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Book reviews

Subjective probability by George Wright and Peter Ayton (Eds.), John Wiley & Sons, Chichester, 1994, pp 574, ISBN 0-471-94443-2.

The term "subjective probability" is one that has a number of different interpretations, and before talking in any detail about this book, it is worth saying a little about those different interpretations. The one with which I am perhaps most familiar is that made by statisticians, who distinguish between "objective" and "subjective" probability where the first term is taken to mean probabilities that are established as the long-run frequency with which an event occurs in a particular population, and the second as a measure of belief in the occurrence of an event which reflects the odds that someone would give were they to bet on that occurrence. Thus information might be gathered about the incidence of stomach ulcers amongst lecturers in electronic engineering departments, and this might be used to obtain an objective probability of my developing such an ulcer, while I could decide upon the subjective probability that quantifies my belief that Manchester City will win the FA Cup next season, and use this to decide the odds at which I would bet upon the event. Both objective and subjective probabilities in this sense obey the same mathematical rules (Kolmogorov's axioms), and though the methods used to manipulate them vary depending on the interpretation, the most important distinction between them stems from how they are assessed and what they mean.

The other interpretation of the term "subjective probability" is that often drawn by psychologists studying the way in which people reason under uncertainty. In this case the distinction is between "objective" probabilities which are the real probabilities as they would be assessed by a statistician (either using objective or subjective probabilities of the statistical sort), and "subjective" probabilities which are those generated by experimental subjects who are faced with the problem of dealing with uncertainty information, some of which may be given to them in a probabilistic form. With probabilities of the psychological sort, the difference between the subjective and objective values is an indication of how good the subjects are at reasoning probabilistically (which is what the psychological research aims to uncover). The important distinction here is that objective probabilities conform to the rules of probability theory whilst subjective probabilities in general don't, and so from a mathematical viewpoint are not probabilities at all.

The bulk of the papers in *Subjective Probability* are written by psychologists, and so use the term "subjective probability" in the psychological sense. A few, however, are concerned with the statistical interpretation. These include the first four papers in the book, and this concentration, in my view, gives the book rather an imbalanced introduction. This problem is compounded by entitling this section "Background" which gives the impression that these papers somehow form the bedrock on which all the others are constructed when in reality most of the others are talking about something else entirely. However, taken as a statement of the statistical position these four chapters are perfect, giving a good introduction to the subjective position while including material that is more widely applicable. They are also nicely complemented by the fifth chapter, which argues that there are useful alternatives to probability for reasoning under uncertainty, and the twentieth chapter which discusses how probabilistic methods have been applied in artificial intelligence.

Turning to the papers that are concerned with the psychological interpretation of "subjective probability" we get to the heart of the book. As mentioned above, psychologists interested in reasoning under uncertainty are concerned with how good people are carrying out such reasoning, and what methods they use to do so. Now, early research in this area compared the results that people obtained with the results that would be obtained from the information that they were given if probability theory were to be used. This seemed to show that people exhibited systematic biases

when compared with probability theory, and led to the suggestion that rather than use an intuitive form of probability in their reasoning under uncertainty, people instead used a number of "quick and dirty" heuristics which, although they were acceptable in that they often led people to make reasonable decisions, were wrong when compared with probability theory. This suggestion, in turn, led to the development of the "heuristics and biases" strand of research which attempted to identify and explore the different biases and the heuristics which gave rise to them. The core of this book can be seen as an update on the "heuristics and biases" literature, and it is in this sense that I believe its greatest contribution lies. Indeed, I feel that it is close to being necessary reading for anyone who is interested in this part of the psychology literature, and has the potential to be as influential as landmark publications such as (Kahneman, Slovic and Tversy, 1982) and (Arkes and Hammond, 1986). The papers range from descriptions of recent work within the "heuristics and biases" program, through surveys of the whole program and its development over time, to attempts to dismantle it by showing that the biases are experimental artifacts. Though, as with any collection of papers, there are gaps in coverage, most relevant topics are dealt with. Furthermore, it should be noted that the editors have assembled an impressive array of authors, and this adds to the authority of the collection. Obtaining a suitable number of good contributors is always a potential pitfall when assembling this kind of book, but in this case the editors have negotiated the hazard with ease.

The last important point to make about *Subjective Probability* is one that has implications for a wider audience than those simply interested in subjective probability (in whatever guise). This is that the strongest message to emerge from the book as a whole is that the concept of "uncertainty" is a very complex one, and cannot be adequately captured by any one model. Many times and in many of the papers, the view that there are many different types of uncertainty bubbles up, along with the idea that different types of uncertainty are handled in different ways. Thus the one thing that I take from this book, above all others, is the view that, from a psychological perspective, an eclectic approach is necessary for handling uncertainty. Since this is an opinion that I have long held, it is most gratifying to see it backed up in this way, and to my mind makes the book well worth buying. However, I also feel that, given the quality of many of the individual contributions, *Subjective Probability* is a very valuable resource for anyone interested in the handling of uncertainty.

References

Arkes, HR and Hammond, KR, 1986. *Judgment and Decision Making: An interdisciplinary reader*, Cambridge University Press.

Kahneman, D, Slovic, P and Tversky, A, 1982. *Judgement Under Uncertainty: Heuristics and biases*, Cambridge University Press.

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