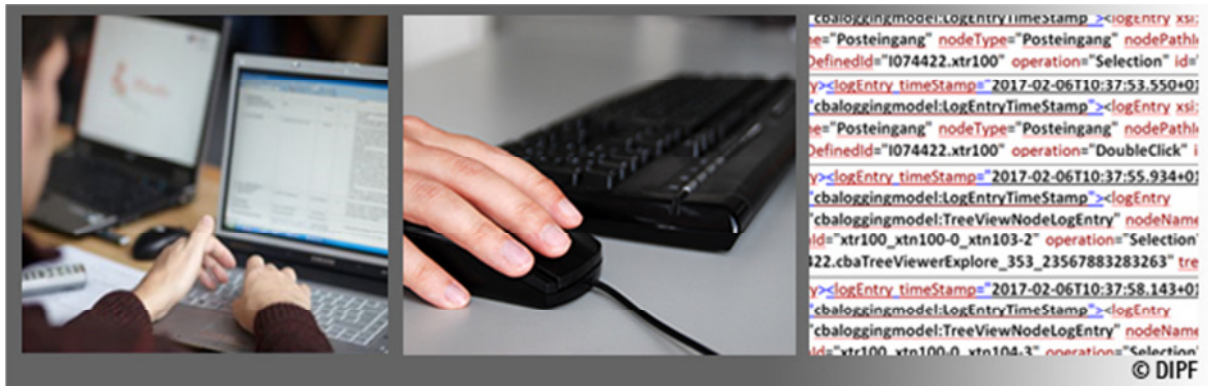# ZIB-Akademie 2017

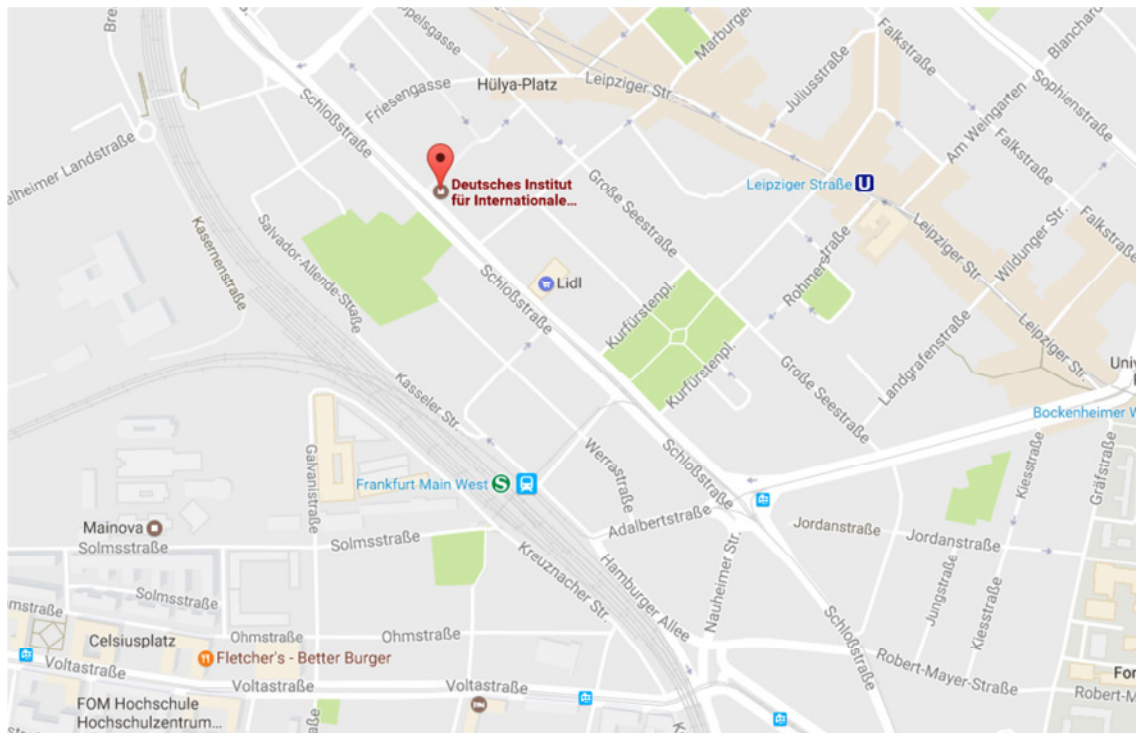## Schwerpunkt: Modellierung von Prozessdaten

