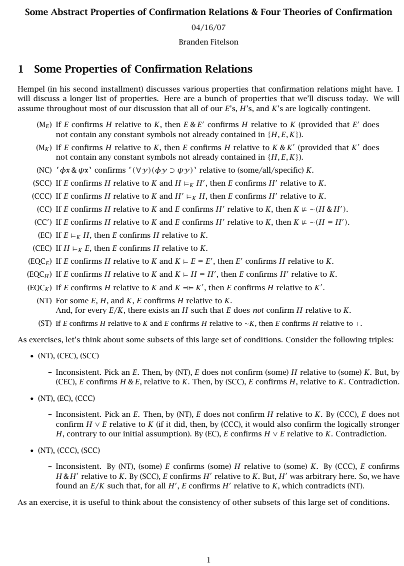
Philosophy 148 — Announcements & Such

- HW #3 grades are posted. People did very well ($\mu = 93, \sigma = 8$).
- I've posted solutions (and common mistakes) for HW #2.
- HW #4 is due **tomorrow** (by 3pm in Raul's box). I'm giving people an extra day to work on it, since we didn't get to it until yesterday.
  - I have posted a salient handout, which I'll be going over today.
- HW #5 has been posted — it's due in two weeks.
- Today's Agenda
  - Properties of Confirmation Relations, and 4 Theories of Confirmation
    * Hempelian, HD, and two Probabilistic Theories
  - Next: **The Paradoxes of Confirmation**
    * The Raven Paradox
    * The Grue Paradox
      · Then: some psychological applications of confirmation theory

Handout on Abstract Properties of $\mathfrak{c}$ & Four Theories of $\mathfrak{c}$



Some Abstract Properties of Confirmation Relations & Four Theories of Confirmation

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1 Some Properties of Confirmation Relations

Hempel (in his second installment) discusses various properties that confirmation relations might have. I will discuss a longer list of properties. Here are a bunch of properties that we'll discuss today. We will assume throughout most of our discussion that all of our E's, H's, and K's are logically contingent.

(M_E) If E confirms H relative to K, then $E \,\&\, E'$ confirms H relative to K (provided that E' does not contain any constant symbols not already contained in $\{H, E, K\}$).

(M_K) If E confirms H relative to K, then E confirms H relative to $K \,\&\, K'$ (provided that K' does not contain any constant symbols not already contained in $\{H, E, K\}$).

(NC) $\ulcorner \phi x \,\&\, \psi x \urcorner$ confirms $\ulcorner (\forall y)(\phi y \supset \psi y) \urcorner$ relative to (some/all/specific) K.

(SCC) If E confirms H relative to K and $H \vDash_K H'$, then E confirms H' relative to K.

(CCC) If E confirms H relative to K and $H' \vDash_K H$, then E confirms H' relative to K.

(CC) If E confirms H relative to K and E confirms H' relative to K, then $K \nvDash \sim(H \,\&\, H')$.

(CC′) If E confirms H relative to K and E confirms H' relative to K, then $K \nvDash \sim(H \equiv H')$.

(EC) If $E \vDash_K H$, then E confirms H relative to K.

(CEC) If $H \vDash_K E$, then E confirms H relative to K.

(EQC_E) If E confirms H relative to K and $K \vDash E \equiv E'$, then E' confirms H relative to K.

(EQC_H) If E confirms H relative to K and $K \vDash H \equiv H'$, then E confirms H' relative to K.

(EQC_K) If E confirms H relative to K and $K \Dashv\vDash K'$, then E confirms H relative to K'.

(NT) For some E, H, and K, E confirms H relative to K.
And, for every E/K, there exists an H such that E does *not* confirm H relative to K.

(ST) If E confirms H relative to K and E confirms H relative to $\sim K$, then E confirms H relative to $\top$.

As exercises, let's think about some subsets of this large set of conditions. Consider the following triples:

- (NT), (CEC), (SCC)
  - Inconsistent. Pick an E. Then, by (NT), E does not confirm (some) H relative to (some) K. But, by (CEC), E confirms $H \,\&\, E$, relative to K. Then, by (SCC), E confirms H, relative to K. Contradiction.
- (NT), (EC), (CCC)
  - Inconsistent. Pick an E. Then, by (NT), E does not confirm H relative to K. By (CCC), E does not confirm $H \vee E$ relative to K (if it did, then, by (CCC), it would also confirm the logically stronger H, contrary to our initial assumption). By (EC), E confirms $H \vee E$ relative to K. Contradiction.
- (NT), (CCC), (SCC)
  - Inconsistent. By (NT), (some) E confirms (some) H relative to (some) K. By (CCC), E confirms $H \,\&\, H'$ relative to K. By (SCC), E confirms H' relative to K. But, H' was arbitrary here. So, we have found an E/K such that, for all H', E confirms H' relative to K, which contradicts (NT).

As an exercise, it is useful to think about the consistency of other subsets of this large set of conditions.

