

Book Review: “Computational Psychometrics”

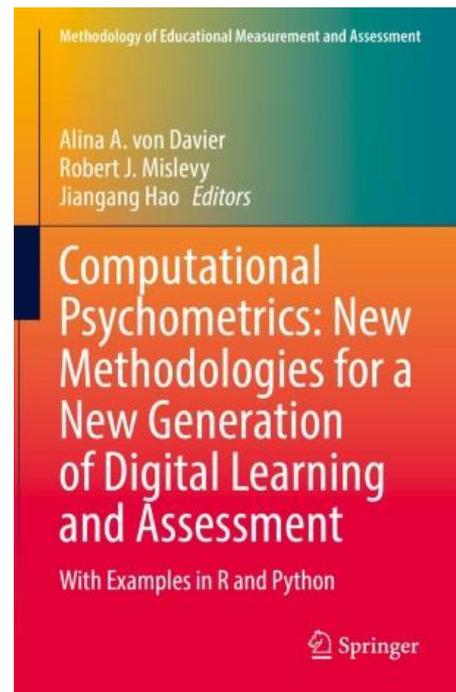
“the methods provided in this book will enable researchers and developers to create systems and tools for better access, better affordability, broader inclusion, and higher quality education for everyone, everywhere” (Computational Psychometrics, 2021)

This ground-breaking 2021 book, Computational Psychometrics: New Methodologies for a New Generation of Digital Learning and Assessment, edited by Alina von Davier, Robert Mislevy, and Jiangang Hao, describes a new world of assessment methods which the authors suggest may revolutionize how we conduct digital assessments.

Challenges the book deals with

New techniques like machine learning and AI promise the ability to make sense of richer datasets to create new kinds of digital learning and assessments.

Traditional psychometrics using classical test theory and item response theory (IRT) have underpinned traditional assessments for decades. The book summarizes the current state of research and practice in a new form of psychometrics “computational psychometrics,” which combines data science and machine learning and other new techniques with traditional psychometrics and potentially allows for better assessments..



What the book covers

The book is concise (~270 pages) but covers a lot of ground and is well produced with many useful diagrams. Although written by 18 authors, it hangs together as a coherent whole. The primary audience is researchers and psychometricians, and so the book includes a good quantity of equations and some sample code (with more on GitHub). Some sections will be opaque to non-mathematicians, but much of it is accessible to the intelligent and interested layperson.

After an introductory chapter, there are four chapters on concepts, which introduce models for thinking about people's abilities, describe some innovative ways that people can learn and be assessed, explain virtual performance environments, and presents other concepts in computational psychometrics. There are then nine chapters on methodology covering data science, machine learning, and issues such as neural networks, time series, and automated scoring of essays. The book is unafraid of delving deep into mathematical concepts but in most sections gives a high-level overview that is understandable without mathematics.

The sections on machine learning distinguish between supervised and unsupervised machine learning. Supervised machine learning allows for the classification of data—for example, whether an incoming email is spam or genuine. It is potentially useful for classifying learning data or for scoring assessments. Unsupervised machine learning identifies patterns in data and is potentially useful for finding clusters or patterns in learning or assessment data that can be used psychometrically.

Typically, the book introduces an area, covers some of the main methods or concepts but then provides references to papers or other documents to cover it in full.

How the book might help

The editors state that the main purpose of the book is to guide psychometricians, data scientists, or researchers who are coming into the field into what has and can be done. So that if you are coming into this area from a related field, you have an excellent introduction.

However, there also seems much value in this book for assessment professionals who are not themselves going to engage in psychometrics and computation, but still want to understand what is possible now and potentially in the future. The book gives a concise and largely readable account of how richer digital assessment using AI can be done to some extent today and may well be very practical in the future.

The book's premise is that computational psychometrics show the future of digital assessments. If you are looking for a crystal ball to show the future for edtech and the testing industry, this book is worth reading.

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