Vom **24. Juli – 27. Juli 2017** am DIPF in Frankfurt am Main

Adresse:

Deutsches Institut für Internationale Pädagogische Forschung
Schloßstraße 29

60486 Frankfurt / Main

Tel. 069 24708 0

Allgemeine Informationen

Ort der Akademie	Alle Workshops finden in den Räumen des DIPF in der Schloßstraße 29, 60486 Frankfurt statt. Nähere Informationen werden vor Ort bekannt gegeben. Die Workshops finden im Raum 113 (1. OG) statt.
Anmeldung	Die Anmeldung ist am Montag 24. Juli 2017 bis 11:00 Uhr möglich.
Eröffnung	Die ZIB-Akademie wird am 24. Juli 2017 um 11:00 Uhr eröffnet.
Teilnahmegebühr	Die Teilnahmegebühr beträgt 80 €. Inbegriffen ist Verpflegung tagsüber (Getränke, Mittagessen und Snacks). Kosten für Anreise und Übernachtung sind von den Teilnehmer(inne)n zu tragen.
Erfrischungen	Während der Workshops werden Getränke und in den Kaffeepausen zusätzlich Gebäck bereit gestellt (in der Teilnahmegebühr enthalten).
Mittagessen	Während der Akademie besteht am DIPF jeden Tag die Möglichkeit zum Mittagessen (in der Teilnahmegebühr enthalten).
Internet	Während der Akademie wird ein Internetzugang bereitgestellt. Informationen hierzu werden vor Ort bekannt gegeben.
Social Events	Am Montag, 24. Juli 2017 ist ein gemeinsames Abendessen in einem für Frankfurt typischen Restaurant „Atschel" (Wallstraße 7, 60594 Frankfurt am Main / http://www.atschel-frankfurt.de/) geplant. Die Kosten hierfür betragen 20 € und sind nicht in der Teilnahmegebühr enthalten.

Programm der ZIB-Akademie

Montag, 24.07.2017

bis 11:00	Anmeldung
11.00 – 12.00	Begrüßung und Einführung in das Thema der ZIB-Akademie *Prof. Dr. Frank Goldhammer (DIPF, ZIB)*
12.00 – 13.00	Mittagspause
13:00 – 15.00	WS 1 Teil 1 „Introduction to computational psychometrics" *Dr. Alina von Davier (ACT, USA)*
15.00 – 15.30	Kaffeepause
15:30 – 17.30	WS 1 Teil 2 „Introduction to computational psychometrics" *Dr. Alina von Davier (ACT, USA)*
ab 19:00	Get together: Gemeinsames Abendessen im Restaurant „Atschel " (Wallstraße 7, 60594 Frankfurt am Main / http://www.atschel-frankfurt.de/)

Dienstag, 25.07.2017

09:00 – 10:30	WS 1 Teil 3 „Introduction to computational psychometrics" *Dr. Alina von Davier (ACT, USA)*
10:30 – 11:00	Kaffeepause
11:00 – 12:30	WS 1 Teil 4 „Introduction to computational psychometrics" *Dr. Alina von Davier (ACT, USA)*
12:30 – 13:30	Mittagspause
13:30 – 15:30	WS 2 Teil 1 „Psychometric modeling of responses and response times" *Prof. Dr. Dylan Molenaar (University of Amsterdam, Netherlands)*
15:30 – 16:00	Kaffeepause
16:00 – 18:00	WS 2 Teil 2 „Psychometric modeling of responses and response times" *Prof. Dr. Dylan Molenaar (University of Amsterdam, Netherlands)*

