Comments on “Conditional propensities, probabilistic dependence and causality

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overview

- two main ideas in Isabelle's talk :

1. a similarity-based propensity interpretation of conditional probability
2. an application to (probabilistic) causal dependence

- I will discuss each idea in turn...

an agenda for interpretations of conditional probability

1. propensity interpretation: the probability $P_S(E)$ of E relatively to a set of physical conditions S is the measure of the tendency of S to produce E
2. conditional probability $P(E|C)$ = the probability of E given that C is the case
3. Ratio Formula : $P(E|C) = P(CE)/P(E)$

- what are the issues for an tentative interpretation of probability ?

  Pb1 : what does mean the probability of E given that C is the case ?
  Pb2 : does the interpretation allow a derivation or justification of the ratio formula ?

- frequentist interpretation: $P_p(E)$ w.r.t. a population (reference class) p is the proportion of individuals in p which are E
- meaning of conditional probability: $P_p(E|C)$ = the proportion of individuals in p which are E among those that are C
- you can derive the Ratio Formula
- analogous remarks for bayesian interpretation : $P(E|C)$ is your degree of belief in E on the supposition that C is the case

meaning of conditional probability

- Isabelle's answer to Pb1: similarity-based propensity interpretation of conditional probability: $P_S(E|C)$ = the probability of E given that C is the case is the measure of the tendency of S^C to produce E where S^C is the most similar system to S that satisfies $P(C) = 1$

first set of questions

- Question 1. on the similarity relation

a. why should there be a unique S^C ? is this just a simplification ?
- if no, strong commitment ;
- if yes, not easy to see how to provide a truly propensity interpretation for conditional probability

b. do you conceive similarity relations as objective ?
- if no, this seems to threaten the project of founding mind-independent interpretation to probability
- if yes, this seems to reinforce the criticisms against propensity interpretation according to which it is ontologically too heavy (Nature populated by measurable tendencies, etc)

the Ratio Formula

- Q2: Isabelle does not derive or justify the Ratio Formula. Have we any reason to believe that $P_S(E|C) = P_{S^C}(E) = P_S(CE)/P_S(C)$?
  - defined for zero-probability C
  - maybe for some F s.t. $P_S(F) = 1$, $P_{S^C}(F) \neq 1$ (contradicts ratio formula)
- Jeffrey : conditionalization is characterized by Certainty ($P_C(C) = 1$) and Invariance
  Invariance = $P_S(CE)/P_S(C) = P_{S^C}(CE)/P_{S^C}(C) = P_{S^C}(CE)$
- the ratio of the tendency of S to produce CE on the tendency of S to produce C equals the tendency to the most similar system to S where $P(C) = 1$ to produce CE ; why should be it so ?

second set of questions

- Question 2. on the ratio formula

a. do you think nevertheless that the ratio formula is or could be justified by your interpretation ?

b. if not, do you think that it is a problem ?

c. do you think that Jeffrey's notion of Invariance could help at least to clarify the issue ?

causal dependence

- let's turn no to causal dependence
- Isabelle's proposal: *C* causes *E* iff

C1 *C* and *E* occur

C2 $P_{S^C,t_C+}(E) > P_{S^{\neg C},t_C+}(E)$

- cf. Lewis (1973) : "without the cause, the effect would have been very much less probable". Isabelle's view mixes intuitions from two main families of causality theory, probabilistic and counterfactual

third set of questions

- Question 3. on the characterization of causation

a condition C1 is neutral w.r.t. temporal direction - does not preclude backwards causation. But C2 seems to preclude it: if E occurs before C and $P_{S,t_E}(C) \neq 1$, then the most similar system to S where $P(\neg C) = 1$ *after time* t_C seems to be S itself. In this case, $P_{S^C,t_C+}(E) = P_{S^{\neg C},t_C+}(E) = 1$

b more generally, by the same reasoning, if $P_{S,t_0}(C) \neq 1$, it seems that the most similar system to S where C does not occur at t_C is S itself !

c the problem comes from the notion of system : a set of initial physical condition. Seems to me that one has to consider states of a system evolving in time

last set of questions

- Question 4. more general questions

a is your characterization of causation supposed to be "reductive" ? If yes, it is not clear that you can elaborate a non-mysterious notion of similarity without causal relations (see Pearl, Woodward who claim to make scientifically respectable sense of similarity or counterfactual intuitions starting from structural equations)

b did you investigate the epistemology of causal attribution ? Maybe, you could find support or application for your analysis ? Or maybe it is focused on generic causation and not relevant ?