Workshops in Biostatistics

An introduction to modelling with latent variables

This 4-day workshop will introduce the basics of structural equation modelling (SEM), and offer hands-on training in the use of Mplus, a popular and robust SEM software package. You will be ready to apply SEM directly in your work.

Monday, February 12 to Thursday, February 15, 2018
9 AM - 5 PM, Medical Sciences Building
(check www.pharmtox.utoronto.ca for details)
Open to all, internal or external $500

Learning objectives:

1) Hands-on experience with MPlus software
2) Learn fundamental concepts about latent variable modeling
3) Understand the strengths and weaknesses of different model approaches and their applications to cross-sectional and longitudinal data
4) Understand how structural equation modeling can address your specific research questions; specification and adaptation of models
5) Understand the statistical, practical and clinical considerations underlying how to formulate, compare, and evaluate models
6) Learn how "item parcels" can be used as alternative indicators to model latent phenomena
7) Brief consultation on your own datasets and research questions

Applications:

1) Overcoming **measurement error in big data**
2) Modeling biological phenomena (e.g. **animal behaviours**)
3) **Reducing complexity** for data sciences
4) Extracting **cognitive domain** scores
5) Generating multi-analyte **biomarkers**
6) Telling a **gender story** as per The CIHR Institute of Gender and Health
7) Validating a scale
8) Recognizing and dealing with invariance (e.g. do men and women perceive the same construct the same way?)
9) Determining **sample size** to validate a latent construct
10) Novel applications for the biological, social and clinical sciences

To register contact w.swardfager@utoronto.ca - (A laptop will be required for this workshop, if you do not have one, please contact the coordinator at w.swardfager@utoronto.ca prior to registering)

Pharmacology & Toxicology
UNIVERSITY OF TORONTO

An introduction to modelling with latent variables: A practical hands-on workshop in MPlus

Synopsis:

This 4-day workshop is focused on the analysis of multivariate data using a latent variable approach. Statistical models will be applied to clinical and basic sciences data, and the interpretation of statistical models will be discussed. Using latent variables offers several advantages for the biological and clinical sciences. For instance, some (latent) phenomena are not directly observed (e.g. depression, inflammation) but rather they are directly evaluated by items in a scale designed to measure depression (i.e., Beck scale for depression) or different interleukins (e.g. inflammation). Although the intention is to assess the latent phenomena, we have only the observed measures. Each of these measures includes some degree of measurement error within them. The structural equation modeling (SEM) can be overcome and test theories by evaluating and creating a latent variable that underlies the observed measured variables, separating what is important in the observed indicators collected (i.e. common variance) from what is residual (i.e. noise). SEM is a general framework that allows empirical testing of research hypotheses in ways not otherwise possible. For instance, "principle components analysis" can reduce multiple measures into a single measure, but it cannot test the hypothesis that these measures inform the same underlying construct. In this workshop we provide an initial exploration of SEM ranging from basic principles to applications. This 4-day course will introduce the basics of SEM, and offer hands-on training in the use Mplus, a popular and very robust SEM software package, in your work.

Schedule & Syllabus

	AM	PM
Feb 12	Measurement model specification & fit indices	Confirmatory factor analysis (unidimensional models): Item Response Theory with 1, 2, 3, and 4 parameters
Feb 13	Confirmatory factor analysis (multidimensional models)	Bifactor models and Subscale reliability and viability
Feb 14	Bayesian confirmatory factor analysis	Invariance testing (multiple indicators multiple causes approach)
Feb 15		Monte Carlo simulations for sample size estimation in the context of CFA and One-on-one consultation for work on your own data

Prerequisites:

Researchers are expected to have a basic knowledge of regression analysis, discussed in most books on multivariate statistics (e.g., Andy Field: Discovering Statistics; Tabachnick and Fidell: Using multivariate statistics). Some knowledge of SEM and SEM may be helpful, but it is not mandatory. For those with no experience with SEM, the following paper is highly recommended: Hox, J. J. & Bechger, T.M. (2007). An introduction to structural equation modelling. Family Science Review, 11, 354-373.

Instructor
Dr. Hugo Cogo-Moreira, PhD
Assistant Professor, Psychiatry & Medical Psychology, Federal University of Sao Paulo
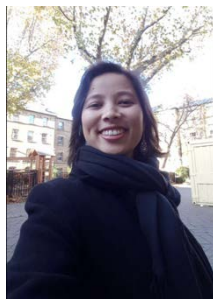
Teaching Assistant
Paola Okuda-Martins, OT
Psychiatry & Medical Psychology, Federal University of Sao Paulo

Coordinator
Dr. Walter Swardfager, PhD
Assistant Professor, Pharmacology & Toxicology, University of Toronto

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