Mittwoch, 26.07.2017

09:00 – 10:30	WS 2 Teil 3 „Psychometric modeling of responses and response times" *Prof. Dr. Dylan Molenaar (University of Amsterdam, Netherlands)*
10:30 – 11:00	Kaffeepause
11:00 – 12:30	WS 2 Teil 4 „Psychometric modeling of responses and response times" *Prof. Dr. Dylan Molenaar (University of Amsterdam, Netherlands)*
12:30 – 13:30	Mittagspause
13:30 – 15:30	WS 3 Teil 1 „Modeling process data from tests and experiments" *Prof. Dr. Paul De Boeck (Ohio State University, USA)*
15:30 – 16:00	Kaffeepause
16:00 – 18:00	**Diskussion der eigenen Arbeit mit Expert(inn)en** Postersession mit Sektumtrunk (Raum 116/118)

Donnerstag, 27.07.2017

09:00 – 10:30	WS 3 Teil 2 „Modeling process data from tests and experiments" *Prof. Dr. Paul De Boeck (Ohio State University, USA)*
10:30 – 11:00	Kaffeepause
11:00 – 12:30	WS 3 Teil 3 „Modeling process data from tests and experiments" *Prof. Dr. Paul De Boeck (Ohio State University, USA)*
12:30 – 13:30	Mittagspause
13:30 – 15:30	WS 3 Teil 4 „Modeling process data from tests and experiments" *Prof. Dr. Paul De Boeck (Ohio State University, USA)*
15:30 – 16:00	Kaffeepause & Verabschiedung *Prof. Dr. Frank Goldhammer (DIPF, ZIB)*

Beschreibung der Workshops

Workshop 1 „Introduction to computational psychometrics"

Dr. Alina von Davier

ACT, USA

Datum: 24.07. 13:00 – 15.00 & 15:30 – 17.30 / 25.07.2017 09:00 – 10:30 & 11:00 – 12:30

Ort: DIPF, 1 OG, Raum 113

Inhalt & Ziele des Workshops:

In this workshop I will introduce the basic concepts of computational psychometrics (CP; von Davier, 2015; 2017), focusing on data mining, machine learning, and data visualization with applications in assessment. CP merges the data driven approaches with the theoretical (cognitive) models to provide a rigorous framework for the measurement of skills in the presence of Big Data. I will use lecture, discussions, and software demo to discuss five types of big data in educational assessment: a) ancillary information about the test takers; b) process data from simulations and games; c) data from collaborative interactions; d) data from multimodal sensors; and e) large data sets from tests with continuous administrations over time. Further, I will address methods for evaluating results from the analyses of Big Data and will present free software available for machine learning and visualization, such as WEKA, RapidMiner, MIRAGE, and routines in R.

The objectives of this workshop are to:

1. Discuss different types of data for which data mining and machine learning techniques are useful (process data and other Big Data).
2. Provide participants with recommended practices for logging process data to support analyses.
3. Provide participants with an overview of methods that can be used to determine the reliability and validity of such analyses.
4. Discuss the potential of several (cognitive) models for the CP analyses.

The session is designed for researchers with a background in measurement but less experience with data mining or machine learning.

Literatur:

von Davier, A. A. (2015, July). Virtual & collaborative assessments: Examples, implications, and challenges for educational measurement. Invited Talk at the Workshop on Machine Learning for Education, International Conference of Machine Learning, Lille, France http://dsp.rice.edu/ML4Ed_ICML2015

von Davier, A. A. (2017). Computational psychometrics in support of collaborative assessments. In A.A. von Davier (Ed.). Measurement issues in collaborative learning and assessment. [Special Issue]. *Journal of Educational Measurement*.

