Fitelson on Confirmation Theory

Patrick Maher
Department of Philosophy, University of Illinois at Urbana-Champaign

Abstract. This paper is a commentary on Branden Fitelson’s ‘Confirmation Theory as a Branch of Inductive Logic’ (2005). I correct his historical statements, rebut his attacks on Carnap, and criticize the conception of confirmation theory he proposes.

1. The first serious formal account of confirmation

Branden says that Hempel “was perhaps the first to undertake a serious formal account of confirmation” (p. 1). But Hosiasson-Lindenbaum (1940) is a serious formal account of confirmation, and her work continues a tradition that stretches back at least to Bayes. Hempel’s first formal account of confirmation was in (1943), so Hempel was not “the first to undertake a serious formal account of confirmation.”

2. Carnap’s major innovation

Branden says:

Like Hempel, Carnap explicated confirmation as an inductive-logical relation between statements. But, rather than using entailment as the main theoretical tool in his explication of confirmation, Carnap used conditional probability [1950]. This was a major innovation in many ways. (p. 1)

It was not an innovation at all, as one can see by reading Hosiasson-Lindenbaum (1940). In fact, Hempel thought it was a major innovation in his account that he did not use probability; in (1943) he wrote that inductive logic is

a field in which research so far has almost exclusively been concerned with probabilities (in the sense of “logical” theories$^1$) or degrees of confirmation$^2$ rather than the more elementary non-quantitative relation of confirmation which forms the object of this essay. (p. 123)

---

$^1$ Such at those of J. M. Keynes, J. Nicod, H. Jeffreys, B. O. Koopman, St. Mazurkiewicz, and others. [This note and the next are Hempel’s.]

$^2$ Cf. particularly Janina Hosiasson-Lindenbaum, On confirmation [1940].
3. Carnap on qualitative confirmation

Branden says that Carnap “at first” gave a probability threshold explic-ration of qualitative confirmation, and that his purpose in explicating probability was to complete this explication of qualitative confirma-tion. But in his first publication on confirmation theory, Carnap (1945) did not even mention qualitative confirmation. In his 1950 book, Carnap did discuss the explication of what he called the “classificatory concept of confirmation”, but the explication he suggested used probabilistic relevance, not a probability threshold (p. 463). In his preface to the 1962 second edition of (1950) Carnap distinguished two classifi-catory concepts, one for firmness (he called this “concept I 1”) and one for increase in firmness (he called this “concept II 1”); he noted that the threshold explication is appropriate for the former (p. xvi), but he also dismissed that concept as unimportant, saying:

Within quantitative inductive logic, we have a detailed theory of relevance . . . which contains the concept II 1 as positive relevance, defined quantitatively. As to the concept I 1, it may be useful for everyday communication, e.g., ‘it is probable that it will rain tomorrow’, but its usefulness for scientific work is hardly higher than that of the concept Warm in physics. (p. xx)

So, contrary to Branden, Carnap was not much interested in explicating concept I 1 and his quantitative inductive logic was certainly not moti-vated by the desire to explicate it. Branden is similarly misrepresenting Carnap when he refers to “Carnap’s ‘official’ conditional probability threshold explication of confirmation” (p. 3).

4. Carnap and analyticity

Branden argues for the following conclusion:

4 “At first, Carnap [1950] explicated ‘E confirms H, relative to background corpus K’ as ‘Pr(H/E&K) > r’, where Pr is a ‘suitable’ . . . conditional probability function, and r is some threshold value . . . Much of Carnap’s time working on confirmation was spent trying to find a ‘suitable’ probability function for the purpose of such an explication.” (p. 2)

4 “The question still remains as to what makes Carnapian claims of the form ‘Pr(H/E&K) > r’ analytic (analyticity is an important feature of claims in deductive logic, and Carnap thought analyticity was also essential for the claims of confirmation theory). On this score, I would argue that Carnap’s own ‘logical probability’ claims aren’t really analytic in the same way that deductive-logical claims are. In Carnap’s systems, inductive-logical claims are not even determinate until various adjustable parameters (λ, γ, etc.) are adjusted. And, since these parameters cannot all be adjusted a priori (they will depend on contingent empirical facts about the
(C) Carnap’s “logical probability” claims aren’t really analytic in the same way that deductive-logical claims are.

There is only one way for a claim to be analytic, namely, by being true in virtue of meanings. So we can simplify (C) to:

(C_1) Carnap’s “logical probability” claims aren’t analytic.

