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[14] Confirmation (ctd.)

0. Outline

1. Confirmation theory: non-Bayesian approaches (ctd.)

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- Last time:
  - The HD account of confirmation and some shortcomings
  - Hempel [1945] on desiderata for the confirmation relation.
  - His suggestion that sentences are confirmed by their instances.
- Definition:

  Where *I* is a set of names of individuals, an *I-instance* of a quantified statement is a sentence obtained by removing the quantifier (if any) and replacing the resulting free variables with members of *I*.
- For example, where *I* = {*Quentin*, *Priscilla*}:
  - Liar(*Priscilla*) = *I*-instance of (∃*x*) (Liar(*x*)),

1. Confirmation theory: non-Bayesian approaches (ctd.)

  - Distrusts(*Quentin*, *Priscilla*) = *I*-instance of (∃*x, y*) (*x* ≠ *y* & Distrusts(*x*,*y*)).
- Definition:

  The *development* of a hypothesis *H* wrt *I*, $Dev_I(H)$ is defined as:

  (i) The conjunction of the *I*-instances of *H* iff *H* is a universal claim.

  (ii) The disjunction of the *I*-instances of *H* iff *H* is an existential claim.

  (iii) *H* itself if *H* is quantifier-free.
- Intuitively: $Dev_I(H)$ is what *H* 'says' about the individuals mentioned in *I*.

1. Confirmation theory: non-Bayesian approaches (ctd.)

- For example, let $I = \{Quentin, Priscilla\}$. We have:
  - $\text{Dev}_I[(\forall x)\ (\text{Liar}(x))] = \text{Liar}(Quentin)\ \&\ \text{Liar}(Priscilla)$
  - $\text{Dev}_I[(\forall x)\ (\text{Liar}(x) \supset \text{Unpopular}(x))] = [\text{Liar}(Quentin) \supset \text{Unpopular}(Quentin)]\ \&\ [\text{Liar}(Priscilla) \supset \text{Unpopular}(Priscilla)]$
  - $\text{Dev}_I[(\exists x)\ (\text{Liar}(x))] = \text{Liar}(Quentin) \vee \text{Liar}(Priscilla)$
  - $\text{Dev}_I[\text{Liar}(Quentin)] = \text{Liar}(Quentin)$
- One last definition:

  E directly Hempel-confirms H iff $E \vDash \text{Dev}_{I(E)}(H)$, where $I(E)$ is the class of individuals mentioned in E.

  (again, strictly speaking, we should relativise to background K: E directly Hempel-confirms H wrt K iff $E, K \vDash \text{Dev}_{I(E,K)}(H)$).

1. Confirmation theory: non-Bayesian approaches (ctd.)

- Intuitively: E directly Hempel-confirms H iff it entails what H has to say about the individuals that it mentions.
- For example:

  $E = \text{Liar}(Quentin)\ \&\ \text{Liar}(Priscilla)$ directly Hempel-confirms $H = \text{Liar}(Quentin)$.

  (we have: $I(E) = \{Quentin, Priscilla\}$ and $\text{Dev}_{I(E)}[\text{Liar}(Quentin)] = \text{Liar}(Quentin)$)
- Note however that:

  $E = \text{Male}(Quentin)\ \&\ \text{Liar}(Quentin)$ does *not* directly Hempel-confirm $H = \text{Male}(Priscilla) \supset \text{Liar}(Priscilla)$.

  (we have: $I(E) = \{Quentin\}$ and $\text{Dev}_{I(E)}[\text{Male}(Priscilla) \supset \text{Liar}(Priscilla)] = \text{Male}(Priscilla) \supset \text{Liar}(Priscilla)$)

1. Confirmation theory: non-Bayesian approaches (ctd.)

- But the following general principle seems at least prima facie plausible:

  PRI (predictive inference): $F(a)\&G(a)$ confirms $F(b) \supset G(b)$

  (Note: remember what ‘confirms’ means here – i.e. ‘provides some support for’ ≠ ‘gives us sufficient grounds to endorse’)
- This suggests that confirmation cannot be equated with direct Hempel-confirmation.
- Hempel’s final account is in fact:

  Hempel confirmation: E confirms H iff there is a set of propositions S such that (i) $S \vDash H$ and (ii) E directly Hempel-confirms every member of S; E disconfirms H iff E confirms $\neg H$.

