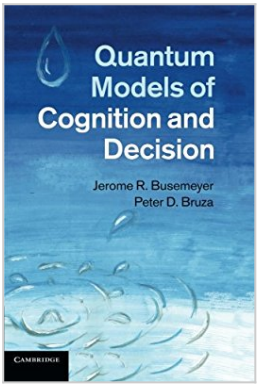

Quantum Models of Cognition and Decision

By Jerome R. Busemeyer, Peter D. Bruza

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Much of our understanding of human thinking is based on probabilistic models. This innovative book by Jerome R. Busemeyer and Peter D. Bruza argues that, actually, the underlying mathematical structures from quantum theory provide a much better account of human thinking than traditional models. They introduce the foundations for modelling probabilistic-dynamic systems using two aspects of quantum theory. The first, 'contextuality', is a way to understand interference effects found with inferences and decisions under conditions of uncertainty. The second, 'quantum entanglement', allows cognitive phenomena to be modeled in non-reductionist ways. Employing these principles drawn from quantum theory allows us to view human cognition and decision in a totally new light. Introducing the basic principles in an easy-to-follow way, this book does not assume a physics background or a quantum brain and comes complete with a tutorial and fully worked-out applications in important areas of cognition and decision.

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Editorial Review

Review

"This is the first book putting forward the main scientific results of an intriguing and promising new research domain called 'quantum cognition.' In this emergent field, the mathematical structure of quantum theory is employed to model essential aspects of human cognition impossible to be modeled properly within classical approaches. The authors are both engaged intensively in quantum cognition and wrote a high-quality and well-understandable treatise showing how this new approach carries the potential of a real breakthrough, with deep implications for how cognition will be looked upon in the decades to come. The approach may also signify a thorough new opening to the old problem of artificial intelligence and the structuring of semantics."
--Diederik Aerts, Center Leo Apostel for Interdisciplinary Studies, Brussels Free University

"This book is about why and how formal structures of quantum theory are essential for psychology - a breakthrough resolving long-standing problems and suggesting novel routes for future research, convincingly presented by two main experts in the field."
--Harald Atmanspacher, Department of Theory and Data Analysis, Institut fuer Grenzgebiete der Psychologie und Psychohygiene e.V.

"Mathematical models of cognition so often seem like mere formal exercises. Quantum theory is a rare exception. Without sacrificing formal rigor, it captures deep insights about the workings of the mind with elegant simplicity. This book promises to revolutionize the way we think about thinking."
--Steven Sloman, Cognitive, Linguistic, and Psychological Sciences, Brown University

"...The title grabs the reader's attention.... The presentation is clear and self-contained, requiring no prior knowledge of quantum mechanics on the part of the reader. Every serious researcher in cognitive science needs to engage with this volume."
--Dr. H. Van Dyke Parunak, Computing Reviews

"The book is intended for anyone who is interested in this topic, and does not presume any preliminary knowledge. It includes a detailed introduction to the corresponding quantum physics, along with a detailed description of the corresponding psychological experiments.... It is very thought-provoking, a must-read for anyone interested in understanding human behavior and human judgments..."
--V. Ya. Kreinovich, Mathematical Reviews

About the Author

Jerome R. Busemeyer is a Professor in the Department of Psychological and Brain Sciences at Indiana University, Bloomington. His research includes mathematical models of learning and decision making and he has formulated a dynamic theory of human decision making called decision field theory. Professor Busemeyer has published over 100 articles in cognitive and decision science journals including Psychological Review and was Chief Editor of the Journal of Mathematical Psychology from 2005 to 2010.

Peter D. Bruza is a Professor in the Faculty of Science and Technology at Queensland University of Technology, Brisbane. His research intersects information retrieval, cognitive science and applied logic. He is a pioneer and co-instigator of the field of quantum interaction (QI) and serves on the steering committee of the quantum interaction symposia. Professor Bruza also serves on the editorial boards of Information Retrieval, the Journal of Applied Logic, The Logic Journal of the IGPL and the Information Science and Knowledge Management book series.

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