From Branden’s argument it appears that what he means by “Carnap’s ‘logical probability’ claims” is claims obtained by fixing parameters in one or another of Carnap’s systems of inductive logic. So, what he means by (C_1) is apparently:

(C_2) Carnap’s claims that are obtained by fixing parameters in one or another of his systems of inductive logic aren’t analytic.

An example of such a claim is the following.

If \( M \) is a primitive property, \( e \) says that two individuals have \( M \) and eight do not, and \( h \) says that another individual has \( M \), then \( c_2(h, e) = 0.25 \).

This claim is provable from the definition of \( c_\lambda \) and hence analytic. Thus (C_2) is demonstrably false.

Branden’s argument for (C) has this premise:

(P) The parameters in Carnap’s systems of inductive logic cannot all be adjusted a priori.

Carnap denied (P); he said that “the reasons to be given for accepting any axiom of inductive logic . . . are a priori” (1963b, p. 978) and that “it is never necessary to refer to experiences in order to judge the rationality of a \( C \)-function” (1968, p. 264). He also made detailed proposals for choosing parameter values, and they do not use empirical evidence (1980, pp. 106–119). Branden has given no reason to think Carnap was wrong about this.

\footnote{contexts in which confirmation theory is being applied, it is (to my mind) somewhat misleading to think of Carnapian ‘logical’ probability claims as analytic in the way that entailment claims are." (p. 2)}

This is from Carnap (1952, pp. 36–37), with the adjustable parameter \( \lambda \) taking the value 2.
5. Probability models in Carnap’s framework

Branden claims that “Carnap’s approach” or “framework” is limited to a class of probability models of a particular kind, whereas Branden’s approach allows arbitrary probability models.6 This claim is false. Of course, since Carnap was mortal, he himself only considered particular kinds of probability models, but he was always willing to try different kinds of models; his approach is not limited to the models he actually tried.

Branden cites an article of mine as if it supported what he says. In that article, I showed that a probability model proposed by Hesse, and another one worked out by Carnap and Kemeny, do not adequately explicate analogical reasoning involving three or more independent properties. I concluded that no probability model yet proposed is adequate for this context, but this has nothing to do with any limitation in “Carnap’s framework”; if Branden could find, among his “arbitrary probability models,” one that can handle this situation satisfactorily, then it could be used by a Carnapian too. The alleged restriction on probability models in “Carnap’s framework” does not exist.

6. Knowing E and nothing else

Branden (p. 5) says that for “obvious reasons” he has “serious doubts” about whether the following locution is intelligible:

\[(L) \text{ E and nothing else (a posteriori) is known by X at } t.\]

I will assume that (L) is intelligible if substitution instances of it are meaningful statements. Here are two arguments that (L) satisfies this condition.

1. For a given \(E, X, \text{ and } t\), it is possible to prove (L) false, either by proving that \(X\) does not know \(E\) at \(t\), or by finding something

6 “Moreover, Carnap’s approach has serious practical limitations. For instance, it seems that Carnap’s framework is unable to emulate enough probability models (via the various constructions of ‘logical probability functions’ that Carnap tried) to meet the general demands of our inductive and statistical applications of confirmation [Maher, 2001]. One way to address these problems is to treat confirmation as a four-place relation: between evidence \(E\), hypothesis \(H\), background corpus \(K\), and a probability model \(M\). By making confirmation-theoretic claims explicitly relative to probability models, we allow for the use of arbitrary probability models in inductive logic (rather that just those that can be cooked-up according to some Carnapian recipe).” (p. 2)
other than $E$ that $X$ does know at $t$. Since only meaningful statements can be false, this shows that substitution instances of (L) are meaningful statements, and hence (L) is intelligible.

2. For a given $E$, $X$, and $t$, it is possible to confirm (L). For example, we can test $X$’s knowledge of a variety of propositions, and if we find that $X$ knows $E$, and does not know any other proposition we try, then (L) will be confirmed. Since only meaningful statements can be confirmed, it follows that substitution instances of (L) are meaningful statements, and hence (L) is intelligible.

It’s a pity that Branden didn’t state his “obvious reasons” for having “serious doubts” about the intelligibility of (L).

7. Logical probability

Branden next attacks Carnap’s view that there are logical probabilities. Branden says he doesn’t “see any reason to think such things exist” and also that he has “no grasp of the concept of ‘logical’ probability” (p. 5).

In Carnap’s work there are three different “logical probability” concepts that need to be distinguished. They are the following.

