

Overview ● Prelude ○ Hempel ○ Carnap ○ Bayesianism ○ Steps Toward an Alternative ○○○○○

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- 6 Steps Toward an Alternative Approach
 - None of the above

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- Traditionally, confirmation theory has aimed to give accounts (or explications) of three kinds of informal “inductive support” relations between propositions:
 - **Qualitative.** E inductively supports H .
 - **Comparative.** E supports H more strongly than E' supports H' .
 - **Quantitative.** E inductively supports H to degree r .
- My focus will be on the *qualitative* and *quantitative* kinds.
- I’ll discuss both logical and epistemic “support” notions.
- By *inductive logic* (IL) I mean a theory of “argument strength” which (in some sense) *generalizes* deductive logic.
- I see confirmation theory as a branch of IL (*i.e.*, “argument strength”/“inductive support” as almost interchangeable).
- Of course, it is controversial as to whether there *is* such a thing as (logical) “inductive strength” or whether “degree of inductive support” is best explicated as a *logical* concept.
- Two related themes: the role/logical status of *probability* in IL, and the relationship between IL and *epistemology*.

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- Hempel (generalizing Nicod’s earlier naïve *instantial* account) offered a *formal, logical* theory of confirmation.
- Hempel’s explication characterized confirmation as a logical relation between sentences in simple, first-order languages.
 - Qualitative.** E confirms H if $E \vdash Z$, where Z is a sentence constructed syntactically from E and H in a certain way. [Hempel also gave **quantitative** and **comparative** accounts of confirmation, but I won’t be discussing those today.]
- Hempel’s confirmation relation has various properties, *e.g.*,
 - (EC) If $E \vdash H$, then E confirms H .
 - (SCC) If E confirms H and $H \vdash H'$, then E confirms H' .
 - (M) If E confirms H , then so does $E \& K$, for any K (provided K mentions no individuals not mentioned in either E or H).
- (EC) is an uncontroversial confirmation-theoretic principle. On the other hand, (SCC) and (M) are quite controversial.
- *Hempel’s own intuitions* about inductive support ran counter to (M). In his discussion of the raven paradox, he warns us not to conflate the following two inductive support claims.

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- (PC) $\sim Ra \& \sim Ba$ supports $(\forall x)(Rx \supset Bx)$, relative to \top .
- (PC*) $\sim Ra \& \sim Ba$ supports $(\forall x)(Rx \supset Bx)$, relative to $\sim Ra$.
- But, Hempel’s *confirmation* relation is *monotonic* (M), and there is no (classical) distinction between the following two:
 - $E \& K$ entails Z , relative to (given) tautological corpus \top
 - E entails Z , relative to (given) corpus K
- Thus, Hempel’s *theory* implies that it is *impossible* for (PC) to be true while (PC*) is false — *contradicting his intuitions*.
- Hempel’s *intuitions* about inductive support seem *right* here. It seems that inductive support is *non-monotonic*.
- Also, Hempel’s discussion of (PC) and (PC*) suggests there may be *more than two relata* (K ?) involved in “support.”
- So, Hempel’s theory of confirmation seems inadequate (by his own lights, it seems “dissimilar to the explicandum”).
- Carnap (and others) gave *probabilistic* explications that are able to capture these sorts of features of “support.”

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- Carnap clarifies his explicandum (what I call “inductive support”) in various ways, including [from page 21 of LFP]:
 - **Qualitative.** (★) E gives some (positive) evidence for H .
 - In the 1st ed. of LFP, Carnap characterizes “the degree to which E confirms H ” as $c(H, E) = \Pr(H | E)$, which leads to:
 - **Quantitative.** $\Pr(H | E) = r$.
 - **Comparative.** $\Pr(H | E) > \Pr(H' | E')$.
 - **Qualitative.** $\Pr(H | E) > t$ (for some “threshold value” t).
 - Doesn’t sound like (★). More on this dissonance below.
 - Like Hempel, Carnap wanted a *logical* explication of “support” (as a relation between sentences in FOLs).
 - For Carnap, this meant that the conditional probability functions of IL must *themselves* be “logical”, which implied that its Pr-claims must be *analytic* and knowable *a priori*.
 - This leads naturally to the Carnapian project of providing a “logical explication” of conditional probability $\Pr(\cdot | \cdot)$ itself.
 - I’m skeptical about *that* project. But, this issue is orthogonal to my talk today, so I’ll leave this one to Jim and Patrick.