1. Confirmation theory: non-Bayesian approaches (ctd.)

- Interesting aside:
  - disconfirmation on Hempel’s account: E confirms $\neg H$.
  - disconfirmation on the HD account: $\neg E$ confirms H ($H \vDash \neg E$, which is different from $\neg H \vDash E$).
- Hempel’s final account *does* satisfy **PRI**. (see appendix)
- It also satisfies:

  NC (Nicod condition): $F(a)\ \&\ G(a)$ confirms $(\forall x)\ (F(x) \supset G(x))$.

  which Hempel thinks is also intuitively compelling. (see appendix)
- **HD confirmation** satisfies neither of these. (see appendix)

1. Confirmation theory: non-Bayesian approaches (ctd.)

- Hempel's analysis also turns out:
  - to satisfy **EC**, **SCC** and **EQC** (proofs omitted),
  - not to satisfy **CCC** (see appendix),
  - to avoid the problems of irrelevant conjunction (Tacking problem) and irrelevant disjunction. (see appendix)
- Scorecard:

	EC	SCC	EQC	CCC	PRI	NC	Irrel. Conj.	Irrel. Disj.
HD conf.	No	No	Yes	Yes	No	No	Yes	Yes
Hempel conf.	Yes	Yes	Yes	No	Yes	Yes	No	No

1. Confirmation theory: non-Bayesian approaches (ctd.)

- All good for Hempel then?
- Possibly not…

1. Confirmation theory: non-Bayesian approaches (ctd.)

- One notorious potential problem, discussed by Hempel himself (Hempel [1945:14]): the *Ravens Paradox*.

  (i) **NC** (premise)

  (ii) '*a* is neither black nor a raven' – $\neg R(a)$ & $\neg B(a)$ – confirms 'all non-black things are non-ravens' – $(\forall x)\ (\neg B(x) \supset \neg R(x))$. (from (i))

  (iii) 'All non-black things are non ravens' – $(\forall x)\ (\neg B(x) \supset \neg R(x))$ – is logically equivalent to 'all ravens are black' – $(\forall x)\ (R(x) \supset B(x))$. (logical truth)

  (iv) **ECQ** (premise)

  (v) '*a* is neither black nor a raven' confirms 'all ravens are black'. (from (ii), (iii) and (iv))

1. Confirmation theory: non-Bayesian approaches (ctd.)

- But (v) seems wrong! White shoes end up confirming that all ravens are black! (indoor ornithology?!?)
- Note: this argument is unsound on the HD approach ((i), (ii) and (v) all come out false).
- Hempel [1945] discusses a number of responses.
- I'll mention just two of these; one that he thinks fails and one that he endorses.
- *Possible response #1*: (iii) is false. 'All *F*'s are *G*' *isn't* properly translated by $(\forall x)\ (F(x) \supset G(x))$.
- Why not? Because (a) 'all *F*'s are *G*' commits us to the existence of *F*'s (it has *existential import*) and (b) this means that it is false if there are no *F*'s.

1. Confirmation theory: non-Bayesian approaches (ctd.)

- ‘All F’s are G’ translates as $(\forall x)\ ((F(x) \supset G(x)))\ \&\ \exists x\ (F(x))$
- ‘All non-G’s are non-F’s’ translates as $(\forall x)\ ((\neg G(x) \supset \neg F(x)))\ \&\ \exists x\ (\neg G(x))$
- Hence we lose the equivalence (iii) required for the paradox.
- *Counter #1*: ‘all F’s are G’ doesn’t ‘commit us to the existence of F’s’; it is synonymous with ‘nothing is both F and not G’.
- *Counter #2*:
  - Ok, ‘All F’s are G’ *does* ‘commit us to the existence of F’s’.
  - But $\exists x\ (F(x))$ isn’t part of the *content* of ‘All F’s are G’; it is merely *presupposed* by it.