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The Raven Paradox (aka., The Paradox of Confirmation)

- **Nicod Condition** (NC): For any object x and any properties F and G, the proposition that x has both F and G confirms the proposition that every F has G. Strong second-order condition:

  $$(\forall F)(\forall G)(\forall x)[Fx \,\&\, Gx \text{ confirms } (\forall x)(Fx \supset Gx)]$$

- **Equivalence Condition** (EC): For any propositions H_1, E, and H_2, if E confirms H_1 and H_1 is (*classically!*) logically equivalent to H_2, then E confirms H_2. Weak 2^{nd} order condition:

  $$(\forall E)(\forall H_1)(\forall H_2)[E \text{ confirms } H_1 \text{ and } H_1 \Dashv\vDash H_2 \Rightarrow E \text{ confirms } H_2]$$

- **Paradoxical Conclusion** (PC): The proposition that a is both nonblack and a nonraven confirms the proposition that every raven is black. This is a first-order condition (arbitrary a): $\sim Ba \,\&\, \sim Ra$ confirms $(\forall x)(Rx \supset Bx)$.

Proof. (1) By (NC), $\sim Ba \,\&\, \sim Ra$ confirms $(\forall x)(\sim Bx \supset \sim Rx)$.

(2) By Classical Logic, $(\forall x)(\sim Bx \supset \sim Rx) \Dashv\vDash (\forall x)(Rx \supset Bx)$.

$\therefore$ (PC) By (1), (2), (EC), $\sim Ba \,\&\, \sim Ra$ confirms $(\forall x)(Rx \supset Bx)$.

- Hempel *&* Goodman *embraced* (NC), (EC) *and* (PC). They saw **no paradox**. Hempel *explains away* the paradoxical *appearance* (Goodman does same):

  > ... 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 ... E in conjunction with ... additional ... information we ... have at our disposal.

- Hempel's Idea: E [$\sim Ra \,\&\, \sim Ba$] confirms H [$(\forall x)(Rx \supset Bx)$] *relative to* $\top$, but E doesn't confirm H relative to some (nontautological) $K \neq \top$.
- *Which* $K \neq \top$? Later, Hempel discusses $K = \sim Ra$. Intuition: if you already know that a is a nonraven, then observing its color will not tell you anything about the color of ravens. Hempel: (PC) is true, but (PC*) is false:

(PC) $\sim Ra \,\&\, \sim Ba$ confirms $(\forall x)(Rx \supset Bx)$, relative to $\top$.

(PC*) $\sim Ra \,\&\, \sim Ba$ confirms $(\forall x)(Rx \supset Bx)$, relative to $\sim Ra$.

- This is a good insight! Unfortunately, it is *logically incompatible* with the (deductive) confirmation *theories* that Hempel and Goodman accept.
- Specifically, this possibility contradicts the *K-monotonicity* property:

(M_K) E confirms H, relative to $\top \Rightarrow E$ confirms H relative to *any* K (provided that K does not mention any individuals not already mentioned in E).

- Because Hempel's theory of confirmation satisfies (M), his theory implies that (PC) entails (PC*). So, it is logically impossible for Hempel's theory to undergird his suggestion that (PC) is true, while (PC*) is false.
- This is bad news for Hempel/Goodman. Surprisingly, nobody noticed this inconsistency in the Hempel/Goodman approach to the paradox.
- As we will see shortly, *Bayesians* can better accommodate Hempel's intuitions here, since *their* theories of confirmation do *not* satisfy (M).
- Interestingly, later in this very same passage, Hempel offers an argument for premise (1) which, itself, *depends on* (M)! [See my handout.]

> If ... E consists *only* of one ... nonraven [$\sim Ra$], then E ... confirm[s] that all objects are nonravens [$(\forall x)\sim Rx$], and *a fortiori* E supports the weaker assertion that all nonblack objects are nonravens [$(\forall x)(\sim Bx \supset \sim Rx)$].

- The dependence on (M) is almost invisible here! My conjecture: (M) is a vestige of "objectual" ways of thinking about confirmation (like NC_0).

- Scheffler rejects (PC), but accepts (1). He denies (EC). He proposes:

(*) A Hempelian positive instance (E) of a $\forall$-hypothesis (H) confirms H, *unless E is also a positive instance of the contrary (H') of H.*

- Let H: $(\forall x)[Rx \to Bx]$. The contrary of H is H': $(\forall x)[Rx \to \sim Bx]$. Let E: $\sim Ra \,\&\, \sim Ba$. E is a Hempelian positive instance of H, *and* H'.
- Thus, according to Scheffler's (*), E does not confirm H after all.
- Scheffler accepts (1) [and (NC)]. E confirms H^*: $(\forall x)[\sim Bx \to \sim Rx]$ — *even according to* (*). This is because E is *not* a Hempelian positive instance of the *contrary* of H^*, $H^{*\prime}$: $(\forall x)[\sim Bx \to Rx]$.
- This leads to a violation of (EC), of course, since – according to (*) – E confirms H^*, but E does not confirm H — even though $H \mathrel{=}\!\!\mathrel{|}\!\mathrel{\models} H^*$.
- Is Scheffler's (*) true? **Exercise**: show that Scheffler's (*), and (NC) are both *false* from the point of view of PR-theory. I'll return to this when we discuss I.J. Good and (NC). This will be one of the many subtle (and non-Hempelian) aspects of of probabilistic relevance accounts of $\mathfrak{c}$.