- I want to focus on two *other* questions that are raised by (my reading of) Carnap’s discussions about confirmation.
 - **Logicity of Pr.** Must Pr *itself* be logical if (probabilistic) confirmation claims are to be logical? Must the confirmation theorist *qua inductive-logician* tell us *which* Pr-assignment is *salient* for the assessment of the strength of an argument?
 - **Epistemology and Inductive Logic.** Carnap presumed (as do I) that there are *some* connections between deductive logic and epistemology. Are there analogous connections between confirmation theory/IL and epistemology?
 - Carnap thought the answer to the logicity of Pr question was “YES.” I disagree. Below, I will describe an alternative approach that does not require the logicity of Pr.
 - Carnap also thought the answer to the epistemology & IL question was “YES.” With this, I agree. I will try to gesture toward something positive here. First, a key distinction.
 - In LFP, Carnap gives a counterexample to Hempel’s (SCC), which presupposes a more (★)-like **qualitative** conception.

Qualitative. E confirms H iff $\Pr(H | E) > \Pr(H)$.

- This *probabilistic relevance* conception *violates* (SCC), whereas the previous Pr-threshold conception *implies* (SCC).
- The 2nd ed. of LFP includes a preface which acknowledges an “ambiguity” in LFP₁, and concedes that the (**qualitative**) relevance conception is the “more interesting” of the two.
 - **Firmness.** The degree to which E confirms _{f} H :

$$c_f(H, E) = \Pr(H | E)$$
 - **Increase in Firmness.** The degree to which E confirms _{i} H :

$$c_i(H, E) = f[\Pr(H | E), \Pr(H)]$$

f measures “the degree to which E *increases* the Pr of H .”
- The 1st ed. of LFP was mainly about firmness (except the chapter on relevance, which has the discussion of Hempel).
- The 2nd edition only adds the preface, which says very little about c_i . Specifically, no function f is rigorously defended.
- My positive proposal for confirmation theory can be seen as an attempt to extend *some* of Carnap’s ideas about c_f to c_i .

- *Many* candidate functions f satisfy the *relevance* constraint:

$$(R) f[\Pr(H | E), \Pr(H)] \geq 0 \text{ iff } \Pr(H | E) \geq \Pr(H)$$
- From an inductive-logical point of view, confirmation measures should *quantitatively generalize* entailment:

$$(D) \text{ Provided that both } E \text{ and } H \text{ are contingent claims}^1$$

$$c_i(H, E) \text{ should be maximal if } E \vdash H, \text{ and minimal if } E \vdash \sim H. \text{ [Note: } \Pr(H | E) \text{ satisfies this, but not } R.]$$
- Kemeny & Oppenheim used this consideration (and others) to argue that the best explication of $c_i(H, E)$ is given by:

$$F(H, E) = \frac{\Pr(E | H) - \Pr(E | \sim H)}{\Pr(E | H) + \Pr(E | \sim H)}$$

- F can be expressed as a function f of $\Pr(H | E)$ and $\Pr(H)$, and it satisfies R , D , and various other IL desiderata.
- One can use F to define **comparative** [$F(H, E) > F(H', E')$] and **qualitative** [$F(H, E) > 0$] confirmation _{i} concepts.

¹Here, I’m bracketing the “paradox of entailment” cases, which are tricky.

