - March 2010
  Budget: € 32.000

- **Heiser,** Willem, & **Van Putten,** Kees, Leiden University. **Verhelst,** Norman (2006), Cito
  Grant: Research cooperation, partly funded by Cito, Arnhem
  Project: Mathematical proficiency in primary education: Cognitive processes and predictability
  PhD student: Marian Hickendorff
  Period: September 2006 - August 2010

- **Meijer**, Rob (2006), Twente University
  Grant: Research cooperation with Dutch Bureau for Firefighter Examinations [NBBE, Nederlands Bureau Brandweer Examens]
  Project: The development of virtual reality examinations for fire fighters [De ontwikkeling van een virtual-reality-examen voor brandweerpersoneel]
  Period: November 2006 - November 2010
  Budget: € 24.000

- **Meijer,** Rob (2006), Twente University
  Grant: Research cooperation with PiCompany
  Project: Development of online IRT based assessment instruments.
  Period: October 2006 - October 2010
  Budget: € 180.000

- **Raijmakers**, Maartje (2006), University of Amsterdam
  Grant: Grant by VTB / Ministery of Education, Culture and Science, from budget Talentenkracht
  Project: Explorative behaviour in free play of toddlers in daycare [onderzoek naar exploratief gedrag in het vrije spel van peuters op de creche]
  Period: March 2006 - March 2007
  Budget: € 60.000

- **Raijmakers**, Maartje (2005), University of Amsterdam
  Grant: Postdoc grant (fellowhip) by the Royal National Academy of Sciences (KNAW)
  Project: Qualitative differences in categorization learning
  Period: April 2005 - April 2007
  Budget: € 130.000

- **Raijmakers**, Maartje, & **Van der Maas,** Han, (2005), University of Amsterdam
  Grant: Grant by European Committee, 6th Framework Programme
  Project: From associations to rules in the development of concepts (FAR)
  Period: January 2005 - December 2008
  Postdoc: Ingmar Visser (1 year 1.0 fte, 1 year 0.8 fte)
  PhD student: Verena Schmittmann (1 year 0.2 fte)
  Res. assist.: 1 year 0.5 fte
  Budget: € 200.000

- **Ten Berge,** Jos, & **Kiers,** Henk (2006), University of Groningen
  Grant: PhD student grant by Fundação para a Ciência e a Tecnologia (FCT, Portugal)
  Project: Uniqueness, rank, and simplicity of three-way arrays with symmetric slices.
  PhD student: Jorge Nunes Tendeiro
  Period: October 2006 - September 2010

- **Van der Heijden,** Peter (2006), Utrecht University
  Grant: Grant by Ministry of Social Affairs (SZW)
  Project: Periodiek Onderzoek Regelovertreding Sociale Zekerheid
  Period: 2006 - 2007
  Budget: € 40.000

- **Van der Heijden,** Peter (2006), Utrecht University
  Grant: Grant by Ministry of Justice
  Project: Illegalenmonitor
  Period: 2006
  Budget: € 75.000

- **Van der Heijden,** Peter (2005), Utrecht University
  Grant: Grant by Ministry of Justice
  Project: Opzetten Fraudemonitor
  Period: 2005 - 2006
  Budget: € 89.000

- **Van der Heijden,** Peter (2005), Utrecht University
  Grant: Grant by ??? (UWV)
  Project: Fraude scorekaart
  Period: 2005 - 2006
  Budget: € 12.000

- **Van der Heijden,** Peter (2002), Utrecht University
  Grant: Grant by Statistics Netherlands (CBS)
  Project: Automatisch gaafmaken en imputeren
  Period: 2002 - 2006
  Budget: € 147.000

3.2 Awards and grants honored to IOPS PhD students

3.2.1 Scientific awards

In 2006, the following IOPS PhD students were honored with a scientific award:

- **Klein Entink,** Rinke (2006), Twente University.
  The 2006 Medical College Admission Test Award. Graduate Student Research Program of the Association of American Medical Colleges, Washington DC, U.S.A.

3.2.2 Grants

- **Glasner,** Tina, & **Van der Vaart**, Wander (2006), VU University
  Grant: Research cooperation and software exchange by MESS (An Advanced Multi-Disciplinary Facility for Measurement and Experimentation in the Social Sciences), CentERdata, Tilburg University.
  Project: Developing and testing an electronic calendar instrument for standardized survey research.
  Period: November 2006 - August 2009

- **Linting**, Mariëlle (2006), Leiden University
  Grant: Chikio Hayashi Award (travel grant)
  Period: 25-29 July 2006
  Budget: US $ 500

- **Schmittmann**, Verena (2006), University of Amsterdam
  Grant: Travel grant by Netherlands Organization for Scientific Research (NWO)
  Purpose: Visit and cooperation with professor William Batchelder, Institute of Mathematical Behavioral Sciences in Irvine, CA, USA
  Period: April 2006 - May 2006
  Budget: € 60.000

4 Students and projects

Applicants for the dissertation training must have a Master's degree in one of the following disciplines. Behavioral Sciences, Technical Sciences, Mathematics or Econometrics. They are appointed as PhD student, or as an indirectly financed trainee. Trainees within IOPS are financed by the participating universities or by NWO (Netherlands Foundation of Scientific Research).
The annual report of 2005 reported a total of 38 PhD projects in progress on 31 December 2005.
In 2006, 3 projects were concluded, and 11 new projects were started. On 31 December 2006, 46 PhD projects were still in progress (two of them have exceeded the project time limits).

4.1 Status of projects

Concluded projects

From 1 January - 31 December 2006, the following three PhD students successfully defended their PhD theses: Laurence Frank (Leiden University), Michiel Hol (University of Amsterdam), and Olav Laudy (Utrecht University).

Projects in progress beyond project time limits

The projects of the following two PhD students are still in progress, but have exceeded the project time limit: Peter Van Rijn (University of Amsterdam), and Bonne Zijlstra (University of Groningen).

New projects

From 1 January - 31 December 2006, the projects of the following 11 PhD students were accepted in the IOPS Research School: Dirk Depril (K.U.Leuven), Rinke Klein Entink (Twente University), Rudy Ligtvoet (Tilburg University), Bärbel Maus (Maastricht University), Joris Mulder (Utrecht University), Zita Oravecz (K.U.Leuven), Ralph Rippe (Leiden University), Marthe Straatemeier (University of Amsterdam), Joachim Vandekerckhove (K.U.Leuven), Floryt Van Wesel (Utrecht University), and Wouter Weeda (University of Amsterdam).

4.2 Summary of projects

Detecting heterogeneity in logistic regression models

Trainee	Katalin Balázs
Address	Faculty of Psychology and Educational Sciences
	Department of Psychology, K.U.Leuven
	Tiensestraat 102, 3000 Leuven, Belgium
Voice	+32 16 32 58 98 / 6012 (secretary)
E-mail	Katalin.Balazs@psy.kuleuven.be
Supervisors	Prof. dr P. De Boeck
Period	1 November 2002 - 1 November 2006
Project financed by	K.U.Leuven

Summary

The aim of the research project is to reveal and systematically examine possible methods for indicating heterogeneity in binary item by person data with item covariates. Several kinds of heterogeneity sources can be differentiated (being based on the person, on the item or on both of them). The heterogeneity indicators can be either parametric or nonparametric. The research plan includes comparisons of methods for detection of heterogeneity, in order to find out what their strengths and weaknesses are.

In the first study, several methods were tried out for detecting the dimensional type, person based heterogeneity in a logistic regression model with item covariates.

- The individual analyses and mean deviance method turned out to have specific problems.
- The PCA and Alternating Logistic Regression (ALR), a GEE approach, were successful in estimating the heterogeneity of the data. The PCA approach will not be followed, because it often leads to artefacts. Concerning the ALR, we will try to overcome the limitation that it requires the item features to be known, by including an additive clustering algorithm as a preliminary step of ALR.
- DIMTEST and DETECT, which are popular nonparametric methods for revealing the dimensionality of data, performed well in this study when we used an ad hoc decision rule for the DETECT procedure different from those defined in the manual. The optimal decision rule will be further investigated through simulation studies, in order to reveal the factors effecting its value.

