ABSTRACTS

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KEVIN KORB

Monash University, Australia

Causality and Information

Numerous attempts have been made to characterize causal power, the tendency for a cause to bring about an effect. Until recently, these have greatly simplified the causal story, ignoring interactions between causes and causes that take a complex range of states. Causal Bayesian networks allow us to tell a more nuanced story and provide, via causal information theory, the basis for making sense of causal power and causal explanation.

LUCIANO FLORIDI

University of Hertfordshire, UK

The Informational Nature of Maker's Knowledge

In this talk, which presents some work in progress, I analyse the so-called maker's knowledge from an informational perspective. The ultimate goal is to understand what kind of knowledge is "poietic" knowledge, as when Alice (knows or rather) is informed (holds the information) that Bob’s coffee is sweetened because she just put two spoons of sugar in it. In the course of the presentation, I shall discuss the three standard distinctions used to qualify propositional knowledge: analytic vs. synthetic, a priori vs. a posteriori, and necessary vs. contingent, and argue that:

a) we need to decouple a fourth distinction, namely informative vs. uninformative, from the previous three, in particular from its implicit association with analytic vs. synthetic and/or a priori vs. a posteriori;

b) such decoupling facilitates, and is facilitated by, moving from a propositional to an agent-oriented approach: the distinctions qualify a proposition, a message, or a set of well-formed, meaningful and truthful data not just in themselves but with respect to an information agent;

c) the decoupling and the agent-oriented approach enable a re-mapping of currently available positions (Classic, Innatist, Kant’s and Kripke’s) on these four dichotomies; and

d) within such a re-mapping, a fifth position, capturing the nature of a maker’s information in terms of these four dichotomies, is best described as the synthetic uninformative.

PHYLLIS ILLARI

University College London, UK

The Challenges of Information Quality

Science and society increasingly use information, and exposure to bad information has made the importance of assessing the quality of information clear to everyone. But what is information quality (IQ) exactly? While yet to be investigated seriously in philosophy of science, this question is live in policy, often with respect to healthcare. So far, our answers to the question have been less than satisfactory. For example, in the US, the Information Quality Act (2000) left undefined virtually every key concept in the text. The issue of IQ is also important in computer science, but there attempts to understand and define aspects of IQ are proliferating, rather than converging. Current IQ literature offers no settled agreement on answers to at least four closely related questions:

1. What is a good general definition of IQ?

2. How should we classify the multiple dimensions of IQ?

3. What dimensions of IQ are there, and what do key features such as 'timeliness', 'accuracy' and so on mean?

4. What metrics might one use to measure the dimensions of IQ, bearing in mind that more than one metric may be required to yield an overall measure for a particular dimension?

What has become clear is that quality of information can only be assessed with reference to its intended use. Information is timely only if it arrives in time for its designated task, whether or not it has been processed efficiently: 'Quality has been defined as fitness for use, or the extent to which a product successfully serves the purposes of consumers … .' (Kahn, Strong, & Wang, 2002, p. 185). More recently, definitions of quality dimensions in the ISO standard all make reference to a 'specific context of use' (ISO, 2008). One important feature of a context of use, is normal purposes in that context.

IQ is of wide-ranging interest to philosophy of science, such as in constraining the model organism databases investigated by Sabina Leonelli. This paper focuses on the commonality between the IQ debate and quality assessment tools (QATs) and evidence hierarchies in medical evidence. What is generally sought is an assessment tool that can be laid out procedurally, and used by any moderately qualified assessor, independent of any context of use. But if Cartwright (2007) and others are right that there are multiple purposes of use for medical evidence, there will be no unitary quality assessment method. This paper argues that Cartwright is indeed right, and approaches to evidence in medicine would benefit from the approaches to quality improvement common in computer science and business which only succeed by examining the whole processing of information, from gathering, through cleaning and maintaining, to use.

References

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DAVID ELLERMAN

UC San Diego, USA

Information as Distinctions: New Foundations for Information Theory

When ordinary logic (usually called "propositional" logic) is formulated at the right level of generality as the Boolean logic of subsets, then there is a category-theoretic dual form of logic as the logic of partitions (i.e., quotient sets are dual to subsets). Boole applied the normalized counting measure to subsets to obtain logical finite probability theory, and similarly the normalized counting measure applied to partitions gives logical information theory. The key concept is a "distinction" of a partition, an ordered pair of elements in distinct blocks of the partition. The logical concept of entropy of a partition is the normalized count of the number of distinctions in a partition. The usual Shannon entropy of a partition is developed by replacing the normalized count of distinctions (dits) by the average number of binary partitions (bits) necessary to make all the distinctions of the partition.

If theories are to be judged by their applications, then a major consequence of partition logic and logical information theory is to finally solve the puzzle of interpreting quantum mechanics. The talk will be a non-technical introduction to partition logic and logical information theory with a few words about how it finally provides the interpretation of quantum mechanics.

TOMOJI SHOGENJI

Rhode Island College, Providence, USA

Measuring the Quality of Information

This paper proposes the formal measure $J(h, e \mid b)$ of information quality:

$$J(h,e \mid b) = \frac{\log P(h \mid e \wedge b) - \log P(h \mid b)}{-\log P(h \mid b)}$$

where h is the information provided by the informant to the recipient, b is their shared background information, and e is the additional information available only to the informant. The quality of information, as measured by $J(h, e \mid b)$, increases as the risk of misinformation $-\log P(h \mid e \wedge b)$ decreases, but it also increases as the quantify of the provided information $-\log P(h \mid b)$ increases. This is because the quality of information is determined by the per-unit risk of misinformation, and not the risk of misinformation per se. I argue that the quality of information in this sense—as distinguished from the risk of misinformation and the quantity of information—should be the primary determinant in the informant's decision to provide the information to the recipient.