- I agree with K&O that F has the right *form* for a c_i measure, but since K&O (like Carnap) assume that Pr must *itself* be “logical”, their account of c_i is *too* Carnapian for my taste.
- I’ll return to this issue later. But, first, some remarks on Carnap’s views on connections between IL & epistemology.
- Carnap (p. 201 of LFP) endorsed the following *epistemic bridge principle* for entailment (\vdash) and *knowledge*:
If E is known by person X at time t , then H is likewise known by X at t [provided $E \vdash H$ is also known by X at t].
- For confirmation as firmness (c_f) and *credence*, Carnap endorsed the following, which he saw as *analogous*:
If E and *nothing else* is known by person X at time t , then the degree of belief justified by the knowledge of X at t is r [provided that $c_f(H, E) = r$ is also known by X at t].
- The “*and nothing else*” is required *because* c_f violates (M)! Adding more information besides E can *change* the degree of c_f . I’ll return to this “requirement of total evidence.”
- Before sketching my account, I’ll glance at *Bayesianism*...

- Most modern Bayesians don’t believe there are “logical” probabilities. I’m inclined to agree, but I’ll let Jim field that.
- As a result, most modern Bayesians simply *give up on* the traditional project of confirmation theory *as a branch of IL*.
- Instead, they set their sights on explicating an explicitly *epistemic* (and subjective) notion of “inductive support”:
Qualitative. E confirms H for agent X at time t iff E and H are positively correlated under X ’s credence function at t .
- This is *formally* similar to the inductive-logical concept c_i . But, it is *subjective* and *epistemic*, *not* objective and logical.
- This forges a connection between confirmation theory & epistemology — by making it *a branch of epistemology*.
- Moreover, like Carnap, Bayesians assume *all inductive support relations supervene on one kind of probability*.
- There is also controversy about **quantitative/comparative Bayesian c_i** . We’ve written on that (not on today’s agenda).

- *Epistemically*, it is “*all things considered*” assessments of the “goodness” of arguments *from E to H in contexts C* that count. These have *both* logical *and non-logical* components.
- Assessing (in C) the “goodness” (*soundness*) of a *deductive* argument from E to H requires the determination (in C) of:
 - Whether the argument is valid. [logical]
 - Whether E is true. [(generally) non-logical]
- How do we *generalize* this to include the *inductive* case?
- Of course, we *still* have to determine (in C) whether E is true.
- What *else*? I guess Carnap would say we need to determine (in C) “the degree to which E confirms _{i} H .” But, again, this determination must be made in accordance with [LFP, 211]:
The Requirement of Total Evidence. In the application of IL to a given knowledge situation, the total evidence available must be taken as a basis for determining the degree of confirmation.
- Let K_C express “everything we (assessor) know in C .” Then, if we know (in C) that E is true, $\text{Pr}(H | E \& K_C) = \text{Pr}(H | K_C)$.

- Therefore, if we know (in C) that E is true, we *cannot* — on a Carnapian approach — determine (in C) that E confirms _{i} H .
- This is problematic. The non-logical component of our all things considered assessment of the argument’s “goodness” has *interfered* with its (Carnapian) logical component!
- This is *not* a problem for *firmness*, since it doesn’t prevent the logical probability $\text{Pr}(H | E \& K_C) = \text{Pr}(H | K_C)$ from being greater than *a threshold value*. This is *just* a problem for c_i .
- Bayesians face a similar problem, which is called “the problem of old evidence.” Problem: *no Pr -assignment such that $\text{Pr}(E) = 1$ can reflect a correlation between E and H* .
- So, how in the world can anyone who knows (in C) that E is true determine (in C) that an inductive argument from E to H is “all things considered good” in *some* “ c_i sense”?
- *That* is one of the central challenges motivating my project. I’ll look at a concrete example of this phenomenon below.
- First, I will outline the basic ideas behind my approach.