Finally, we will concentrate on a non-dimensional type of heterogeneity, where observations create heterogeneity in other observations. LID detecting procedures will be compared with the methods have been just mentioned.

Modeling residual dependencies in item response models

Trainee	Johan Braeken
Address	Faculty of Psychology and Educational Sciences Department of Psychology, K.U.Leuven Tiensestraat 102, 3000 Leuven, Belgium
Voice	+32 16 32 6136 / 60 12 (secretary)
E-mail	Johan.Braeken@psy.kuleuven.be
Supervisors	Prof. dr F. Tuerlinckx, prof. dr P. De Boeck
Period	1 October 2004 - 1 October 2008
Project financed by	K.U.Leuven, Belgium

Summary

In this project we will introduce the concept of copula functions in item response models to take into account residual dependencies. In mathematics a copula is a function that connects a multidimensional function with its margins. These copula functions have some nice properties with regard to the modeling of dependence. Applications of copula functions are common for modeling dependence between continuous variables in the domains of insurances and finances, but can also allow for new modeling possibilities for the modeling of conditional dependencies (violations of the assumption of local independence) in item response theory. However, applications with discrete variables as in item response theory are rather rare. The focus lies upon exploring the possibilities, advantages and limitations of these copula functions within the modeling framework of item response theory.

Survey research on ethnic attitudes: A comparison between open en closed questions

Trainee	Christine Carabain
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Project financed by	VU University Amsterdam

Summary

The projects concerns a comparitive stude of different methods of datacollection on behalf of the measurement of prejudice against ethnic minorities. Data collected by means of standardized interviews with closed questions on stereotypes about ethnic minorities will be compared with data collected by means of open interviewing (open interviewing is defined as an interviewing strategy in which question order and question formulations are regulated but not completely standardized and in which open questions play a dominant role) with questions on ethnic minorities in which the formulation of questions do not entail cues on the aspects to be used by respondent in mental representations and evaluations of ethnic minorities. In the comparison, attention will be paid to the role of the interviewer and respondent. The following research questions are central to the project:

1. Which difference in outcomes are produced between open interviews and standardized interviews in measuring prejudice?
2. Which characteristics of the interviewing strategy play a role in the explanation of these differences?
3. Is it possible to interpret differences in comparable outcomes in terms of validity and reliability?

Adjustment for nonresponse bias in household surveys

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Summary

At Statistics Netherlands, surveys are performed in order to produce statistics about the population. A random sample is selected from the population. When for some reason individuals that are selected in the sample do not provide the requested information, there is nonresponse. Nonresponse in surveys affects estimates of population characteristics if respondents and nonrespondents on average provide different answers to the survey questions. In order to detect and adjust potential bias in the estimates, auxiliary information is linked to the surveys for both respondents and nonrespondents. The method that is most commonly used at Statistics Netherlands to adjust for the nonresponse bias is linear weighting.

A vital part of the adjustment approach is the availability of auxiliary information. At Statistics Netherlands, more and more information becomes available from registers. This increasing amount of auxiliary information provides a lot of possibilities but at the same time it complicates selecting the most informative auxiliary variables and models.

This project considers alternative adjustment techniques for the nonresponse bias, like the propensity score method and sample selection models, as well as datamining techniques to select the most informative auxiliary variables.

Heterogeneity in Poisson models for the estimation of the population size, and in randomized response

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Project financed by	Utrecht University

Summary

In this project two models are further developed. The first project concerns the further development of a model to estimate the size of population based on incomplete registration files in the sense that not every member of the population is registered. The second project concerns the further development of count variables within the context of randomised response research. Although these models look very different, they have the following characteristics in common (1) both models can be used to estimate the amount of rule offenders and (2) in both models heterogeneity of rule offenders is important. The reason we have incorporated both models in one project is that separate projects for each model are probably too small for a full PhD-student project.

Additive clustering for two-mode data (new project)

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Summary

Two-way two-mode object by variable data often show up in statistical practice. In several contexts it may be desirable to obtain a possibly overlapping clustering of one of the modes implied by such data. For this purpose a one-mode additive clustering model has been proposed in the literature, which implies a decomposition of the data into a binary object by cluster membership matrix and a real-valued cluster by variable profile matrix. The reconstructed data values for each object are then obtained as summations of the profiles of the clusters the object belongs to.

The initial goal of the doctoral project is two-fold: first, with respect to the mathematical properties of the model, the minimal number of clusters needed to decompose a given model matrix has to be determined and conditions under which this decomposition is unique (upon permutation of the clusters) are to be identified. Second, algorithms need to be developed to fit the optimal model to an empirical data set, optimality being defined in the least squares sense. For this purpose a sequential fitting (SEFIT) algorithm has already been proposed by Mirkin, but information on its performance is lacking. In the present project SEFIT will be evaluated and if necessary new algorithms will be developed and compared to SEFIT on both simulated and benchmark real life data.

Subsequently, the research will be extended with algorithmic work for the following types of models: (1) additive clustering of three-way two-mode data (INDCLUS model), (2) two-mode additive clustering, (3) hybrid models that combine a discrete clustering of one mode with a dimensional reduction of the other mode, (4) two-mode clustering with heterogeneous biclusters.

Identification of non-response in groups that are difficult to study and the development of tailor-made non-response reduction strategies

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Summary

Non-response is a serious and increasing problem in survey research. In recent years non-response rates have increased sharply, and compared to other countries the Netherlands are not doing very well (De Heer, 1999; De Leeuw & De Heer, 2002). For example the Dutch Labour Force Survey (LFS) has a response rate ranging between 55 and 60% (Schmeets and Janssen, 2003). The non-response rate in the other European countries is lower, but increasing. For instance Germany obtained large non-response rates in the *Allgemeine Bevölkerungsumfrage* (Schneekloth and Leven, 2003) and other countries in the European Social Survey (Stoop and Philippens, 2004).

Non-response has two components, item non-response and unit non-response. Item non-response is a failure to answer one or more specific questions; the survey is incomplete. Unit non-response is the failure to get access to an eligible respondent when the respondent refuses co-operation (Mason, Lesser and Traugott, 2002).

Unit non-response can have a more serious impact, because it fails to collect any measurement from a potential respondent. Unit non-response can raise the costs for reaching the desired response rate. It can also make it harder to generalise the results, because some form of selectively is inevitable when many eligible respondents refuse to respond. The selectivity will bias the results of the survey, because it generates biased point estimates (Dillman, Eltinge, Groves and Little, 2002). Generally it holds that higher non-response rates and greater differences in background characteristics (selectivity) between respondents and non-respondents will increase the bias in the target variables (De Leeuw and Hox, 1997).

The aim of this project is to develop solutions for unit non-response of groups that are difficult to study. It is part of a larger project within Statistics Netherlands (CBS). In 2001 Statistics Netherlands initiated a strategic research project 'Non-response in groups that are difficult to study' (Snijkers, 2003). The goal of this program is to enhance the quality of statistical outcomes based on survey results. There are two strategies to reach this goal:

1. Bottom up by diminishing the selectivity in non-response during data sampling. Therefore it is necessary to identify the non-responding groups and to develop tailor-made approach strategies;
2. And top down by diminishing the distortion that resulting from selective non-response. For this purpose weighting strategies will be developed.

Stability of feature network modeling of proximity data (concluded project)

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Project financed by	Leiden University
Date of defence	21 September 2006
Title of thesis	*Feature network models for proximity data: Statistical inference, model selection, network representations and links with related models*. Rotterdam: Optima. ISBN 90-8559-179-1.