7.1. Logical probability in Carnap’s sense

Let an elementary probability sentence be a sentence that says the probability of a specific hypothesis given specific evidence has a particular value (either a numeric value or something vaguer). Let a logically determinate sentence be a sentence whose truth value is determined by meanings alone, independently of empirical facts. Carnap calls a probability concept “logical” if all elementary probability sentences for it are logically determinate (1950, pp. 20, 30). This conception of logical probability is perfectly meaningful.

Branden says that “making sense of this notion [of logical probability] seems (semantically) to require some sort of privileged measure”, but that is not true of logical probability in Carnap’s sense. For example, Carnap’s (1952) continuum of inductive methods contains an infinite set of measures $c_{\lambda}$, one for each positive real number $\lambda$, but every $c_{\lambda}$ is a logical probability in Carnap’s sense. This observation also shows that logical probabilities in Carnap’s sense exist.
7.2. Inductive Probability

Carnap’s aim in inductive logic was to explicate a pretheoretic concept that he called “degree of confirmation,” “probability\textsubscript{1},” and “inductive probability;” I will use the latter term.\(^7\) This concept is one sense that the word “probability” has in ordinary language (the other sense being physical probability). We are using this concept when we talk about how probable a scientific theory is given some observational evidence, for example, whether our evidence makes it probable that existing species have arisen by a process of natural selection. For an extensive discussion of this concept, see (Maher, 2006a).

Inductive probability is “privileged” in the sense that it is unique and we care about it, but nothing else that Branden says applies to inductive probability. It is not a “measure” in any strict sense, since it often lacks numeric values. It also is not “based on . . . measures constructed for simple logical languages”, since it is an unconstructed concept of natural language.

The concept of inductive probability is a meaning of a word in ordinary language, which people use every day, so there cannot be any serious doubt that it is meaningful. People learn this concept the way the meanings of most words are learned, from examples in which it applies and ones in which it does not apply. It can be further clarified by distinguishing it from other concepts with which it is sometimes confused; for example, it is not the same as degree of belief, and there are senses of “rational” in which inductive probability is not the same as rational degree of belief (Maher, 2006a, sec. 2).

Since inductive probability is not subjective probability, the truth of an elementary inductive probability sentence does not depend on the speaker’s psychological state. It also does not depend on facts about the world, as physical probabilities do. For example, let \(E\) and \(H\) be as follows:

\(E\): A coin is either two-headed or two-tailed, is about to be tossed, and will land either heads or tails.

\(H\): The coin will land heads.

If \(E\) is true then the physical probability of \(H\) is either 0 or 1, depending on what the facts about the coin are; but the inductive probability of \(H\) given \(E\), which is plausibly 1/2, is what it is regardless of the facts about the coin, or the truth value of \(E\), or any other contingent facts. Thus the concept of inductive probability is logical in Carnap’s sense.

\(^{7}\) Carnap used the term “inductive probability” in (1950, p. 2), (1963a, p. 72), (1966, p. 22), (1971, p. 35), and elsewhere.
That inductive probabilities exist may be argued as follows (Maher, 2006a, sec. 3.1): There are elementary sentences of inductive probability that competent users of ordinary language overwhelmingly agree are true. Since these sentences are logically determinate, the people who endorse these sentences would be misusing a concept of ordinary language if those sentences were false. Competent users of ordinary language usually do not misuse the concepts of their language. Therefore, we have good reason to think that the sentences of inductive probability that they accept are true, and hence that inductive probabilities exist.

Branden says:

Carnap tried various kinds of “logical” measures, but he ended up being unhappy with all of them (owing to one kind of epistemic worry or another). (p. 5)

These “epistemic worries” were really disagreements between inductive probability and Carnap’s proposed explicata; there can only be such disagreements if inductive probabilities exist.

7.3. EXPICATA FOR INDUCTIVE PROBABILITY

The “various kinds of measures, constructed for simple logical languages” that Carnap proposed at different times were proposed as explicata for inductive probability. They are intended to be “privileged” in the sense that they are similar to inductive probability and have the other characteristics of a good explicatum. They need not, however, be uniquely optimal; there can be different good explicata for a concept.

Since Carnap’s explicata for inductive probability are given explicit definitions, they are demonstrably meaningful; we know which statements about them are true and which are false. They also demonstrably exist. And they are logical in Carnap’s sense, since the truth value of elementary probability sentences for them is determined by their definition.

7.4. SUMMARY

I have pointed out three different “logical probability” concepts involved in Carnap’s work. All three are meaningful and exist. Branden’s difficulties with “the concept of ‘logical probability’” result from his failure to distinguish these concepts.

