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Bayesian pseudo-confirmation, use-novelty, and genuine confirmation

Gerhard Schurz

Heinrich-Heine-University of Duesseldorf, Department of Philosophy, Universitaetsstrasse 1, Geb. 23.21, 40204 Duesseldorf, Germany

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ABSTRACT

According to the comparative Bayesian concept of confirmation, rationalized versions of creationism come out as empirically confirmed. From a scientific viewpoint, however, they are pseudo-explanations because with their help all kinds of experiences are explainable in an *ex-post* fashion, by way of ad-hoc fitting of an empirically empty theoretical framework to the given evidence. An alternative concept of confirmation that attempts to capture this intuition is the use novelty (UN) criterion of confirmation. Serious objections have been raised against this criterion. In this paper I suggest solutions to these objections. Based on them, I develop an account of *genuine* confirmation that unifies the UN-criterion with a refined probabilistic confirmation concept that is explicated in terms of the confirmation of evidence-transcending content parts of the hypothesis.

1. The initial problem: Bayesian 'confirmation' of irrational beliefs

Neo-creationists have applied Bayesian confirmation methods to confirm refined versions of *creationism*. With help of Bayes' formula Unwin (2003) has calculated the posterior probability of God's existence as 67%. Swinburne (1979, chap. 13) is more cautious; his major argument is based in the claim that certain experiences *increase* the probability of God's existence. Can something like this count as a serious confirmation? To answer this question we first distinguish two kinds of creationisms:

Empirically criticizable creationisms are testable by means of their empirical consequences. Literal interpretations of the genesis and other holy scriptures make several empirically testable assertions (e.g. concerning the age of the earth), but most of them have been scientifically refuted. These empirically criticizable creationisms do not constitute a problem for Bayesian (and other) confirmation accounts.

We are dealing here with *empirically uncriticizable* creationisms. These are *rationalized* versions of creationism that carefully avoid any conflict with established empirical knowledge, but nevertheless entail empirical consequences. This is possible by enriching the empirically vacuous creator-hypothesis ex-post with already established empirical facts as follows:

(1) *Hypothesis of rationalized creationism:* God has created our world with the following properties (E): ... (here follows a list of many scientifically established facts).

History of rationalized theology is full of "explanations" of this sort. Contemporary neo-creationists announce, for example, that they can ex-post explain the fine-tuning of the constants of nature (Dembski, 2003) or the intricate complexity of the human eye (Behe, 2003). The most "advanced" rationalized creationists have stipulated a God that creates the living beings by the mechanism of Darwinian evolution (Isaak, 2002). Intuitively we feel that something is wrong with this kind of ex-post "explanations," but what could it be?

Our initial problem consists in the fact that even from the viewpoint of one of the most influential confirmation theories in philosophy of science, namely Bayesian confirmation theory, creationist pseudo-explanations come out as being confirmed by the evidence which they "explain." To see why, we need some formal notions: in what follows H (or H_1, H_i...) stand for hypotheses, E (E_i,...) for

E-mail address: schurz@phil.uni-duesseldorf.de

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empirical evidences, $P(H)$ for H's prior probability, $P(H|E)$ for H's posterior probability given E, and $P(E|H)$ for E's probability given H—the so-called likelihood. Sometimes, but not always, this likelihood is objectively determined. For example, the likelihood of E = "throwing heads", given H = "throwing a regular coin" is 1/2 by the laws of statistics. In particular, the likelihood of E given a hypothesis H which entails (logically implies) E is always 1. A proposition A is called *epistemically contingent* iff $0 < P(A) < 1$, i.e. its probability is different from 0 and 1.

There exist two different (basic) Bayesian confirmation concepts: H is *absolutely* confirmed by E iff $P(H|E)$ is sufficiently high (at least higher than 1/2), where this conditional probability is computed by the famous Bayes' formula as follows:

(2) *Bayes' formula:* $P(H|E) = P(E|H) \cdot P(H)/P(E)$,

where $P(E) = \sum_{1 \leq i \leq n} P(E|H_i) \cdot P(H_i)$.

Thereby, $\{H_1, \ldots, H_n\}$ is a partition of alternative hypotheses containing H (i.e., $H = H_k$ for some k, $1 \leqslant k \leqslant n$).[1] It is widely accepted that the choice of the prior probabilities, $P(H_i)$, and the choice of the partition of alternative hypotheses are the most problematic parts of Bayesian confirmation theory, because degrees of belief which are "prior to experience" are subjective.

The second Bayesian confirmation concept is the following:

(3) *Definition of comparative Bayesian confirmation:* H is confirmed by E (in the comparative sense) iff E increases H's probability, i.e. iff $P(H|E) > P(H)$.