Summary

An unresolved problem in network modeling of proximity data is how to determine the stability of the parameter estimates. Existing methods to derive a network model from empirical data only gives the best fitting network, and yield no standard errors. This project approaches the problem by trying to profit from two known additivity properties of networks, in particular segmental additivity and distinctive feature additivity. The former property holds in all networks, while the latter is specific for networks based upon a set of (known or unknown) features. Both forms of additivity open the possibility to apply existing distribution theory for the linear model (under order constraints). Since the theoretical standard errors may be too optimistic, a simulation study will be performed to check the size of theoretical simultaneous confidence regions against a simulated sampling distribution.

Reconstructing event histories in standardized survey research: Cognitive mechanisms and aided recall techniques

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Summary

Life histories of individuals are often reconstructed using retrospective questions. Since retrospective data frequently suffer from recall error, sociologists and health scientists have employed event history calendars and timelines to enhance data quality. Yet, methodological research on the value of these techniques is scarce and requires more theoretical foundation. The few studies that compare to regular questionnaire procedures show positive effects on data quality. This project aims to obtain more insight in the cognitive mechanisms underlying these techniques in order to further improve them. Pilot experiments and a field experiment will be performed to elaborate techniques and evaluate their effects.

Random effect approaches of individual differences in complex models for categorical data

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Summary

The statistical project is inspired by a substantive theory about feeling responses as studied in psychology. Feeling responses are assumed to follow from situational features which can be observed, and from appraisal responses which cannot be observed. Further, it is assumed that individual differences play in the process of feeling responses. The data which are collected are commonly of the ordered-category type, and data are observed in a set of representative situations. The hypothesized relationship between feeling responses and situational features and unobserved appraisal responses is implemented in the model by a feeling response parameter that is a linear function of (1) the situational features and (2) situational appraisal parameters.Two kinds of individual differences will are considered:

1. Differences in the propensity for a given feeling response, or for the corresponding appraisal responses.
2. Differences in the association between feeling responses and the situational features and appraisals.

These individual differences will be modeled as random effects. The kind of model we are using is of the nonlinear mixed type. It is of the nonlinear type because products of parameters are used, and it is of the mixed type because of the random effects. The specific model, MIRID, is published in its basic form in Psychometrika, 1998. An important extension we plan is to handle situational differences with a random effects approach, so that a double MIRID is obtained (in fact a double-structure structural equation model), with latent variables for persons **and** for situations. The challenge of the project stems from the fact that the model is of a high dimensionality, especially because the random effects of persons and situations are crossed. We plan the following:

1. An exploration of quasi-MonteCarlo methods for a more efficient numerical integration required in the estimation procedure for the MIRID and the double MIRID, because the Gaussian quadrature method is too heavy. The method will be compared with Gaussian quadrature and Monte Carlo on feasible problems.
2. The development and investigation (with simulations) of a MCMC estimation and testing procedure for the double MIRID.
3. The development and investigation of model selection and model comparison methods.

Mathematical proficiency in primary education: Cognitive processes and predictability

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Project financed by	Leiden University / Cito Arnhem

Summary

General aim of this project is to systematically describe and analyze mathematical proficiency in primary education. Reform in mathematics education and changes in mathematical achievement give rise to the need for this research. The present study aims at going beyond analysis of pure achievement, in the following way: by applying advanced data analysis techniques which have an opportunity to include predictor variables and by extending the type of data analyzed with information on the cognitive processes involved in solving mathematical problems. So, several advanced data analyses will be conducted in which the effects of predictor variables are included, on data with information on cognitive processes in addition to correct/incorrect scoring to get robust substantive conclusions. The research objectives lie in two domains. Primary objectives are in the domain of mathematics education, where exploratory analyses followed by carefully set up data collections should lead to a deeper understanding of the processes involved in and the predictability of mathematical proficiency. In the domain of psychometrics, three data analysis techniques aimed at exploration of the data will be compared, and the validity of the construct mathematical proficiency. will be explored by focusing on the response processes.

Categories and dimensions

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Summary

In psychology it is rather common to use categories, for example psychiatric categories. An important question is whether what is considered to be a category is really categorical and not just dimensional. This issue is approached in two ways: with a broadly used method that is called *taxometrics*, and with a new method that is called *dimcat.*

Taxometrics is a common term for several analysis techniques of which MAXCOV (MAXimum COVariance) was the first and most frequently used. In the case of a taxonic structure the covariance of two indicators along the sections of a third indicator reaches its maximum value in the section where the proportion of taxon and non-taxon group members is equal. If the structure is dimensional, the covariance of two indicators will be about equal along the sections of a third indicator.

Dimcat is based on item response modeling (IRT). In dimcat distinctions are made along two axes, which are as follows: the first differentiates between-category qualitative differences and between-category quantitative differences. The second differentiates within-category heterogeneity and within-category homogeneity.

In this project the extension of the dimcat approach is suggested in two ways. First, a generalization of the framework to rating-scale data are incorporated and an extension to latent categories. Finally, we propose a comparison of the extended dimcat and taxometrics along two dimensions: heterogeneous vs. homogeneous categories and smooth vs. abrupt differences between the categories.

Use and usability of statistical procedures

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Project financed by	University of Groningen

Summary

vioral sciences, statistical techniques are often viewed as a necessary evil: indispensable, but also difficult to understand. The inherent variability of human performance and the unavailability of perfectly reliable measurement instruments necessitate the use of statistical techniques. But even the simplest statistical techniques are often misinterpreted or found difficult to understand by behavioral scientists. One might blame this state of affairs entirely on the incorrect use of mathematically correct statistical techniques. On the other hand, one could also reason that researchers make so many mistakes when using statistical techniques because the interaction between user and technique is not functioning optimally. In this project, we specifically consider the possibility that people have *rational* reasons for making certain mistakes or performing a task differently than they should. As a consequence, an important research question is whether certain statistical techniques (or aspects thereof) are too difficult to understand. The purpose of the present project is to lay the foundations for an attempt to adjust statistical techniques to the needs of behavioral scientists. We distinguish two types of issues. The first issue is the mismatch between what users expect from statistics and what statistics can deliver. The second is the question whether the statistical techniques are used appropriately in practice.

Effciency and administration invariance of computer adaptive computerized and paper-and-pencil testing using Likert item questionnaires (concluded project)

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Project financed by	NWO (Netherlands Foundation of Scientific Research)
Date of defence	10 November 2006
Title of thesis	A cat with personality and attitude. Enschede: PrintPartners Ipskamp B.V. ISBN: 90-9021170-5.

Summary

The following two problems are studied: First, the efficiency of Computer Adaptive Test (CAT), Computerized Test (CT), and Paper-and-Pencil Test (P&PT) administrations of Likert item questionnaires; and, second, the invariance of item and person parameters and structural relations between variables across CAT, CT and P&PT administrations of Likert item questionnaires. The efficiency and administration invariance are studied in two complimentary experiments: A between-subjects field experiments compares CAT, CT, and P&PT administrations of attitude scales; and within-subjects laboratory experiment compares CAT and P&PT administrations of attitude and personality scales. A serious threat to CAT efficiency are so called “misfits”, that is: persons who are administred the same number of items under CAT administrations as under P&PT administration. The effects of item bank size, item bank and person population parameter characteristics on number of misfits is investigated in a simulation study.

Simultaneous modeling of response times and responses on test item (new project)

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Summary

With the introduction of computerized testing, the collection of response times (RTs) on test items has become straightforward. RTs form an additional source of information that allows more elaborate analysis of the behavior of test taker and items. For example, they can help to detect aberrant response behavior of test takers or to analyze the relationship between the difficulties and time intensities of the items. Moreover, RTs can be used to improve such activities as item calibration and test design. To be able to perform these and other analysis, joint modeling of responses and RTs on test items is required. The goals of this project, funded by the Law School Admission Council (LSAC), Newtown, PA, is to further develop a hierarchical framework for the joint modeling of the responses and response times, add structural models for the person and item parameters to the framework, develop procedures for the statistical treatment of the extended framework, and produce a package of statistical functions for use in R or S-PLUS.

