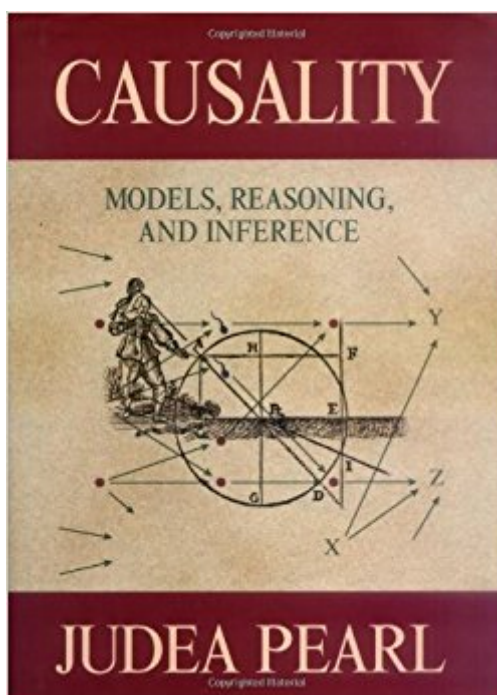


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# Causality: Models, Reasoning, And Inference



## Synopsis

Written by one of the pre-eminent researchers in the field, this book provides a comprehensive exposition of modern analysis of causation. It shows how causality has grown from a nebulous concept into a mathematical theory with significant applications in the fields of statistics, artificial intelligence, philosophy, cognitive science, and the health and social sciences. Pearl presents a unified account of the probabilistic, manipulative, counterfactual and structural approaches to causation, and devises simple mathematical tools for analyzing the relationships between causal connections, statistical associations, actions and observations. The book will open the way for including causal analysis in the standard curriculum of statistics, artificial intelligence, business, epidemiology, social science and economics. Students in these areas will find natural models, simple identification procedures, and precise mathematical definitions of causal concepts that traditional texts have tended to evade or make unduly complicated. This book will be of interest to professionals and students in a wide variety of fields. Anyone who wishes to elucidate meaningful relationships from data, predict effects of actions and policies, assess explanations of reported events, or form theories of causal understanding and causal speech will find this book stimulating and invaluable. Professor of Computer Science at the UCLA, Judea Pearl is the winner of the 2008 Benjamin Franklin Award in Computers and Cognitive Science.

## Book Information

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## Customer Reviews

"...thought provoking and [a] valuable addition to the scientific community. The author, Judea Pearl,

is not only an expert but also well known for creating novel ideas in cognitive system analysis and artificial intelligence...It is a well-composed and written book. The bibliography is exhaustive and up-to-date. I enjoyed thoroughly reading the material in the book. I would highly recommend this book to both theoretical and applied scientists." *Journal of Statistical Computation and Simulation*"Without assuming much beyond elementary probability theory, Judea Pearl's book provides an attractive tour of recent work, in which he has played a central role, on causal models and causal reasoning. Due to his efforts, and that of a few others, a Renaissance in thinking and using causal concepts is taking place." Patrick Suppes, Center for the Study of Language and Information, Stanford University"For philosophers of science with a serious interest in causal modeling, *Causality* is simply mandatory reading." *Philosophical Review*"This highly original book will change the way social science researchers think about causality for years to come. Pearl has produced a new and powerful formal theory of causal analysis that will be of great use to the serious empirical researcher. A must read." Christopher Winship, Department of Sociology, Harvard University"Judea Pearl's previous book, *Probabilistic Reasoning in Intelligent Systems*, was arguably the most influential book in Artificial Intelligence in the past decade, setting the stage for much of the current activity in probabilistic reasoning. In this book, Pearl turns his attention to causality, boldly arguing for the primacy of a notion long ignored in statistics and misunderstood and mistrusted in other disciplines, from physics to economics. He demystifies the notion, clarifies the basic concepts in terms of graphical models, and explains the source of many misunderstandings. This book should prove invaluable to researchers in artificial intelligence, statistics, economics, epidemiology, and philosophy, and, indeed, all those interested in the fundamental notion of causality. It may well prove to be one of the most influential books of the next decade." Joseph Halpern, Computer Science Department, Cornell University"Judea Pearl has come to statistics and causation with enthusiasm and creativity. His work is always thought provoking and worth careful study. This book proves to be no exception. Time and again I found myself disagreeing both with his assumptions and with his conclusions, but I was also fascinated by new insights into problems I thought I already understood well. This book illustrates the rich contributions Pearl has made to statistical literature and to our collective understanding of models for causal reasoning." Stephen Fienberg, Maurice Falk University Professor of Statistics and Social Science, Carnegie Mellon University"This book on causal inference by a brilliant computer scientist will both delight and inform all--philosophers, psychologists, epidemiologists, computer scientists, lawyers--who appreciate the intriguing problem of causation posed by David Hume more than two and a half centuries ago." Patricia Cheng, Department of Psychology, University of California, Los Angeles"This book fulfills a

long-standing need for a rigorous yet accessible treatise on the mathematics of causal inference. Judea Pearl has done a masterful job of describing the most important approaches and displaying their underlying logical unity. The book deserves to be read by all statisticians and scientists who use nonexperimental data to study causation, and would serve well as a graduate or advanced undergraduate course text." Sander Greenland, UCLA School of Public Health"Judea Pearl has written an account of recent advances in the modeling of probability and cause, substantial parts of which are due to him and his co-workers. This is essential reading for anyone interested in causality." Brian Skyrms, Department of Philosophy, University of California, Irvine"In conclusion, make no mistake about it: This is an important book. Even if almost all of the content has appeared previously in diverse venues, it has been brought together here for all of us to think about." Journal of American Statistical Association, Charles R. Hadlock, Bentley College