- What we need is a way to be able to know (in C) that E is true *and at the same time* determine (in C) that — in *some* sense that is *epistemically salient* — E confirms _{i} H (in C).
- **Step 1.** Confirmation _{i} is a *three*-place relation $[F_{Pr}(H, E)]$ between E , H , and a probability assignment Pr , where Pr is a *non-logical parameter*, which gets fixed *contextually* (in C).
- Note: On this account, confirmation _{i} claims $F_{Pr}(H, E) = r$ are *logical* and *objective*, i.e., *analytic*, knowable *a priori*, and *quantitative generalizations of $E \vdash \pm H$* , without “logical” Pr .
- **Step 2.** When assessing (in C) the “all things considered goodness” of an argument from E to H (i.e., whether E *evidentially supports* H in C), one must determine (in C):
 - Whether E is true. [(generally) non-logical]
 - The (most?) *evidentially salient* probability assignment with respect to E and H in C (Pr). [(generally) non-logical]
 - Whether $F_{Pr}(H, E) > 0$. [logical component]
- Now, let’s look at a concrete “problematic context.”

- In some contexts (where E is known), there may be *some* (*prima facie*) salient assignments Pr relative to which E confirms _{i} H and *others* Pr' relative to which it does *not*.
- Here’s an example, which also illustrates the “old evidence problem” (for Bayesians and Carnap) described above:
 - Mary administers a pregnancy test. It comes out positive (E). Let (H) be the hypothesis that Mary is pregnant. John knows that E is true (I will assume *with certainty*), and that the test is highly reliable, administered properly, etc.
 - John has available to him a (*prima facie*) evidentially salient Pr relative to which E is positively correlated with H [$F_{Pr}(H, E) > 0$]: the *statistical* model of the test’s reliability.
 - John also has available to him a (*prima facie*) evidentially salient Pr' relative to which E is *not* positively correlated with H [$F_{Pr'}(H, E) \not> 0$]: his *current credence function*.
 - Similarly for a “logical” Pr , *conditioned on* J ’s *total evidence*.
- My intuition is that John’s assessment in this context should be that E provides some (positive) evidence for H .

- This suggests the following (contextual) “bridge principle”: If X knows that E is true in C and that Pr is the (most?) evidentially salient Pr -assignment wrt E and H in C , then X knows that E provides some (positive) evidence for H in C [provided that X also knows $F_{Pr}(H, E) > 0$].
- In this **qualitative** case, *any relevance measure* will do in place of F , since they all agree on such “ > 0 ” judgments.
- But, if we extend this to **comparative** relations such as “ E favors H_1 over H_2 ” [$F_{Pr}(H_1, E) > F_{Pr}(H_2, E)$], things get more interesting, since those *depend on* the *form* of our chosen F .
- Two remarks. First, I’m *not* claiming that *all* (rational) evidential judgments can be explicated in this way. It may be that some are (inherently) probabilistically inexplicable.
- Second, in some C ’s the evidentially salient Pr *does* assign $Pr(E) = 1$. E.g., if the pregnancy test is *known to always* give positive results in C . Then, $F_{Pr}(H, E)$ *shouldn’t be* > 0 .
- The \$64 question is: What *determines evidential salience*? Of course, I have no *theory* of this. But, I’ll say a few things.

- First Thing: “ Pr is (most?) *evidentially salient* with respect to E and H in C ” *is importantly distinct from* “It would (in C) be epistemically rational to adopt Pr as a *credence function*.”
- This follows straightaway from the consideration of “old evidence” cases, in which the agent’s credence function in C is *not evidentially salient* with respect to E and H in C .
- Second Thing: *Accuracy*. If we think (other things being equal) that it’s the reliability of the test that is salient, then we’ll want a model of its reliability (in C) that is *accurate*.
- Third Thing: Which Pr -assignments one takes to be salient (in which contexts) will depend on one’s *epistemological commitments* concerning *the nature of evidential relations*.
- If one is an *externalist*, then one might tend to see *objective* probability models as *more salient* than *subjective* ones.
- Final Thing: The inductive logician *qua logician* needn’t resolve such issues. Their job is to determine the *form* of the c_i -function, *not* to determine “evidential salience in C .”