Software:

RapidMiner: http://www.rapidminer.com/
MIRAGE: http://cm.bell-labs.com/who/tkh/mirage/
WEKA: http://www.cs.waikato.ac.nz/ml/weka/
GGobi: http://www.ggobi.org/

Zur Person:

Alina von Davier is the Vice President of ACTNext by ACT, Inc., a Research, Development, and Business Innovation Division, as well as an Adjunct Professor at Fordham University. She earned her PhD in mathematics from the Otto von Guericke University of Magdeburg, Germany, and her MS in mathematics from the University of Bucharest, Romania. At ACT, von Davier and her team of experts are responsible for developing prototypes of research-based solutions and creating a research agenda to support the next generation for learning and assessment systems (LAS). She pioneers the development and application of computational psychometrics and conducts research on blending machine learning algorithms with the psychometric theory. Prior to her employment with ACT, von Davier was a Senior Research Director at Educational Testing Service (ETS) where she led the Computational Psychometrics Research Center.

Materialien:

Workshopteilnehmer(innen) werden gebeten ihren eigenen Laptop mitzunehmen, auf dem das freie Programm WEKA (http://www.cs.waikato.ac.nz/ml/weka/) installiert sein sollte. Falls Sie keinen eigenen Computer mitbringen können, wenden Sie sich bitte an Frau Dr. Olga Kunina-Habenicht und wir werden versuchen, Ihnen ein Notebook zur Verfügung zu stellen.

Materialien für den Workshop werden vor Ort verteilt.

Workshop 2 „ Psychometric modeling of responses and response times"

Prof. Dr. Dylan Molenaar

University of Amsterdam, Netherlands

<u>Datum</u>: 25.07. 13:30 – 15:30 & 16:00 – 18:00 / 26.07.2017 09:00 – 10:30 & 11:00 – 12:30

<u>Ort</u>: DIPF, 1 OG, Raum 113

<u>Inhalt & Ziele des Workshops</u>:

In this workshop, an overview is given of a generalized linear modeling framework used in psychometrics to simultaneous analyze responses and response times to psychological tests. These models extend the traditional Item Response Theory models by adding the response times as an additional source of information concerning individual differences. The modeling framework can be used to improve the measurement of psychological constructs and to identify respondents that use aberrant response processes to answer the test items (e.g., suboptimal response processes, guessing, cheating, etc).

In the workshop, first, some of the older models in psychometrics are discussed. Next, the generalized linear modeling framework is outlined which draws on Van der Linden (2007; 2009), and Molenaar, Tuerlinckx, & Van der Maas (2015a; 2015b). Different instances of the framework are discussed including models for ability tests and models for personality tests. In the practical sessions, the models discussed in the lectures are fit to real and simulated data using Mplus and R. Some basic knowledge about Mplus, R, and Item Response Theory or Factor Analysis is recommended.

<u>Literatur</u>:

Van der Linden, W. J. (2007). A hierarchical framework for modeling speed and accuracy on test items. *Psychometrika, 72*, 287-308. DOI: 10.1007/s11336-006-1478-z

Van der Linden, W. J. (2009). Conceptual Issues in Response-Time Modeling. *Journal of Educational Measurement, 46(3)*, 247-272. DOI: 10.1111/j.1745-3984.2009.00080.x

Molenaar, D., Tuerlinckx, F., & van der Maas, H.L.J. (2015a). A Generalized Linear Factor Model Approach to the Hierarchical Framework for Responses and Response Times. *British Journal of Mathematical and Statistical Psychology, 68(2)*, 197-219.

