An Introduction to Agent-Based Modeling: Modeling Natural, Social, and Engineered Complex Systems with NetLogo (MIT Press)

By Uri Wilensky, William Rand

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The advent of widespread fast computing has enabled us to work on more complex problems and to build and analyze more complex models. This book provides an introduction to one of the primary methodologies for research in this new field of knowledge. Agent-based modeling (ABM) offers a new way of doing science: by conducting computer-based experiments. ABM is applicable to complex systems embedded in natural, social, and engineered contexts, across domains that range from engineering to ecology. *An Introduction to Agent-Based Modeling* offers a comprehensive description of the core concepts, methods, and applications of ABM. Its hands-on approach -- with hundreds of examples and exercises using NetLogo -- enables readers to begin constructing models immediately, regardless of experience or discipline.

The book first describes the nature and rationale of agent-based modeling, then presents the methodology for designing and building ABMs, and finally discusses how to utilize ABMs to answer complex questions. Features in each chapter include step-by-step guides to developing models in the main text; text boxes with additional information and concepts; end-of-chapter explorations; and references and lists of relevant reading. There is also an accompanying website with all the models and code.

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Editorial Review

Review

This book eloquently captures the excitement of understanding natural and social phenomena by recreating them in computer simulations. The agent-based approach championed here provides deeply satisfying scientific explanations because it provides a bridge between levels of description, showing how high-level, macroscopic properties, such as crystal formation, tumor shape, flocking, population cycles, social coordination, and transportation networks, can spontaneously emerge from lower-level interactions among agents rather than being explicitly programmed into a model. When combined with active exploration using Uri Wilensky's free and widely used NetLogo programming environment, reading this book equips students and researchers with a new language for generating and expressing scientific theories.

(Robert Goldstone, Chancellor's Professor of Psychological and Brain Sciences, Indiana University Bloomington)

A clear, comprehensive, and up-to-date introduction. This is the best book out there for learning (or teaching) the art and science of agent-based modeling. I highly recommend it for anyone interested in this essential area of complex systems science.

(Melanie Mitchell, Professor, Portland State University and the Santa Fe Institute; author of *Complexity: A Guided Tour*)

This outstanding book offers a *tour d'horizon* of agent-based modeling for students, teachers, and scientists at all levels, using NetLogo, the 'low-threshold/unknown-ceiling' language developed by Uri Wilensky. With this *Introduction to Agent-Based Modeling*, he and William Rand have set the standard for textbooks on this topic. An essential contribution.

(Joshua M. Epstein, Johns Hopkins University and the Santa Fe Institute)

About the Author

Uri Wilensky is Professor of Learning Sciences, Computer Science, and Complex Systems at Northwestern University and Director of the Center for Connected Learning and Computer-Based Modeling there. He is the author of the NetLogo language. William Rand is Assistant Professor of Marketing and Computer Science and Director of the Center for Complexity in Business at the Robert H. Smith School of Business at the University of Maryland.

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