Confirmation and the ravens paradox 2

Seminar 4: Philosophy of the Sciences

Wednesday, 28 September 2011

Required readings

Peter Godfrey Smith. *Theory and Reality.* Sections 3.1-3.3, and 14.1-14.4 (can be downloaded from HKU library)

J. A. Cover and Martin Curd 'Commentary on confirmation and relevance', section 5.1, pp 627-638 (on course website)

Optional readings

- Paul Horwich ‘Wittgensteinian Bayesianism’ (on course website)
- Skyrms, Brian. *Choice and Chance*. Chapter 6 (On course website)
- Fitelson. ‘The paradox of confirmation’, *Philosophy Compass.* 2006. pp 93-113 (can be downloaded from HKU library) [Difficult]

Tutorials

Next Tutorials will be next week on Friday 7 October

Class 1: 1 PM - 2 PM seminar room 305

Class 2: 4 PM – 5 PM seminar room 305

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- J. A. Cover and Martin Curd 'Commentary on confirmation and relevance', section 5.1, pp 627-638 (on course website)

Required reading and seminar handouts must be brought along to tutorials

The hypothetico-deductive theory of confirmation (HDT)

i) E confirms H (relative to K) if E can be divided into two parts, E1 and E2, such that a) E1.K does not entail E2, but b) H.E1.K does entail E2.

ii) E disconfirms H (relative to K) if E entails ~H

iii) Otherwise E neither confirms or disconfirms H (relative to K)

HDT and Semmelweis

E1 = The medical staff wash their hands with a solution of chlorinated line before examinations

E2 = Infection rate drops to normal rates

K includes the knowledge that chlorinated lime destroys cadavaric matter

Problems with HDT

Problem 1: HDT entails PC, and hence faces the ravens paradox

Problem 2: HDT cannot account of confirmation of statistical theories such as the hypothesis that anyone who smokes has a 25% chance of developing lung cancer.

Problem 3: Irrelevant conjunction

- Suppose evidence E, made up of E1 and E2, is such that i) E1 does not entail E2, but ii) H.E1 does entail E2.
- Then H.S.E1 entails E2, where S is any hypothesis at all.
- Hence, according to HDT, E confirms H.S.
- Moreover, by SPC, E confirms S. But S can be anything at all!

The probability raising theory of confirmation

PRT for relative confirmation:

i) E confirms H relative to background knowledge K iff $P(H|E.K) > P(H|K)$

ii) E disconfirms H relative to background knowledge K iff $P(H|E.K) < P(H|K)$

where ‘P(H)’ means ‘the probability of H’, and ‘P(H|E)’ means ‘the probability of H given E’.

Quantitative probability raising theories of confirmation

Def: c(H,E,K) = the degree to which E confirms H relative to background knowledge K

A popular account of c among PRT theorists:

Diff) $c(H,E,K) = P(H|E.K) - P(H|K)$

I will assume that PRT theorists endorse (Diff).

Basic probability theory

Axiom 1: For any sentence A, $0 \leq P(A) \leq 1$

(If A is certain than P(A)=1, while if A is certainly false then P(A)=0.)

Axiom 2: If A is necessarily true, then P(A)=1

Axiom 3: If A is incompatible with B, then P(A or B) = P(A) + P(B)

Axiom 4: $P(A.B) = P(A|B)P(B)$

Bayes's theorem

Version 1: $P(H|E)/P(H) = P(E|H)/P(E)$, provided $P(E)$ and $P(H)$ aren't 0

Version 2: $P(H|E.K)/P(H|K) = P(E|H.K)/P(E|K)$, provided $P(E|K)$ and $P(H|K)$ aren't 0

Bayesians hold that probability theory, and Bayes's theorem in particular, play an important role in understanding confirmation

Consequences of Bayes's theorem and PRT

C1) E confirms H (relative to K) iff

$P(E|H.K)/P(E.K)$

C2) E confirms H (relative to K) iff

$P(E|H.K) > P(E|{\sim}H.K)$

Good’s response to the raven paradox

Good’s claim: Whether E=Ra.Ba confirms H= $\forall x(Rx \supset Bx)$ relative to K depends on what the background knowledge K is.

Good's example

E won't confirm H if K is the knowledge that either

i)There are 100 black ravens, no non-black ravens and 1 million other birds

ii)There are 1000 black ravens, 1 white raven, and 1 million other birds

In this case $P(E|H.K) < P(E|{\sim}H.K)$. It follows from C2 that E fails to confirm $\forall x(Rx \supset Bx)$ relative to K.

Good on absolute confirmation

Good also claimed that it might be that $Ra.Ba$ fails to confirm $\forall x(Rx \supset Bx)$ absolutely.

Discuss unicorn case.

The standard Bayesian strategy to solve the ravens paradox

Show that given plausible assumptions about our background knowledge, Ra.Ba confirms $\forall x(Rx \supset Bx)$ relative to K more than ~Ra.~Ba.

This result if established can then be used to explain why (PC) seems false.

Hawthorne and Fitelson's attempt

Hawthorne and Fitelson show that, given (Ass) and (Diff), Ra.Ba confirms $\forall x(Rx \supset Bx)$ relative to K more than ~Ra.~Ba does.

(Ass) i) P(H|Ba.Ra.K), P(H|~Ba.~Ra.K), and P(~Ba.Ra|K) aren't 0 or 1; ii) P(~Ba|K) > P(Ra|K); and iii) P(H|Ra.K) ≥ P(H|~Ba.K).

PRT and SPC

SPC) If E confirms H1 (relative to K), and H1 entails H2, then E confirms H2 (relative to K)

Example: Since we have lots of evidence for general relativity, and general relativity entails nothing can travel faster than the speed of light, we have lots of evidence that nothing can travel faster than the speed of light

PRT entails SPC is false.

Example

Suppose D is a 10 sided dice that is rolled. H1 is the hypothesis that D will land on 1; H2 is the hypothesis that D will land on either 1,2,3 or 4; and E is the evidence that D lands on a odd number.

Then, according to PRT, E confirms H1, but does not confirm H2, even though H1 entails H2.

Question: Should we reject PRT or SPC?

PRT and the problem of irrelevant conjunction

Suppose H.K entails E, P(E|K)<1, and S is any hyposthesis. Then, according to PRT, E confirms H.S (relative to K)!

Argument:

$P(H.S|E.K)/P(H.S|K)=P(E|H.S.K)/P(E|K)$ (Bayes's Th)

$=1/P(E|K)$ (Since $P(E|H.S.K) = 1$)

>1 (since $P(E|K)<1$)

Response

While E confirms H.S (relative to K), it typically does so less than H.

Given (Diff), we have:

$c(H,E,K) = P(H|K)(1-P(E|K))/P(E/K)$

$c(H.S,E,K) = P(H.S|K)(1-P(E|K))/P(E/K)$

Since $P(H.S|K) \leq P(H|K)$, $c(H.S,E,K)$ will typically be less than $c(H,E,K)$.

Achinstein's Objection to PRT

Suppose A is a world-class swimmer, and let E be the proposition that A is swimming today. Then, according to PRT, E is evidence that A is going to drown today.

More generally, PRT faces the objection that we have too much evidence for all kinds of hypotheses.

Response: E is evidence that A is going to drown, but not strong evidence.

The absolute probabilistic theory of confirmation

(APT) E confirms H (relative to K) iff P(H|E.A) is sufficiently high

(APT) avoids a number of the problems that faces PRT. For example (APT) is consistent with (SPC).

Objection to (APT): If P(H|K) is sufficiently high, then E will confirm H, no matter what E is