Robustness issues for cluster randomised trials

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Summary

Cluster randomised trials randomise complete groups to treatment conditions. The estimates of the model parameters and their standard errors are only correct if the chosen statistical regression model includes all necessary fixed and random effects, and if the model assumptions are satisfied. Furthermore, optimal designs for cluster randomised trials depend on the values of certain model parameters, of which the true values must be specified in the design stage. This study researches two questions: What is the robustness of optimal designs and estimation methods? What should be done to correct for an incorrect model or an incorrect guess of the model parameters?

Translation of theories into statistical models using inequality constrained loglinear/ latent class models (concluded poject)

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Project financed by	Utrecht University
Date of defence	27 October 2006
Title of thesis	*Bayesian inequality constrained models for categorical data.*
	ISBN-10: 90-393-4299-7, ISBN-13: 978-90-393-4299-2

Summary

The project will focus in the analysis and selection of the best of a number of competing models that can be formulated for a contingency table consisting of observed and latent ordinal and categorical data. Depending on the actual data, each model will be based on a loglinear and/or a latent class model. An example of the type of data that will be considered is given in Boom, Hoijtink and Kunen (2001). They use 25 balance items (that can be answered right or wrong) to distinguish different classes of children (each class corresponds to a strategy to solve the items) and have different theories about the relation between class membership, gender and age groups. Although it is possible to determine if class membership can be predicted using gender and age (see, for example, Van der Heijden, Dessens and Bockenholt (1996) and Vermunt (1996, pp. 63-65)), this is not the approach that will be taken in this project. Here inequality constraints among the parameters of the latent class model (Hoijtink and Molenaar, 1997; Hoijtink, 1999) and the parameters of the loglinear model / the probabilities of the cells in the contingency table (Agresti and Coull, to appear; Vermunt, 1999) will be used to translate a number of theories into competing models. Subsequently, each model will be analysed and the best theory will be selected. In the context of the complex kind of models considered in this project, it may be difficult or even impossible to select the best model using classical approaches based on the testing of hypotheses. Bayesian model selection procedures constitute a novel, viable and interesting alternative (Marden, 2000; Hoijtink, 2001).

Models and methods for invariant item ordering (new project)

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Project financed by	Tilburg Unversity

Summary

Items in a test or a questionnaire have an invariant item ordening (IIO) if the items have an identical ordering according to difficulty or atractiveness for every individual in the population of interest, with the exeption of possible ties. Several applications of test results require an IIO. Examples are the investigation of developmental theories, differential item functioning, aberrant response patterns, and the use of starting and stopping rules in administration. This Ph.D project proposal contains four parts, each investigating different aspects of the ordering of polytomous items in a test or questionnaire. The first project aims at the development of an item response theory model, which implies an invariant item ordering of polytomous items, which implies an invariant ordering. The psychometric properties of these models will be investigated. Second, methods for testing the invariant ordering of polytomous items, which have not yet been investigated thoroughly, are further developed and compared. Third, the use of latent class analysis as a tool for estimating item orderings is explored. Fourth, the newly developed models and methods are applied in the real data.

Nonparametric inference in multivariate categorical data analysis

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Project financed by	Leiden University

Summary

In the behavioral sciences most researchers use well known data analysis techniques, like multple regression analysis or analysis of variance. Other (multivariate) analysis techniques are much less often used. The purpose of this project is to shed new light on the many possibilities of multivariate categorical anlysis, with special application to educational data. In particular, categorical principal components analysis (CATPCA) and categorical regression analysis (CATREG) will be of interest. One reason why these techniques are not very often used, is that no immediate statistical inferences can be made. Therfore, this project will be focused specifically on establishing stability and statistical significance of solutions obtained from these techniques. Stability issues will be considered by means of bootstrap and jackknife procedures. By using permutation tests, statistical significance of the solutions will be established. Grphical representation of analysis results will receive special attention. Through its focus on the variety of ways ub which inferences can be made from advanced multivariate techniques, this study aims to a wider use of these techniques in the behavioral sciences.

Performance of latent class analysis based random-coefficient models

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Summary

The two basic assumptions underlying standard linear random-effects models - normal errors and normal random effects - may be unrealistic in social science research. Outcome variables of interest are very often categorical variables, which makes it necessary to use non-linear mixed models. Also the distributional assumptions about random effects are not realistic in most applications. Latent class regression analysis provides an alternative nonparametric approach that relaxes this assumption and that makes it straightforward to deal with categorical outcome variables. The objective of this project is to provide a systematic comparison between parametric and nonparametric random-coefficients models.

Measurement and prediction in culturally heterogeneous population

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Summary

Psychological measurement and prediction procedures usually assume that individual differences can be described by one standard measurement and prediction model. However, empirical psychometric research has shown that these models are not always invariant over cultural groups. Therefore, it is important for both comparative and applied psychology to study these qualitative differences in measurement and prediction and to design culture-fair procedures that take these differences into account. For example, in selection psychology, candidates from different cultural groups have to be compared with respect to their suitability for a certain job. In practice, information about group membership is often used in the decision. This practice has been criticized, because it may result in different selection probabilities for equally fit individuals from different groups. It is expected that this problem will increase as minority groups become more heterogeneous as a result of differences in acculturation. We propose new measurement and prediction methods based on mixture measurement models. The methods take qualitative group differences in test performance into account, but do not rely on information about group membership.

Selection decisions are solely based on item response patterns. Qualitative group differences are only taken into account to the extent that they may be determined from the response patterns. Individual scoring rules are derived on the basis of a moderated directed acyclic graphical model containing a mixture measurement model that describes the cultural impact on measurement and prediction. Statistical, substantive, and applied issues are addressed. Available and newly collected experimental data will be analyzed. The ultimate aim of the project is to improve the validity of test scores of immigrants.

Simultaneous modeling of response times and responses on test item (new project)

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Summary

Cognitive processes can be studied with functional magnetic resonance imaging (fMRI) experiments. Different within subject and between subject designs exist with their own advantages and disadvantages. This research project aims at finding optimal designs for fMRI experiments that have maximal efficiency and maximal power for finding real effects. By means of results from the statistical theory of optimal designs for generalized linear mixed effects models, including both random and fixed parameters together with (auto)correlated errors, the problem of finding optimal designs can be formulated as a nonlinear optimisation problem. The optimal designs will be empirically evaluated with real fMRI data**.**

Interview-strategies in open interviews

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Project financed by	VU University Amsterdam

Summary

This research is a comparative research in interview-strategies in open interviews, which are being used in pilot studies for preparation and development of new questionnaires, or assessment and correction of used questionnaires in standardised survey research. The research is focussed on the effects of distinguished interview-strategies for open interviews on the quality of acquired information. To compare interview-strategies the research question concentrates on one dimension of interview-strategies: ways of respondent's treatment by the interviewer in question and answer sequences. Two topics are considered, to determine whether the effects of interviewer-strategies are topic-dependent: Ethnic categorisation, as a controversial topic, and categorisation of primal relations.

What is the influence of ways of respondent's treatment by the interviewer in open interviews in question and answer sequences on the quality of the acquired information about ethnic categorisation and categorisation of primal relations?

Inequality constrainted models for the multivariate normal mean: A Bayesian approach (new project)

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Summary

Instead of focussing on null hypothesis testing, a researcher is often interested in the alternative situation in which the null hypothesis does not hold. The researcher may have several competing theories that have to be tested with the collected data. Competing theories on the means can be, for instance, that the means are increasing from time point 1 to 4 or that the means at time point 1 and 2 are smaller than the means at time point 3 and 4. The aim of this research project is to address this issue for models for the multivariate normal mean using a Bayesian approach. Furthermore, issues that a researcher encounters such as missing data, adjustment of a constrained model, and model averaging are addressed.