1. Confirmation theory: non-Bayesian approaches (ctd.)

Support: arguably, the utterance will be taken to be *meaningless* rather than false when made in a conversational context in which F’s are taken not to exist.

- So ‘All non-black things are non ravens’ and ‘all ravens are black’ are, when meaningful, T / F in exactly the same possible worlds.
- We can then restore the paradox by appealing to a modified version of EQC, which appears to be intuitively compelling:

  EQC*: if H_1 and H_2 are, when meaningful, T / F in exactly the same possible worlds, then E confirms H_1 iff E confirms H_2.
- See Hempel [1945: 15-17] for further complaints. I won’t discuss these here.

1. Confirmation theory: non-Bayesian approaches (ctd.)

- *Possible response #2*: (v) is actually true; it just *seems* false.
- This is Hempel’s own line [1945: 18-21]:

  ‘In the seemingly paradoxical cases of confirmation, we are often not judging the relation of the given evidence E alone to the hypothesis H… Instead we tacitly introduce a comparison of H with a body of evidence which consists of E in conjunction with an additional body of evidence that we happen to have at our disposal [(here: a is a non-raven)]. If we assume this … information as given, then of course, the outcome of the experiment can add no strength to the hypothesis under consideration. But if we are careful to avoid this tacit reference to additional knowledge… the paradoxes vanish.’
- This is, to be fair, somewhat cryptic…

1. Confirmation theory: non-Bayesian approaches (ctd.)

- Fitelson [2006] interprets Hempel as claiming that we are confusing

  (v) $\neg R(a)\ \&\ \neg B(a)$ confirms $(\forall x)\ (R(x) \supset B(x))$ relative to background knowledge K such that $K \nvDash \neg R(a)$.

  which is true – with closely related (v)***** – which is *false*:

  (v)*****: $\neg R(a)\ \&\ \neg B(a)$ confirms $(\forall x)\ (R(x) \supset B(x))$ relative to background knowledge $K^* = K$ augmented by $\neg R(a)$.
- Fitelson says that, intuitively:
  - (v) is true: $\neg R(a)\ \&\ \neg B(a)$ rules out a possible counterexample to the hypothesis (namely $R(a)\ \&\ \neg B(a)$).
  - (v)* is false: the counterexample is *already* ruled out by K^*.

1. Confirmation theory: non-Bayesian approaches (ctd.)

- But as Fitelson points out that *according to Hempel's own account of confirmation*, if (v) is true then so is (v)*. (See his paper for an explanation.)
- Hempel can't make the move he seems to want to make.
- Another worry: it isn't particularly clear to me *why* (and hence *that*) we should be confusing (v) and (v)* in the first place.
- I find this all the more puzzling given that presumably, according to Hempel, we *don't* confuse:

  (ii) $\neg R(a)$ & $\neg B(a)$ confirms $(\forall x)\ (\neg B(x) \supset \neg R(x))$ relative to background knowledge K such that $K \nvDash \neg R(a)$.

1. Confirmation theory: non-Bayesian approaches (ctd.)

with

(ii)*(ii) $\neg R(a)$ & $\neg B(a)$ confirms $(\forall x)\ (\neg B(x) \supset \neg R(x))$ relative to background knowledge $K^* = K$ augmented by $\neg R(a)$.

- Indeed, the air of paradox makes its appearance at step (v), not before.

  'It seems perfectly reasonable to qualify an object as confirming… a hypothesis if it satisfies its antecedent and its consequent… Thus we shall agree that if d is neither black nor a raven, d certainly confirms… $[(\forall x)\ (\neg B(x) \supset \neg R(x))]$'

  'any red pencil,.., etc. becomes confirming evidence for the hypothesis that all ravens are black. This surprising consequence of two very adequate assumption… ' Hempel [1945:14]

1. Confirmation theory: non-Bayesian approaches (ctd.)

- So where does the alleged asymmetry come from?