8. The pregnancy test

Branden claims his pregnancy test example
exposes a kind of “support” that is crying out for probabilistic explication, but for which no Bayesian or Carnapian explication is forthcoming. (pp. 6–7)

But what is the “kind” of support “this example exposes”? As Branden observed early in his paper:

We now recognize that the “support” relation that confirmation theory aims to explicate is really (at least) a three-place relation: between evidence $E$, hypothesis $H$, and a background corpus $K$. (p. 1)

So Jane’s judgment that $E$ supports $H$ must be relative to some background corpus. Let $R$ be that the test is reliable in the sense Branden specifies. It is intuitive that $E$ supports $H$ relative to a background corpus consisting of just $R$. It is completely unintuitive to say that $E$ supports $H$ relative to any corpus that includes $\sim H$. So when Branden says “there is a perfectly good sense in which Jane would . . . be rational to judge that $E$ supports $H$”, he is right, but the sense is simply that $E$ supports $H$ relative to $R$ alone.

This “sense” of “support” is not some mysterious new sense; it is just the standard concept of support with specific background evidence. And there is no special problem about giving a Carnapian explication of it; if $c$ is an explicatum for inductive probability, then Jane’s judgment will be explicated as $c(H, E.R) > c(H, R)$.

### 9. Branden’s explicatum

Branden uses the words “support” and “confirmation” for different concepts. This is made clear in various places, for example, when he says he will

identify a plausible epistemic bridge principle that connects a logical notion of confirmation (in a probabilistic relevance sense) with some epistemically salient notion of “support.” (p. 7)

I think he is using “support” to refer to the pretheoretic concept that is his explicandum and is using “confirmation” to refer to the formally defined concept that is his explicatum. But then he misspoke when he said:

I propose that we explicate ‘$E$ confirms $H$, relative to background corpus $K$, in $\mathcal{M}$’ as ‘$F_\mathcal{M}(H, E|K) > 0$’. (p. 7)

---

8 Passages that indicate this include the following: “Confirmation theory began as an attempt to formally explicate an informal notion of ‘support’ between statements” (p. 1). “Let’s return to the intuitive relation of ‘support’ that Hempel was on about all those years ago” (p. 6). “I think this example exposes a kind of ‘support’ that is crying out for probabilistic explication” (pp. 6–7).
What is explicated is an explicandum, and “confirmation” is Branden’s explicatum, not his explicandum. So I think that here, instead of “explicate,” Branden meant “define.”

Thus Branden’s explicatum is really:

\[(T) \quad F_M(H, E|K) > 0.\]

The expression
\[
E \text{ confirms } H, \text{ relative to background corpus } K, \text{ in } M.
\]
is for Branden just another way of expressing (T). From Branden’s definition of \(F\) (p. 3), it is easy to see that (T) is also equivalent to:

\[
Pr_M(E|H.K) > Pr_M(E|\sim H.K).
\]

I think the last of these is the most perspicuous formulation, but Branden usually uses (T).

10. Branden’s explicandum

Branden has indicated that his explicandum is a pretheoretic concept of support so, since his explicatum is a four-place relation, and since he has earlier hinted that the relation of support might also be a four-place relation (p. 1, quoted in Section 8), we might guess that his explicandum would be:

\[(N_1) \quad E \text{ supports } H \text{ relative to background corpus } K, \text{ in } M.\]

But people do not ordinarily talk about support “in \(M\),” and if someone did talk that way, the only thing I can suppose they would mean is (T). Explication makes no sense if the explicandum is not meaningful independently of the explicatum, so (N_1) is not a sensible explicandum.

This objection can be avoided by taking Branden’s explicandum to be:

\[(N_2) \quad E \text{ supports } H \text{ relative to background corpus } K.\]

The trouble with this is that it does not mention the parameter \(M\) that appears in (T), so there is a mismatch between explicandum and explicatum. We can address this mismatch by restricting (N_2) to particular corpora \(K\) that involve \(M\). In Branden’s “bridge principle” (p. 7), and also in his pregnancy test example, the subject is assumed to have background knowledge \(K\) satisfying this condition:

\[(C_1) \quad K \text{ includes}:\]
• The truth value of $E$ is determined by a process $S$, under “normal conditions.”

• $F_M(H,E) > 0$.

• $M$ is a correct model of (the statistical behavior of) $S$ under “normal conditions.”

So perhaps Branden’s explicandum is those instances of $(N_2)$ for which $(C_1)$ holds.