Modeling core affect trajectories with diffusion models (new project)

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Summary

Core affect is the heart of any emotional experience. It is a continuously present but ever changing affective state, not directed towards an object. Core affect is characterized by two dimensions: Activation (vs. deactivation) and Pleasantness (vs. unpleasantness). At any given point in time, a person occupies a certain position in this two-dimensional space and throughout time, his or her position changes depending on external (i.e., outside the person) or internal (i.e., inside the person) factors. With this research we want to model the trajectories of people in this space with a particular class of stochastic models, called diffusion models. In a first stage of the project we are going to explore the possibilities of diffusion processes as models for the trajectory of a single person. The basic model for the trajectories is the Ornstein-Uhlenbeck diffusion process, a time homogeneous continuous-time Markov model with a continuous state space. In the next step, a random-effects extension will be formulated so that the model can be used for the data of several unrelated persons. Because of the fact that many parameters in the individual switching Ornstein-Uhlenbeck process can vary across persons, there will be rather large algorithmic challenges. Finally, a model consisting of coupled system of processes will be developed to explain the trajectories of partners in the core affect space.

Powerful and robust designs for longitudinal multilevel studies

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Summary

The use of powerful (*optimal*) designs for multilevel data with time-structured measurements will result in a high probability of finding a true effect with a minimum sample size. However, an optimal design for multilevel models depends on the best fitting (correct) statistical model. Since the best fitting model is unknown before data collection, it is highly relevant to try and find a *robust design* that remains powerful for alternative models. The aim of this research is to find such designs. A second aim of this study is to provide social and behavioral scientists with general and robust guidelines for the required sample sizes at different levels of their multilevel design. These guidelines will help researchers to reduce the costs of data collection.

Developmental psychology and evolutionary theory

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Project financed by	University of Amsterdam

Summary

Evolutionary psychologists state that psychological mechanism have been developed in the course of evolution and have been shaped by natural selection. Evolutionary psychologists do not have much influence in developmental psychology. Another point is that they missed an important development in evolutionary biology, i.e., the idea that natural selection alone is not the only principle in evolution; self-organization is also important. It is proposed to study the relationship between different evolutionary theories and development psychology. Next to a theoretical analysis, also simulation studies will be done to find evidence for the relation between evolutionary theory, self-organization and developmental psychology. Also experiments will be done in which the cultural transmission of information will be studied to find out more about mechanism behind biological transmission of information (memes versus genes).

Item analysis of unipolar item response data

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Project financed by	Leiden University

Summary

The project aims at contributing to the development of a full-blown item analysis of unipolar (single-peaked) items. Correspondence analysis will be used as a method for the multidimensional representation of item response data, and a coefficient of single-peakedness will be developed that measures the strength of the nonlinear relationship between item responses and personscores (or item scores). This coefficient will also be used to define a measure of reliability. The new methodology will be tested on a number of clinical test data, as well as on simulated data.

Nonlinear modeling with high volume data sets from systems biology (new project)

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Project financed by	Leiden University

Summary

Prediction problems are typically regression problems and supervised classification problems, in which the development of the prediction procedures and their validation go hand-in-hand. Prediction problems are nonlinear when categorical (ordinal or nominal) variables are involved, possibly with numerical variables as well.

Large data sets generally come into two forms: either the number of variables is very large compared to the number of observations (*wide data sets*), or the number of observations is extremely large (*long data sets*).

The current proposal will develop, extend and apply methodology to deal with both forms of large data sets, in a direction which is especially applicable to categorical data through the use of nonlinear transformations. This approach is firmly based in the data analytic and algorithmic tradition of the Data Theory Group at the Faculty of Social and Behavioral Sciences at Leiden University.

Real-valued HICLAS models

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Project financed by	K.U.Leuven, Belgium

Summary

Hierarchical classes (HICLAS) models constitute a distinct family of classification models for N-way N-mode data that imply a simultaneous clustering of each of the modes in the data. The clusterings are such that each of them reflects a quasi-order between the elements of the corresponding data mode while together they yield reconstructed data that approximate the actual data as good as possible. Up to now, the family of hierarchical classes models has been limited in scope with respect to the range of values allowed in the data (D), and the reconstructed data (M), which can be taken either from the binary set {0, 1} or from a limited) subset of the set of natural numbers.

The expansion to real-valued HICLAS models may be valuable for two reasons.

First, in some cases it may be desirable to allow for positive reals in M, even though D is not real-valued. For example, modeling a binary data set with reconstructed data values in [0, 1] naturally allows the reconstructed data to be interpreted as conditional probabilities of observing a 1.

Second, in several domains of psychological research, the observed data are not of a categorical type, but rather are values on a continuous scale. Examples include measures of response times, intensity of brain waves, muscle tensions etc. In order to deal with this type of data properly, it is desirable to approximate them by reconstructed data that take values from the same set.

In this project, we will expand the family of hierarchical classes models to allow for real-valued reconstructed data. More in particular, we will work on the formulation and the mathematical study of new, real-valued HICLAS models for two- and three-way data, and we will construct and evaluate appropriate algorithms for the associated model estimation.

Analysis of qualitatively different learning forms by testing multi-modality and other catastrofe flags

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Project financed by	University of Amsterdam

Summary

Recently, nonlinear dynamic models of sudden, qualitative change have successfully been applied in the area of developmental psychology. One particular subclass of models, catastrophe models, predicts specific features, such as multimodality, of a system in the vicinity of a qualitative change. Several statistical techniques have been developed to test these hypotheses. In psychology, these models have mainly been applied to investigate Piagetian, cognitive development. The aim of this project is to adapt these techniques for studies of discrimination learning. The question whether two qualitatively different learning forms exist, rather than a continuum of learning forms is a topical subject of discussion in the field of explicit and implicit learning. Research on this subject has mainly concerned the nature of the learning forms, but has not produced definite results. In the context of development, usually mean scores per age groups have been inspected, or other ad-hoc analyses have been applied to describe individual differences. Statistical techniques related to catastrophe theory, particularly finite mixture analysis for multimodality analysis, are appropriate for investigating the existence of qualitatively different forms of learning, and to model individual differences. In this project these techniques will be integrated with existing, mostly mathematical psychological, learning models and research paradigms for discrimination learning.

Countering sample selection biases in social and behavioral research

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Project financed by	Tilburg University

Summary

This project will make an inventory of the different methods that have been proposed to correct for sample selection bias. The assumptions underlying these correction procedures and their mutual relationships will be studied, and their applicability in social and behavioral research will be assessed by using simulation research and by comparing their performance on existing data sets.

A complexity apporach to cognitive learning in young children: Fundamental and applied aspects (new project)

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Project financed by	NWO (Netherlands Foundation of Scientific Research)

Summary

Cognitive learning and development in young children are complex dynamic processes. The aim of this project is to test a non-linear dynamical model of cognitive developmental transitions, based on catastrophe theory, across a number of domains of intellectual development. This will be done by using high-frequency measurements in a computerized microgenetic design. This method can give important insights in the developmental processes underlying several cognitive (e.g., proportional reasoning, conservation) and academic skills (e.g., arithmetical abilities), such as the relation between individual variability and transitions. The practical aim is to make a contribution to the construction and testing of a computerized micro-genetic measurement method within schools. This is very important for the innovation of computerized progress-monitoring systems of individual pupils.

The multiple group method of confirmatory factor analysis for test construction

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Project financed by	University of Groningen

Summary

This project deals with data analytic methods for assigning items to sub-tests of psychological tests. Two such methods exist. Some prior research indicates that the simplest of these (the Multiple Group Method) performs at least as well as the more complex one (Confirmatory Factor Analysis). An important purpose of this project is to verify these prior findings in a thorough comparative study, based on application to simulated as well as real-world data. The Multiple Group Method will be evaluated further, and a generalization of the Multiple Group Method will be developed that allows for handling three-way data.