Molenaar, D., Tuerlinckx, F., & van der Maas, H.L.J. (2015b). A Bivariate Generalized Linear Item Response Theory Modeling Framework to the Analysis of Responses and Response Times. *Multivariate Behavioral Research, 50(1)*, 56-74. DOI: 10.1080/00273171.2014.962684

Zur Person:

Dylan Molenaar is an assistant professor at the department of psychology. Dylan received his PhD degree in psychology from the University of Amsterdam in 2012 (cum laude). Title of his thesis was "Testing distributional assumptions in psychometric measurement models with substantive applications in psychology". His research interests are item response theory, factor analysis, response time modeling, intelligence, and statistical modeling of genotype by environment interactions.

Materialien:

Workshopteilnehmer(innen) werden gebeten ihren eigenen Laptop mitzunehmen, auf der R und ein Editor für R Ihrer Wahl (bspw. R-Studio) sowie Mplus installiert sind. Falls Sie keinen eigenen Computer mitbringen können, wenden Sie sich bitte an Frau Dr. Olga Kunina-Habenicht und wir werden versuchen, Ihnen ein Notebook zur Verfügung zu stellen.

Falls Sie kein Mplus auf Ihrem Computer haben, wenden Sie sich bitte an Frau Dr. Olga Kunina-Habenicht und wir werden versuchen, Ihnen ein Notebook mit entsprechender Software zur Verfügung zu stellen.

Materialien für den Workshop werden vor Ort verteilt.

Workshop 3 „ Modeling process data from tests and experiments"

Prof. Dr. Paul De Boeck

Ohio State University, USA

<u>Datum</u>: 26.07. 13:30 – 15:30 / 27.07.2017 09:00 – 10:30, 11:00 – 12:30 & 13:30 – 15:30

<u>Ort</u>: DIPF, 1 OG, Raum 113

<u>Inhalt & Ziele des Workshops</u>:

Data from cognitive ability tests and cognitive experiments can be binary, such as correct vs. incorrect, and/or they can be continuous, such as (log) response times, and almost always they are repeated measures, such as responses to items and stimuli. These observations can be used for measurement and/or for the investigation of cognitive processes. The work by Robert Sternberg on intelligence is an illustration of how process models for response times and accuracy can reveal how subjects solve problems in intelligence tests. Other examples of research issues are how response time contributes to accuracy, whether the processes underlying fast and slow responses are different, etc. Generalized Linear Mixed Modeling (GLMM) is a powerful and flexible statistical framework to investigate these and other research questions. An important aspect of its flexibility is that it applies to binary and continuous data alike and that individual differences can easily be accounted for. Links with regression, multilevel, and latent variable models will be discussed. The GLMM software for the workshop is the lme4 package in R. The participants are expected to bring their laptop with R and will be provided with datasets and code for applications and exercises. Basic knowledge of R and regression analysis is recommended but not necessary.

<u>Zur Person</u>:

Paul De Boeck is professor of Quantitative Psychology at the Ohio State University. Paul De Boeck has a Ph.D. degree from the KU Leuven in Belgium (Flanders), where he also has spent most of his career. From 2009 to 2012, he was affiliated with the University of Amsterdam. He is a former president of the Psychometric Society (2008) and was the first editor of the Applied Research and Case Studies section of Psychometrika. He is interested in individual differences in various domains, and in quantitative approaches in general. His early quantitative work concerns primarily classification models based on disjunctive and conjunctive rules (HICLAS), while his more recent work concerns model development and applications in the domain of item response theory (IRT) and logistic mixed models. Within IRT he focuses on explanatory models and explanatory measurement, and recently also on IRTree models for response scales (e.g., Likert scales), decision making, and cognitive processes.

Materialien:

Workshopteilnehmer(innen) werden gebeten ihren eigenen Laptop mitzunehmen, auf der R und ein Editor für R Ihrer Wahl (bspw. R-Studio) installiert sind. Falls Sie keinen eigenen Computer mitbringen können, wenden Sie sich bitte an Frau Dr. Olga Kunina-Habenicht und wir werden versuchen, Ihnen ein Notebook zur Verfügung zu stellen.

Materialien für den Workshop werden vor Ort verteilt.