The comparative confirmation concept has the advantage that it is independent of the (subjective) choice of H's prior probability, but depends only on the likelihoods. For the Bayes' formula in (2) entails that if H and E are epistemically contingent, then $P(H|E) > P(H)$ holds iff $P(E|H) > P(E)$. Moreover, $P(E|H) > P(E)$ is provably equivalent with $P(E|H) > P(E|\neg H)$.[2] On this reason, most contemporary Bayesians prefer the comparative concept of confirmation, or quantitative refinements of it.[3] With "Bayesian confirmation" we mean in this paper always this comparative concept.

Unfortunately, the comparative confirmation concept has the following awkward consequence which allows all sorts of Bayesian pseudo-confirmations:

(4) *Consequence of (3)—Bayesian pseudo-confirmation:* Every epistemically contingent hypothesis H which entails an epistemically contingent evidence E is confirmed by E according to (3).

(4) follows from (3), because if H entails E, then $P(E|H) = 1$, whence $P(H|E) = P(H)/P(E) > P(H)$, because $P(E) < 1$. This consequence can be exploited by proponents of all sorts of rational speculation. Every epistemically contingent hypothesis, be it as weird as you want, is confirmed by a given evidence if it only entails this evidence (cf. Schurz, 2008, Section 7.1). For example, the fact that grass is green confirms the hypothesis that God wanted this and had brought it about that grass is green. The same fact also confirms the hypothesis that not God but a flying spaghetti monster[4] has brought it about that grass is green, and so on until the scientific explanation of the green colour of grass in terms of chlorophyll. All these explanatory hypotheses H_i get comparatively confirmed by E. If they have a different conditional degree of belief $P(H_i|E)$, then (according to the Bayes' formula (2)) this can only be because they have different prior probabilities, since the likelihood $P(E|H_i)$ is 1 for all of them, and the value of $P(E)$ is independent from the chosen hypothesis.

Bayesian philosophers of science are aware of this problematic result. They offer different replies. One reply says that scientific hypotheses have a significantly higher prior probability than religious hypotheses (cf. Howson & Urbach, 1996, 141f; Sober, 1993, 31f). This reply is questionable, because prior probabilities are subjective; and it seems to be inappropriate to ground the distinction between scientific hypotheses and speculations on subjective prejudices. From the religious point of view creationism has a higher prior probability than evolution theory.[5] Another reply (pointed out by an anonymous referee) argues that the Bayesian framework tells us something informative only *relative* to a specified prior probability distribution over a space of alternative hypotheses, where this prior distribution must come from "elsewhere" but not from the Bayesian framework. This reply maintains, in other words, that the Bayesian framework is much weaker than it may seem. I agree with this. My criticism of Bayesian pseudo-confirmation in (4) is not directed against the Bayesian framework as a whole, but only against the comparative Bayesian confirmation concept (3), which does indeed tell us something about confirmation *without* reference to a prior probability distribution over a hypotheses space. Note also that result (4) does not refute the moderate claim that the Bayesian confirmation criterion is at least a *necessary* condition for genuine conformation; what it shows is only that the Bayesian criterion is *not sufficient* for confirmation.

Let me add two points: *First*, the inadequacy result (4) does not only undermine Bayesian confirmation, but also the (naive) hypothetico-deductive (HD) confirmation criterion. According to the latter, E confirms H if H entails E, provided H is not a contradiction and E not a tautology. Observe that (naive) HD-confirmation follows from (naive) Bayesian confirmation as a special case. *Second*, pseudo-confirmation is also a problem when H does not entail E, but makes E only highly probable. For if H is epistemically contingent, then E confirms H as soon as $P(E|H) > P(E)$. So assuming the prior probability of the fact that grass is green is not too high, then this fact does also confirm probabilistic weakenings of the above pseudo-explanations, such as "a spaghetti-monster whose wishes become reality in 99% of all cases has wanted the grass to be green" (etc.).

Independent from the problem of choosing prior probabilities, it seems that rationalized creationism is not just "a little bit less" confirmed than evolution theory. Rather, it is *not confirmed at all* by way of these ex-post explanations, like any other of the absurd hypotheses mentioned above. In conclusion, the Bayesian confirmation criterion is too weak to demarcate genuine confirmation from pseudo-confirmation.

[1] That $\{H_1, \cdots, H_n\}$ is a *partition* means that the H_i are pairwise incompatible and jointly exhaustive, relative to a (possibly empty) background knowledge on which P is conditionalized.

[2] This follows from $P(E) = P(E|H) \cdot P(H) + P(E|\neg H) \cdot P(\neg H)$.

[3] Two important quantitative refinements of comparative confirmation are the *difference* measure $P(H|E) - P(H)$ and the *ratio* measure $P(H|E)/P(H)$.

[4] The *church of the flying spaghetti-monster* is a movement initiated by a physicist who intended to turn creationist teaching requirements into absurdity. See *www.venganza.org/aboutr/open-letter*.

[5] For example, when Unwin (2003) computed the posterior probability of God's existence to be 67%, he (naively) assumed a 1:1 prior probability of Gods existence. This motivated the editor of the magazine *Skeptic*, Michael Shermer, to set up a counter-computation with different priors that resulted in a posterior probability of God's existence of merely 2%.