A comparison between factor analysis and item response theory modeling in scale construction

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Project financed by	NWO (Netherlands Foundation of Scientific Research)

Summary

In practice, the two most important approaches for scale construction are either based on factor analytic or item response theory modeling. The proposed research deals with a comparative analysis of both methods, which differ in their assumptions, but share similar principles and coinciding goals. The stability and sensitivity of scales obtained with each method, are topics of investigation. The analysis of empirical data is part of the research design. The aim is to develop, so far lacking, practical recommendations for the applied researcher in a perhaps unified approach.

The development and application of diffusion models (new project)

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Summary

Diffusion models are a class of stochastic time-series models which can be used to model time-continuous movement through an *N*-dimensional space. They are a category of random walk models, but with added features such as biased starting points, drift rates, boundaries and concentration points. Such features make these models flexible tools for studying the time course of complex processes.

For example, many experiments in psychology yield both reaction time and binary response data (accuracy) simultaneously. These data do not conform to the assumptions made by classical statistical models (i.e. they are not normally distributed and not independent). By equipping a unidimensional diffusion model with two boundaries, the model's boundary crossings and first passage times can be linked to responses and reaction times, respectively, in a natural fashion.

For a second example, a diffusion model could be used to study an individual's discretized changes in *core affect* - a 2-D psychological construct which describes a person's ever-changing affective state.

By examining the best fitting parameters of this diffusion model to such data and linking them to experimental variables or measured covariates, a more sensitive type of analysis may be obtained. We aim to find solutions to the problem of prohibitive computational complexity of this fitting process, for example by simplifying model formulations and reducing dimensionality.

Automatic editing and imputation: Development of a framework

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Project financed by	Utrecht University

Summary

In the social sciences often statical analyses are needed. However, for correct statistical analyses, datasets with complete records often are necessary; otherwise inconsistencies may occur and hence statistical analyses may not be trusted. A record is called imputation, and correcting a value is known as statistical data editing.

Traditionally in Statistics Netherlands, the official Dutch company for statistical analyses, imputation and editing are done manually. This process is slow, expensive and not transparant. Since also the amount of requests for analysing datasets is increasing, the need for automatic editing and imputation is obvious. Currently implementations of the required automatic processes for Statistics Netherlands concentrate upon the established theorems of Fellegi-Holt, based on changing a minimum number of variables in a record. A new theorem, the NIM-approach, based on changing a record according to the records that best resemble the current record, has emerged recently. The impact resulting from this new theorem on the existing theorems and implementations calls for the efforts of a Phd-student.

Constrained regression models

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Project financed by	Leiden University

Summary

The objective of the project is to develop various models for categorical data that will be derived from the general linear regression model by applying various kinds of constraints. Algorithms to fit these models will be developed, implemented, and applied to data from the field of social sciences. Also, the models will be evaluated in terms of performance and compared to existing models. The proposed constrained models can be divided into three classes. The first class of models concerns multivariate analysis of variance models, with additivity constraints and special attention to the modeling of interaction. The second class of models concerns particularly restricted pathmodels, resulting in (quasi) redundancy analysis, PLS-models, and forms of neural nets. In the third class of models equality constraints will be applied to the regression weights to deal with instability due to multi-collinearity.In all cases the techniques will be appropiate for the analysis of categorical data, notably by allowing monotonic or completely nonlinear spline transformations. Special attention will be given to suitable representations of the subjects in the analysis.

Handling missing scores and ouliers in test and questionnaire data

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Project financed by	Tilburg University

Summary

Nowadays, much software is availabe for the analysis of the scores on J items from tests and questionnaires using item response theory (IRT). From the perspective of practical data analysis, a limitation in several of these software packages is that they cannot handle missing data other than by means of list-wise deletion. Although often they are unaware of the damage this may do to their data analysis, this is the option used by most researchers. In addition, many researchers are unfamiliar with the concept of outliers, which may also distort the results of an IRT analysis. The purpose of this project is to find simple and practical solutions for handling missing data and outlier problems in test and questionnaire data, and to implement these solutions into SPSS code and, more specifically, the much used IRT program MSP.

Market segmentation using Bayesian model based clustering

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Summary

Bayesian model based clustering will be developed such that it can be applied to data sets that are specifically used for market segmentation. A number of statistical issues have to be studied before these data sets can be analyzed: - A cluster algorithm that can handle very large data sets will have to be developed.

- The cluster algorithm has to be able to deal with data that are missing at random.
- The cluster model has to be a latent mixture of log-linear models that contain main-effects and specific sets of two-way interactions.
- With large data sets often many clusters are obtained. A specific issue will be transforming the optimal clustering into a more workable (for marketing activities) clustering with a limited number of clusters.
- The influence of the prior distribution on the marginal likelihood (a quantity that will be used to determine the number of clusters) has to be determined.
- Obtaining clusters such that these are useful for market segmentation. This requires a cluster model that is restricted to render clusters that have a high probability to contain specific types of persons (in terms of variables that are not used for the clustering).
- Using the cluster model to predict for new persons to which cluster they belong. This project will build on the work in Hoijtink (1998, 2001) and Hoijtink and Notenboom (2004).

Key words: Bayesian computational statistics, Latent class analysis, Log-linear modeling, Market segmentation, Markov Chain Monte Carlo methods, Missing data, Model based clustering.

Model selection(new project)

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Summary

This project is part of a bigger research project about the use of prior knowledge, Bayesian statistics. Researchers using prior knowledge either end up with a set of competing models that differ in the inequality constraints used, or with one or more constrained models, a null model and an unconstrained model. In this project several model selection criteria that can be used to select the best model will be developed, studied and evaluated.

Ordering properties of homogeneity analysis when applied to data from IRT models

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Project financed by	Leiden University

Summary

When applied to data generated by some Item Response Theory (IRT) model, homogeneity analysis (including simple and multiple correspondence analysis) seems to recover the ordering of the person and item parameters quite well. The current project aims at a full theoretical explanation for this phenomenon, and at a rigorous description of the conditions under which these ordering properties hold. Heiser's (1981) work on the consecutive ones property in correspondence analysis will be generalized to the probabilistic case along the lines of what Schriever (1985) has done for multiple correspondence analysis. Both dichotomous and polytomous items will be considered. If possible, stronger properties than ordering of parameter values are of inter-est as well. Another question is whether the results can be extended to the multidimensional case. Finally, the effect of sample size on recovery will be studied in some simulation studies.

EEG/MEG components: A new statistical approach to analyze their (co)variance properties (new project)

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Project financed by	NWO (Netherlands Foundation of Scientific Research) Part of Vidi project by Hilde Huizenga: *The association between intelligence and performance variability: A new statistical neuroscientific approach.*

Summary

In this project the primary aim is to assess variance and covariance properties of EEG/MEG components, without the need to localize these components. Such a method should meet several criteria. First, it is necessary that signal variance can be dissociated from noise variance. Second, it should be possible to disentangle latency variance and tests of amplitude and latency variance parameters. Third, it is neccessary that the amplitude covariance between components can be estimated and tested. Existing methods (e.g. variance, complexity, wavelets, independent component analysis, parallel factor analysis) are adequate to answer other reseacrh quetions, but they do not meet the aforementioned criteria, and thus are not suited for the present purposes.

We therefore develop a new statistical method that does meet these criteria. By modeling EEG/MEG by a sum of a) partly random temporal component functions and b) a noise variance model, it will become possible to reliably assess variations in amplitude and latency, and the covariance of amplitudes. Since the proposed method is new and by no means straigthforward, it will be developed in several subprojects that have substantial merits in their own right.

