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Bayes's Theorem

Richard Swinburne (ed.)

Published in print: 2005 Published Online: January 2012
ISBN: 9780197263419 eISBN: 9780191734175
Item type: book
Publisher: British Academy
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Bayes' theorem is a tool for assessing how probable evidence makes some hypothesis. The papers in this book consider the worth and applicability of the theorem. The book sets out the philosophical issues: Elliott Sober argues that there are other criteria for assessing hypotheses; Colin Howson, Philip Dawid, and John Earman consider how the theorem can be used in statistical science, in weighing evidence in criminal trials, and in assessing evidence for the occurrence of miracles; and David Miller argues for the worth of the probability calculus as a tool for measuring propensities in nature rather than the strength of evidence. The book ends with the original paper containing the theorem, presented to the Royal Society in 1763.

Plausible Reasoning

David Hodgson

in Rationality + Consciousness = Free Will

Published in print: 2012 Published Online: May 2012
ISBN: 9780199845309 eISBN: 9780199932269
Item type: chapter
Publisher: Oxford University Press
DOI: 10.1093/acprof:oso/9780199845309.003.0004

In Chapter 3, I consider one very important aspect of our rationality, namely our ability to engage in plausible reasoning; that is, reasoning in which the premises or data do not entail the conclusions by virtue of applicable rules, but rather support them as a matter of reasonable albeit fallible judgment. I argue that even the scientific method depends on plausible reasoning, and that plausible reasoning cannot be fully explained in terms of rules for good reasoning. I discuss Bayes’ theorem, and its merits and limitations. I conclude by introducing the possibility that underlying plausible reasoning there are physical structures and

algorithmic processes selected by evolution, and foreshadowing my contention that this cannot fully account for plausible reasoning.

The Logic of Scientific Discovery

Colin Howson

in Hume's Problem: Induction and the Justification of Belief

Published in print: 2000 Published Online: November 2003
ISBN: 9780198250371 eISBN: 9780191597749
Item type: chapter
Publisher: Oxford University Press
DOI: 10.1093/0198250371.003.0009

Applies the results of Ch. 7 to scientific methodology and shows that they give a logical interpretation of the subjective Bayesian theory of inductive inference. This theory is therefore no more necessarily subjective than deductive logic, consisting as both do of objective logical rules for proceeding from premises to conclusion. In the Bayesian case, the premises are prior probability assignments. It is shown that familiar rules of scientific method are endorsed, and, in particular, the rule that unless there is prior support for a hypothesis, its overall probability will be very small however good the fit with current evidence.

The Justification of Explanation

Richard Swinburne

in The Existence of God

Published in print: 2004 Published Online: September 2007
ISBN: 9780199271672 eISBN: 9780191709357
Item type: chapter
Publisher: Oxford University Press
DOI: 10.1093/acprof:oso/9780199271672.003.0004

An explanatory hypothesis (whether of the personal or scientific kind) is probable in so far as it makes probable the occurrence of many observed phenomena, the occurrence of which is not probable otherwise; and in so far as it is simple, and fits with background knowledge. This account of the probability of hypothesis is given precise form by Bayes's Theorem.

Simple Bayesian Models

N. Thompson Hobbs and Mevin B. Hooten

in Bayesian Models: A Statistical Primer for Ecologists

Published in print: 2015 Published Online: October 2017
ISBN: 9780691159287 eISBN: 9781400866557
Item type: chapter
Publisher: Princeton University Press
DOI: 10.23943/princeton/9780691159287.003.0005

This chapter lays out the basic principles of Bayesian inference, building on the concepts of probability developed in Chapter 3. It seeks to use the rules of probability to show how Bayes' theorem works, by making use of the conditional rule of probability and the law of total probability. The chapter begins with the central, underpinning tenet of the Bayesian view: the world can be divided into quantities that are observed and quantities that are unobserved. Unobserved quantities include parameters in models, latent states predicted by models, missing data, effect sizes, future states, and data before they are observed. We wish to learn about these quantities using observations. The Bayesian framework for achieving that understanding is applied in exactly the same way regardless of the specifics of the research problem at hand or the nature of the unobserved quantities.

Bayes’s Theorem and Weighing Evidence by Juries

A. P. Dawid

in Bayes's Theorem

Published in print: 2005 Published Online: January 2012
Publisher: British Academy
DOI: 10.5871/bacad/9780197263419.003.0004
ISBN: 9780197263419 eISBN: 9780191734175
Item type: chapter

This chapter discusses Bayes's theorem and the weighing of evidence by the juries. It first examines statistics and the law, before moving on to testing between two hypotheses in court. Identification evidence and databases and search are examined as well. The chapter concludes with a brief discussion of some problems of legal reasoning that have been greatly clarified by examining them from a Bayesian perspective.

Introduction*

Richard Swinburne

in Bayes's Theorem

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Item type: chapter

This chapter introduces Bayes' Theorem, which is primarily concerned with probability. It discusses some of the different kinds of probability, such as statistical probability, before moving on to a discussion of probability axioms. Bayesianism, prior probability and simplicity, and countable additivity are also studied in the chapter.

Decision Technology

Jie W Weiss and David J Weiss

in A Science of Decision Making: The Legacy of Ward Edwards

Published in print: 2008 Published Online: January 2009
ISBN: 9780195322989 eISBN: 9780199869206
Item type: chapter
Publisher: Oxford University Press
DOI: 10.1093/acprof:oso/9780195322989.003.0032

This chapter focuses on decision technology—the rules and tools that help us make wiser decisions. It begins by reviewing the three rules that are at the heart of most traditional decision technology: multiattribute utility, Bayes' theorem, and subjective expected utility maximization. A comprehensive nineteen-step model is presented to show how to make best use of all three rules. The remainder of the chapter explores recently developed tools of decision technology.

What Doctors Must Know about Medical Practice

Bernard Gert, Charles M. Culver, and K. Danner Clouser

in Bioethics: A systematic approach

Published in print: 2006 Published Online: September 2006
ISBN: 9780195159066 eISBN: 9780199786466
Item type: chapter
Publisher: Oxford University Press
DOI: 10.1093/0195159063.003.0008

This chapter shows the importance of recognizing the probabilistic nature of medical diagnosis and treatment. It discusses the possibly serious effects of physicians not understanding Bayes theorem, and hence, not appreciating the importance of knowing the prevalence of a disorder in the population to be treated or screened. It shows the importance of doctors knowing about volume-outcome studies, geographical variation studies, and practice guidelines.

The Criteria of Logical Probability

Richard Swinburne

in Epistemic Justification

Published in print: 2001 Published Online: November 2003
ISBN: 9780199243792 eISBN: 9780191598524
Item type: chapter
Publisher: Oxford University Press
DOI: 10.1093/0199243794.003.0005

The logical probability of a proposition on another proposition is the true measure of how probable the latter makes the former. The central case of this concerns how likely some evidence makes some hypothesis

postulated to explain it. This depends on how probable it is, given the hypothesis that we would find the observed evidence, whether the hypothesis fits with background evidence, how simple it is, and how narrow is its scope. (The scope of a hypothesis depends on how many big and detailed claims it makes.) The latter two a priori criteria give to every proposition an intrinsic probability (a probability on no evidence). These criteria are captured by Bayes's Theorem. A detailed analysis is provided of what it is for a hypothesis to be simple. This account of the probability of a hypothesis on evidence is extended to deal generally with the probability of one proposition on another; and in particular with our grounds for believing testimony.