Causality offers the first comprehensive coverage of causal analysis in many sciences, including recent advances using graphical methods. Pearl presents a unified account of the probabilistic, manipulative, counterfactual and structural approaches to causation, and devises simple mathematical tools for analyzing the relationships between causal connections and statistical associations. The book will facilitate the incorporation of causal analysis as an integral part of the standard curriculum in statistics, business, epidemiology, social science and economics. Causality will be of interest to professionals and students in the fields of statistics, artificial intelligence, philosophy, cognitive science, and the health and social sciences.

I needed this for my research and found the price and quality. Unfortunately, the content was tedious reading and failed to illuminate the subject as well as other tomes I've read.

This is a very interesting book that Judea Pearl wrote. The topic is currently of general interest for diverse fields as economics, social sciences and biology, however, this book is not intended for practitioners from these fields who face a special problem and search for a possible solution. If you want to buy this book for this reason you will not be able to extract this information from this book. The reason therefor is that important techniques like Bayesian Networks or Structural Equations are treated in 3 pages in each case. Judea Pearl assumes that the reader is already familiar with such methods beforehand. (Readers interested in the latter subject are strongly referred to Bollen's book "Structural Equations with latent variables".)Moreover, I do not think that this book presents state of the art information about our current knowledge of this subject. For example, the important problem to

extract a network structure (structure learning) from data rather than estimating the parameters of a given networks structure is completely missing. Nevertheless, this is a good book, because it might give you in the long run (you can not read it in one piece) insights you did not have before. Of course not to all topics causality is involved (see, e.g., above) but the given topics are thorough explained albeit on an advanced level. Update: I add one star (total three) to my evaluation, because in the meanwhile I appreciate the historical development described in the book including references to the literature.

great

Judea Pearl is one of the leading researchers in the topic of causality. What is causality? In the exploration of statistical data we are often able to find relationships or correlations between two variables. We are often tempted to attribute the results of one variable, say A as an outcome (being high or low) that is due to the result (high or low) of the other, say B. We want to say that B is the cause of the outcome of A. Significant correlation by itself only suggests relationships. It cannot tell you whether A causes B or B causes A or neither. Causality is the study of designing experiments to allow you to determine if a relationship has a cause and effect. The subject matter is very philosophical and somewhat controversial. But a lot of research effort has gone into providing mathematical rigor to the concept. Pearl is one of those rare scientists who can contribute to such theory and explain it. But as Aickin suggests in his review this is not a subject for a novice. Previous exposure to statistical methods such as correlation and regression is important to a clear understanding of this book.

A great text, if for no other reason than the fact that it fills an important niche. Pearl does an excellent job of delineating causal models as both philosophical and statistical problems. I found the coverage of latent variable models particularly useful. My only complaint is Pearl often makes assumptions without justifying them sufficiently. Usually, the assumptions made are reasonable or of negligible consequence, but at other times, the veracity of the assumptions is arguably core matter of the discussion. The net effect is a feeling of reading a brilliant, detailed exposition of what causal models imply observationally, undermined by doubts about the appropriateness of causality as a concept at all. Overall, however, this a wonderful text that should be useful to anyone interested in causality or statistical modeling.

Judea Pearl and his colleagues at UCLA (and elsewhere) have published a large number of papers and written unpublished reports over the past 15 years, in which they have developed a modern, analytical approach to causation. Many of these are in somewhat obscure publications, and so it is especially helpful to have the most important of them collected together in this volume. Pearl has edited, written new chapters and connecting prose, to weave this summary of a substantial amount of research. Although the dust-jacket suggests that only modest mathematics is needed, and although this is technically true, it is misleading, because the whole area requires a sophistication of thought that goes well beyond the simplicity of the tools. Nonetheless, there is currently no other volume that is as easy to read as this, and summarizes so much material so compactly. It is possible that the new vision of causal analysis developed by Spirtes, Scheines, Glymour, Pearl, Robins, Verma, Heckerman, Meek, and others, will have profound effect on how we analyze research data. If so, this book will be necessary reading for decades to come.

Choice (November 00) calls both Pearl's *Causality* (and Juarrero's *Dynamics in Action*, which Choice reviews together with Pearl), a "radically new perspective on causation and human behavior... Pearl critically reviews the major literature on causation, both in philosophy and in applied statistics in the social sciences. His formal models, nicely illustrated by practical examples, show the power of positing objectively real causation connections, counter to Hume's skepticism, which has dominated discussions of causality in both analytic philosophy and statistical analysis. Probabilities, Pearl argues, reflect subjective degrees of belief, whereas causal relations describe objective physical constraints. He reveals the role of substantive causes in statistical analyses in examples from medicine, economics, and policy decisions. "Both works are highly ambitious in rejecting traditional views. Although the arguments are meticulous and represent intensive research, their criticisms of mainstream traditions are destined to arouse controversy... Juarrero and Pearl's books will greatly interest philosophers and scientists who are concerned with causality and the explanation of human behavior."

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