

Towards a Logical Framework for Latent Variable Modelling

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Abstract

Modelling in psychometrics has become increasingly reliant on computer software; at the same time, many offline decisions that a researcher makes remain unrecorded and perhaps, unreconciled to anything more than the researcher's intuition or best guess. The aim of this paper is to set out a logic that accounts for and guides accounting for decision procedures in psychometric research practices. Such a logic is informed by the integration of three systematic viewpoints under a view of constraints-based practice: i) bounded rationality (Gigerenzer & Goldstein, 1996); ii) axiomatic measurement theory with specific focus on handling measurement uncertainty (Suppes, 2002, 2006, 2016); and iii) a constructive approach to mathematical set theory (Ferreiros, 2016). The integration of these three viewpoints under an overall perspective that is characterised by inference from the best systematisation (Rescher, 2016) is reviewed, and compared to current researcher practices, with particular reference to the problems for psychometric and biometric sciences that are revealed in the Reproducibility Project (Open Science Collaboration, 2012) outcomes. Our conclusion for the overall system is that the constraints characterised by constructive mathematics offer unique tools to researcher communities in accounting for their decision procedures, and a proposal for a software tool that handles the decision protocol is presented. In characterising the decision procedures, we also explore the way that rough set theory (Pawlak, 1998) is integrated into decision procedures to provide insight into database fields or variables that hold some import but may otherwise remain hidden in research outcome reporting.

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