The use of item response theory in personality assessment

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Project financed by	NWO (Netherlands Foundation of Scientific Research)

Summary

This project focuses on application of item response theory (IRT) in the context of personality measurement and clinical assessment in psychology. On theoretical grounds, compared to classical test theory application of IRT will result in a substantial improvement of the precision and reliability, and can support much more flexible test administration procedures. Two topics will be addressed.

1. Existing studies suggest that it is unclear which IRT modesl best describe personality data. Therefore, it will be investigated which IRT models are best suited to describe personality data and which item characteristics determine the fit of an IRT model.
2. It will be investigated empirically whether IRT can indeed improve classification decisions in the personality domain.

Application and development of multi-group means and covariance structure modeling of the Flynn effect

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Project financed by	NWO (Netherlands Foundation of Scientific Research)

Summary

The increase in IQ test scores denoted by the Flynn effect has important implications for both practices and theory about test scores on standardized intelligence tests. The aim of this project is to apply Multi-group covariance and mean structure (MGCMS) analyses to inter-generational data sets in order to shed light on the nature and the causes of this increase. Furthermore these analyses should use a more precise selection variable (date of birth) instead of the comonly used division into generations of cohorts. A further aim of this project is to incorporate the recently proposed Dickens-Flynn model into MGCMS modeling.

Admissable statistics and latent variable theory

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Summary

Does the appropriateness of statistical analyses depend on the measurement level of the variables on which these analyses are carried out? Measurement theorists are generally of the opinion that this is the case; the measurement level of variables determines the class of appropriate statistics. Several statisticians have, however, claimed that this limitation is unfounded and that it has adverse scientific consequences. The disagreement between these camps is known as the admissible statistics controversy. Although discussants in this controversy disagree on virtually everything, they share a core assumption: namely, that measurement and statistical analyses are separate endeavors. However, in an important class of measurement models, known as latent variable models, measurement and statistical theory are intertwined to such a degree that it is difficult to say where one begins and the other ends. In the present research, the admissible statistics problem is formulated and analyzed in terms of latent variable theory. This yields a quite different view of what the problem actually is; namely, a problem that occurs because statistical analyses assume that variables are errorless measures of the theoretical attributes involved, while measurement models usually view these same variables as imperfect indicators of these attributes. Thus, the admissible statistics problem becomes a question of robustness: Under which conditions is it possible to ignore measurement error and equate observed scores to theoretical attributes? This question is investigated through mathematical analysis and simulation studies. Second, alternative methodes of analysis, that may be used to address measurement and statistical issues at the same time, are evaluated for their potential in solving the admissible statistics problem; specifically, the use of multi group models with mean structures in factorial designs is investigated in this respect.

Detection of out liers in test, questionnaire and survey data

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Summary

Outliers, often defined as observations, which are inconsistent with the remaining data, are influent ial to the degree in which they affect stat ist ical results. Outlier research is often done with cont inuous variables, such as income and age. This project defines outliers for highly discrete data in test, questionnaire and survey data, and proposes several methods for detect ing outliers. It is also investigated when an outlier is influential, and how to deal with influential cases. Simulated and numerous real data sets are used. The project will result in user-friendly software for handling data quality problems, including out lier analysis.

5 Graduate training program

5.1 Seminars

In 2006 IOPS organized one seminar:

- Seminar *Generalized latent variable modeling*, Tilburg University.
  Instructor: prof. dr J. Vermunt
  Dates: 1 and 2 June 2006
  14 Participants received an IOPS certificate for successfully completing the seminar.

5.2 Postdoctoral courses

In 2006 IOPS organized six postdoctoral courses:

- Postdoctoral course: *Mixed models and incomplete data*, K.U. Leuven (Belgium).
  Instructors: prof. dr G. Molenberghs (Univ. Hasselt), dr G. Verbeke (K.U. Leuven)
  Dates: 22 and 23 February 2006
  52 Participants received an IOPS certificate for successfully completing the course.
- Postdoctoral course *Constructie van tests en vragenlijsten*, University of Amsterdam (UvA).
  Instructors: prof. dr G.J. Mellenbergh, dr P. Oosterveld, & dr H.C.M. Vorst
  Dates: 10, 17, and 24 March 2006
  18 Participants received an IOPS certificate for successfully completing the course.
- Postdoctoral course: *Introduction to numerical techniques for statisticians*, K.U. Leuven.
  Instructors: Geert Molenberghs (Univ. Hasselt), Geert Verbeke (K.U.Leuven), Francis Tuerlinckx (K.U.Leuven)
  Dates: 2 and 3 May 2006
  30 Participants received an IOPS certificate for successfully completing the course.
- Postdoctoral course *Structural Equation Modeling,* Utrecht University.
  Instuctor: dr A. Boomsma (University of Groningen)
  Dates: 31 August and 1 September 2006
  30 Participants received an IOPS certificate for successfully completing the course.
- Postdoctoral course *Statistiek in vogelvlucht*, University of Groningen.
  Instructors: dr M. Huisman, prof. dr H.A.L. Kiers, dr M.E. Timmerman, dr M.A.J. Van Duijn
  Dates: 25 and 26 October & 1 and 2 November 2006
  29 Participants received an IOPS certificate for successfully completing the course.

- Postdoctoral course *Meta analysis*, Maastricht University.
  Instructor: dr W. Viechtbauer
  Dates: 16 and 17 November 2006
  19 Participants received an IOPS certificate for successfully completing the course.

5.3 Conferences

5.3.1 21st IOPS summer conference

The 21st IOPS summer conference was held in Voorburg on 18-19 June 2006. Statistics Netherlands (CBS), co-organiser and host of the conference, welcomed 47 participants.

Invited speaker
An invited presentation was given by Jelke Bethlehem, CBS Voorburg. Title: *Reducing the bias of estimates based on web survey data.*

Conference presentations
The following seven IOPS dissertation students gave a presentation on the results of their research:
- Fannie Cobben, CBS: *A model for statistical inference based on mixed-mode interviewing.*
- Tina Glasner, VU University Amsterdam: *Reconstructing event histories in standardized survey research.*
- Michiel Hol, University of Amsterdam*: Computerized adaptive testing for polytomous motivation items: Administration mode effects and a comparison with short forms.*
- Marielle Linting, Leiden University:*The use of permutation tests in principal components analysis: Two strategies.*
- Pascal Van Hattum, Utrecht University: *Market segmentation using Bayesian model based clustering.*
- Anke Weekers, Twente University: *Response processes in personality assessment:The use of dominance and unfolding IRT models.*
- Jelte Wicherts, University of Amsterdam: *Measurement invariance in the common factor model: Useful and important.*

Article discussions
On the IOPS summer conferences staff members are requested to give a presentation on a submitted paper. This year a presentation was given by Ger Snijkers, CBS, Heerlen: *Pre-testing a web questionnaire for a business survey: An example of a pre-test study and other pre-test methods.*

5.3.2 16th IOPS winter conference

The 16th IOPS winter conference was held on 14 and 15 December 2006 at Felix Meritis, Amsterdam. IOPS and welcomed 90 participants.

University of Amsterdam, co-organiser and host of the conference, organised the workshop *Methods in neuro-imaging* on Friday 15 December. For this event a number of specialists in this field were invited to give a presentation or present a poster.