However, there are cases in which $(N_2)$ is true and $(C_1)$ holds but $(T)$ is false because $F_M(H,E|K)$ is undefined. For example, let $H$ and $E$ be as in Branden’s pregnancy test example, and let $K'$ consist of the items specified in $(C_1)$ together with the information that Jane’s not-entirely-trustworthy partner has examined the test result and reported that it is negative. There is, I think, no physical probability for $E$ given $H.K'$, so $Pr_M(E|H.K')$ is not defined, hence neither is $F_M(H,E|K')$, so $(T)$ is false in this example. Still, $(N_2)$ is true and $(C_1)$ holds, so Branden’s explicatum disagrees with his explicandum in this example (and in the many other similar examples that could be concocted).

I will now consider how Branden could avoid this kind of counterexample. In his bridge principle, Branden has a footnote attached to his analog of the second clause of $(C_1)$, saying: “For simplicity, I suppress the ‘background corpus $K$’, and treat $F_M$ as a 3-place function” (p. 7, n. 9). This suggests that the second clause of $(C_1)$ is really meant to be $F_M(H,E|K) > 0$. But to require that $K$ include $F_M(H,E|K) > 0$ introduces a worrisome self-reference into $K$. I think that for present purposes, where we are not trying to construct an epistemic bridge principle but merely fix the scope of the explicandum, it would be sufficient to require that $F_M(H,E|K)$ be defined; that is enough to exclude counterexamples like the one I gave in the preceding paragraph. So the best replacement for $(C_1)$ that I can see is:

$$(C_2) \quad \begin{array}{l}
\bullet \text{K includes that } E \text{ is an outcome of a process } S \text{ under “normal conditions” and that } M \text{ is a correct model of (the statistical behavior of) } S \text{ under “normal conditions.”} \\
\bullet F_M(H,E|K) \text{ is defined.}
\end{array}$$

So, the most charitable interpretation of Branden’s explicandum that I can come up with is that it is those instances of $(N_2)$ in which $(C_2)$ holds.

---

9 I have phrased this so it does not imply that $E$ is in $K$. 
This interpretation is to a large degree my construction. But Branden has not given any clear and sensible account of what his explicandum is, and I can’t evaluate his theory without knowing what his explicandum is, so I have been forced to be creative here.

11. Triviality

Now let’s return to Jane and her pregnancy test. Let $K$ be Jane’s background knowledge and suppose it includes $\sim H$. In that case, $H$ and $K$ are inconsistent, and according to Branden (p. 4, n. 2) that means $\text{Pr}_M(E|H,K)$ is undefined, and hence $F_M(H,E|K)$ is undefined. Thus Branden’s explicandum does not apply to this example. The very example that Branden produced to motivate his conception of confirmation theory is one to which it does not apply!

More generally, the background knowledge that people have in real life practically never satisfies (C₂). Often the evidence is not the outcome of a process $S$ for which physical probabilities exist. When the physical probabilities do exist, we usually do not know what they are; much scientific research is actually an endeavor to determine these physical probabilities. Thus the first clause of (C₂) is rarely satisfied by the background knowledge people actually have. Furthermore, even if that clause were satisfied, we often have other knowledge such that, if $K$ is our total background knowledge, $F_M(H,E|K)$ is not defined; this is what happened in the pregnancy test example and also in my counterexample to (C₁). Thus if I have Branden’s explicandum right, his conception of confirmation theory restricts the theory so severely that it practically never applies.

Furthermore, in the cases where (C₂) is satisfied, it is uncontroversial that logical probabilities and rational subjective probabilities agree with the physical probabilities $\text{Pr}_M$; thus both Carnapians and subjective Bayesians can easily handle the only kind of case to which Branden’s confirmation theory applies. Thus Branden has not only restricted confirmation theory to a very narrow range of cases, but furthermore the cases that he has restricted it to are the easy cases that nobody has any difficulty with. Thus Branden’s conception of confirmation theory trivializes the subject.

12. Bridge principles

In Branden’s paper, there is much reference to “epistemic bridge principles”; apparently Branden believes that a confirmation theory must contain such a principle. I don’t.
Confirmation theory is an attempt to explicate a pretheoretic concept, what Branden calls “support” and most people call “confirmation.” We explicate a concept by finding another concept (the explication) that is precise, similar enough to the explicandum to be useable in place of the explicandum for the purposes we have in view, fruitful, and simple (Carnap, 1950, p. 7). Nothing here requires a “bridge principle” of any kind.

13. Conclusion

Branden’s history of confirmation theory, his criticisms of Carnap, and his own alternative conception of confirmation theory, are all deeply flawed. For a better conception of confirmation theory, see (Maher, 2005), and for a better conception of inductive logic, see (Maher, 2006b).

References