Appendix: proofs

- Proof that **Hempel confirmation** satisfies **NC**. Let $E = F(a)$ & $G(a)$ and $H = (\forall x)\ (F(x) \supset G(x))$ and $S = \{H\}$:

  (i) $I(E) = \{a\}$

  (ii) $\mathrm{Dev}_{I(E)}(H) = F(a) \supset G(a)$

  (iii) $E \vDash \mathrm{Dev}_{I(E)}(H)$

  (iv) E directly confirms H and hence every member of S (H is the sole member of S).

  (v) $S \vDash H$.

  (vi) **NC**: E confirms H (from (iv), (v) and **Hempel confirmation**). ■

Appendix: proofs

- Proof that **Hempel confirmation** satisfies **PRI**. Let $E = F(a)$ & $G(a)$, $H = F(b) \supset G(b)$ and $S = \{(\forall x)(F(x) \supset G(x))\}$:

  (i) $S \vDash H$.

  (ii) E directly Hempel-confirms $(\forall x)(F(x) \supset G(x))$ (see previous proof, premise (iv)) and hence every member of S (there is only one member: $(\forall x)(F(x) \supset G(x))$).

  (iii) E confirms H (**PRI**). (from (i), (ii) and **Hempel confirmation**) ■
- Proof that **HD confirmation** doesn't satisfy **NC**: $(\forall x)(F(x) \supset G(x)) \nvDash F(a)$ & $G(a)$. ■
- Proof that **HD confirmation** doesn't satisfy **PRI**: $F(b) \supset G(b) \nvDash F(a)$ & $G(a)$. ■

Appendix: proofs

- Proof that **Hempel confirmation** doesn't satisfy **CCC**. Let $E = F(a)$, $H_1 = (\forall x)(F(x))$, $H_2 = (\forall x)(F(x))$ & $G(a)$.

  (i) $I(E) = \{a\}$ and $\mathrm{Dev}_{I(E)}(H_1) = E$.

  (ii) $E \vDash \mathrm{Dev}_{I(E)}(H_1)$,

  (iii) E directly H.-confirms (hence confirms) H_1. (from (ii))

  (iv) $H_2 \vDash H_1$

  (v) Assume, for reductio, that there exists a set of propositions S such that (a) $S \vDash H_2$ and (b) E directly Hempel-confirms every member of S.

  (vi) S includes a proposition P such that $\mathrm{Dev}_{I(E)}(P) \vDash G(a)$. (from (v)(a))

  (vii) $E \nvDash G(a)$ and hence $E \nvDash \mathrm{Dev}_{I(E)}(P)$. Contradicts (v)(b) ■

Appendix: proofs

- Proof that **Hempel confirmation** avoids the irrelevant conjunction (Tacking) problem. Let $E = F(a)$, $H_1 = (\forall x)(F(x))$ and $H_2 = (\forall x)(F(x))$ & $G(a)$. We have just seen that, on Hempel's account, E confirms H_1 but not H_2 (= conjunction of H_1 with $G(a)$). ■
- Proof that **Hempel confirmation** avoids the irrelevant disjunction problem. $E = F(a)$, $E^* = G(a)$ and $H = (\forall x)(F(x))$. E confirms H but $E \vee E^*$ doesn't. ■

  I'll leave it up to you to work out why (clue: $F(a) \vee G(a) \nvDash F(a)$).

Reference

- Hempel, C.G. [1945]: 'Studies in the logic of confirmation I', *Mind* 54(213): 1-26.
- Fitelson, B. [2006]: 'The Paradox of Confirmation', *Blackwell Philosophy Compass* 1(1): 95-113.

Next lecture: 'Confirmation (ctd.)'

- Reading:
  - Fitelson, B. [2006]: 'The Paradox of Confirmation', *Blackwell Philosophy Compass* 1(1): 95-113. (skip: section on the 'independent argument for PC' - pp 97-98, section 2.2 and section 5)
- Supplementary reading:
  - Earman, J. [1992]: *Bayes or Bust*. Camb. Mass.: MIT Press. Pp 69-73. (in L13 folder on Moodle)
  - Howson, C. & P. Urbach [1993]: *Scientific Reasoning: the Bayesian approach, 2nd Edition*. LaSalle: Open Court. pp 126-130.