Conference presentations
The following seven IOPS dissertation students gave a presentation on the topic of their research:
- Katalin Balazs, K.U.Leuven: *Detecting local item dependence*
- Marian Hickendorff, Leiden University: *Mathematical proficiency in primary education: Cognitive processes and predictability*
- Gerben Moerman, VU University Amsterdam: *Assessing the manipulation: The effect of interviewer training on interviewing behaviour*
- Zita Oravecz, K.U.Leuven: *A multivariate stochastic approach for modelling longitudinal variables*
- Janke Ten Holt, University of Groningen: *A comparison of factor analysis and item response theory modeling in scale construction*
- Wouter Weeda, University of Amsterdam: *Describing functional magnetic resonance imaging activation using Activated Region Fitting*
- Annemarie Zand Scholten, University of Amsterdam: *On the statistical treatment of vending machines*

International and invited speakers
The following nine speakers, specialists in the field of neuro-imaging, were invited by IOPS to give a presentaton:
- Christian F. Beckmann, University of Oxford: *Advances in neuro-imaging data analysis and implementation as FSL.*
- Jan De Munck, VU University Amsterdam: *The hemodynamic response of the alpha-rhythm. An EEG/fMRI study.*
- Elia Formisano, Maastricht University: *Statistical pattern recognition in fMRI and 'Brain reading': A methodological introduction and applications to auditory perception.*
- Hilde Huizenga, University of Amsterdam (IOPS staff member): *Psychometrics and neuro-metrics.*
- Eric Maris, Radboud University Nijmegen: *Nonparametric statistical testing of EEG- and MEG-data.*
- Thomas E. Nichols, University of Michigan: *Inference on statistic images.*
- Jos Roerdink, University of Groningen: *Visualization of functional brain imaging data.*
- Alwin Stegeman, University of Groningen (IOPS postdoc): *Comparing Independent component analysis and the Parafac model for multi-subject artificial fMRI data.*
- Lourens Waldorp, University of Amsterdam (IOPS postdoc): *Hypothesis testing in functional magnetic resonance imaging.*

Poster presentations on the subject of neuro-imaging were presented by:
- Michael Capalbo, Maastricht University
- Raoul Grasman, University of Amsterdam
- Lemke Leyman, Ghent University
- Vincent Van de Ven, Maastricht University
- Wouter Weeda, IOPS PhD student, University of Amsterdam

6 Publications

A quantitative overview and a list of publications by IOPS staff members and trainees under auspices of IOPS in 2006 is given below.

Quantitative overview of publications in 2006

Dissertations by IOPS PhD students	3
Other dissertations under supervision of IOPS staff members	4
Dissertations by IOPS postdocs	1
Articles in international English-language journals	191
Contributions to international English-language volumes	25
Book reviews	3
Books and test manuals	2
Articles in other journals	11
Other publications	37
Software	0

6.1 Dissertations

6.1.1 Dissertations by IOPS PhD students

Frank, L.E. (2006). *Feature network models for proximity data.* Leiden University, 184 pp. Rotterdam: Optima. Promotor: prof. dr W.J. Heiser.

Hol, A.M. (2006). *A CAT with personality and attitude: Computerized adaptive testing of personality and attitude attributes with polytomous items*. Amsterdam: University of Amsterdam, 120 pp. Promotor: G. J. Mellenbergh.

Laudy, O. (2006). *Bayesian inequality constrained models for categorical data.* Utrecht University, 122 pp. Promotor: prof. dr H.J.A. Hoijtink.

6.1.2 Other dissertations under supervision of IOPS staff members

Derks, E.M. (2006). *Assessment and genetic aetiology of attention problems, hyperactivity, and related disorder*. Amsterdam: VU University, 228 pp. Prom./co-prom.: prof. dr D.I. Boomsma; dr C.V.Dolan, & prof.J.J. Hudziak. [Cum Laude].

De Vries, A.L.M. (2006). The merit of ipsative measurement: Second thoughts and minute doubts. Maastricht: Universiteit Maastricht, 238 pp. Prom./co-prom.: prof. dr J. Van Heerden & prof. dr G.J. Mellenbergh.

Elzen, H.A. (2006). *Self-management for chronically ill older people*. University of Groningen, 200 pp. Prom./co-prom.: prof. dr J.P.J. Slaets, prof. dr T.A.B. Snijders, dr N. Steverink.

Rebollo Mesa, I. (2006). *Dimensions of personality: A genetic approach.* Amsterdam: VU University, 189 pp. Prom./co-prom.: prof. dr D. I. Boomsma, dr C.V. Dolan.

6.1.3 Dissertations by IOPS postdocs

Arends, L.R. (2006). *Multivariate meta-analysis: Modelling the heterogeneity. Mixing apples and oranges: dangerous or delicious?* Erasmus University, 207 pp. Ablasserdam: Haveka BV. Prom./co-prom.: prof. dr Th. Stijnen.

6.2 Articles in international English-language journals

Aalfs, C.M., Oort, F.J., De Haes, H.C., Leschot, N.J., Smets, E.M. (2006). Counselor-counselee interaction in reproductive genetic counseling: Does a pregnancy in the counselee make a difference? *Patient Education and Counseling, 60,* 80-90.

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Ariel, A., Veldkamp, B.P., & Breithaupt, K. (2006). Optimal testlet pool assembly for multi-stage testing designs. *Applied Psychological Measurement, 30,* 204-215.

Bakx, A.W.E.A., Van der Sanden, J.M.M., Sijtsma, K., Croon, M.A., & Vermetten, Y.J.M. (2006). The role of students' personality and conceptions in social-communicative training: A longitudinal study on development of conceptions and related performance. *Higher Education, 51,* 71-104.

Balázs, K., Hidegkuti, I., & De Boeck, P. (2006). Detecting heterogeneity in logistic regression models. *Applied Psychological Measurement*, *30*, 322-344.

Bean, T., Mooijaart, A., Eurelings-Bontekoe, L., Spinhoven, Ph. (2006). Validation of the child behavior checklist for guardians of unaccompanied refugee minors. *Children and Youth Services Review*, *28*, 867-887.

Bean, T., Mooijaart, A., Eurelings-Bontekoe, E.H.M. & Spinhoven, Ph.(2006). Factors associated with mental health service need and utilization among Unaccompanied Refugee Adolescents. *Administration and Policy in Mental Health and Mental Health Services Research, 33,* 342-355.

Bekker, M.H.J., & Van Assen, M.A.L.M. (2006). A short form of the Autonomy scale: Properties of the Autonomy Scale (ACS-30). *Journal of Personality Assesment, 86,* 51-60.

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Borsboom, D. (2006). Can we bring about a velvet revolution in psychological measurement? A rejoinder to commentaries. *Psychometrika*, *71*, 463-467.

Borsboom, D. (2006). Evolutionary theory and the riddle of the universe. *Behavioral and Brain Sciences, 29,* 351.

Borsboom, D. (2006). When does measurement invariance matter? *Medical Care*, *44*, S176-S181.

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6.8 Software

None.

7 Finances

7.1 Financial statement

Since the establisment of IOPS as a graduate school in 1994, IOPS is financed by the participating institutes. A contribution is payed according to the number of participating dissertation students.

Finances 2006
In 2006, the total expenditures amounted to € 106.007,11; the receipts (including the above mentioned annual contributions) amounted to € 115.522,45. Consequently, 2006 showed a credit balance of € 9.515,34.

Expenses
In 2006, the IOPS secretariat moved to another room, and new furniture had to be purchased. Total amount € 1.778,12.
Other extra expenses in 2006 were the costs for maintenance of the IOPS website (€ 1.730,60) and new design of the IOPS certificate format (€ 499,80), both executed by a professional web-designer. Total amount € 2.230,40.

Receipts
The participating departments of Leiden University, University of Amsterdam, University of Groningen, VU University Amsterdam, Twente University, Tilburg University, Utrecht University, Maastricht University, and Statistics Netherlands (CBS) contributed financially according to the number of their dissertation students that participated in IOPS on 1 July 2006. The total contribution was € 48.430.
Louvain University (K.U.Leuven) contributed € 5.000 according to a special agreement with this university, made in February 2003.
In 2006, The University of Amsterdam was co-host of the 16th IOPS Winter conference, held on 14-15 December 2006 in Amsterdam, and sponsored the conference with an amount of € 2.500.

7.2 Summary of receipts and expenditures in 2006

A summary of receipts and exependitures of 2006 is given on page 106.