- Quine rejects (PC) but accepts (EC). As a result, Quine rejects (1), and he argues that $\forall F$ and $\forall G$ in (NC) must be *restricted in scope*:

(NC') $(\forall F' \in N)(\forall G' \in N)(\forall x)[F'x \,\&\, G'x$ confirms $(\forall x)(F'x \supset G'x)]$

- Quine calls properties F', G' satisfying (NC') "*projectible*." And, he says that *natural kinds* are distinctively projectible in this sense.
- Many (*e.g.*, H *&* G) are inclined to follow Quine in restricting (NC) to "natural kinds" (*e.g.*, "GRUE"). But, many (*e.g.*, H *&* G) *reject* Quine's classification of $\sim R$ and $\sim B$ *in particular* as "unnatural".
- Quine thinks R and B *are* "natural" (hence "projectible"). This may seem odd, but there is a history [esp. in metaphysics] of denying the "naturalness" of "negative properties" (denials of "naturals").
- Some have followed Quine (Kim Quines the confirmation of psychological laws). Why should "non-naturalness" rule-out *confirmation*? And, what's Quine's *theory* of confirmation?
- This is another lecture! Meanwhile, let's look at Bayesianism ...

- All Bayesian approaches begin by *precisifying* (NC) [and (PC)].
- Since Bayesian confirmation is a *three-place* relation [$C(H, E \mid K)$], we'll need a *quantifier* over the *implicit K's* in (NC). Four renditions:

(NC_w) $(\exists K)(\forall F)(\forall G)(\forall x)[C((\forall x)(Fx \supset Gx), Fx \,\&\, Gx \mid K)]$

(NC_α) $(\forall F)(\forall G)(\forall x)[C((\forall x)(Fx \supset Gx), Fx \,\&\, Gx \mid K_\alpha)]$

($NC_\top$) $(\forall F)(\forall G)(\forall x)[C((\forall x)(Fx \supset Gx), Fx \,\&\, Gx \mid K_\top)]$

(NC_s) $(\forall K)(\forall F)(\forall G)(\forall x)[C((\forall x)(Fx \supset Gx), Fx \,\&\, Gx \mid K)]$

- (NC_w) is *too weak* [let K = "all instances confirm all generalizations"].
- Hempel's "explaning away" *suggests* (NC_s) should be *too strong*.
- So (NC_α) and ($NC_\top$) seem to be the salient renditions of (NC).
- *Qualitative* Bayesians seek to refute *some* rendition of (NC).
- The question for qualitative approaches is *which* (NC) to refute.
- Early qualitative Bayesian approaches took aim at (NC_s).

- I.J. Good showed that the strong (Bayesian) rendition (NC_s) of Nicod's condition is false. He gave the following counterexample:

  K: Exactly one of the following two hypotheses is true: (*H*) there are 100 black ravens, no nonblack ravens, and 1M other birds, or ($\sim H$) there are 1,000 black ravens, 1 white raven, and 1M other birds.

  E: $Ra \,\&\, Ba$ (a is randomly sampled from the universe).

  So, $H = (\forall x)(Rx \supset Bx)$, and $E = Ra \,\&\, Ba$. And, we have:

$$\Pr(E \mid H \,\&\, K) = \frac{100}{1000100} \ll \frac{1000}{1001001} = \Pr(E \mid {\sim}H \,\&\, K)$$

- So, (NC_s) is false, and *even for "natural kinds"* (*pace* Quine). Similar examples can be generated to show that (PC_s) and Scheffler's ($*_s$) are false.
- So? Hempel replies that (NC_T) *not* (NC_s) is the salient rendition. That's plausible, but as we have seen *it's incompatible with Hempel's theory*!
- Nonetheless, Good later tried to meet Hempel's (NC_T) challenge.
- He gave the following example, which is known as "Good's Baby"…

- Here's Good's attempt to meet Hempel's Challenge about (NC_T):

  … imagine an infinitely intelligent newborn baby having built-in neural circuits enabling him to deal with formal logic, English syntax, and subjective probability. He might now argue, after defining a crow in detail, that it is initially extremely unlikely that there are any crows, and therefore that it is extremely likely that all crows are black. … On the other hand, if there are crows, then there is a reasonable chance that they are a variety of colours. Therefore, if I were to discover that even a black crow exists I would consider [*H*] to be less probable than it was initially.

- Even Good wasn't so confident about this "counterexample" to (NC_T). Maher argues this is *not* a counterexample to (NC_T).
- However, Maher has recently provided a very compelling (Carnapian) counterexample to (NC_T), which is beyond our scope.
- Most modern Bayesians don't *understand* (NC_T). Unlike Carnap, they have *no theory of* "Pr_T." They've nothing to say about (NC_T). This is why they *abandon qualitative* approaches in favor of the *comparative/quantiative*.