Confirmation 3
Explication; Verified Consequences

(pp. 8–11)

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Explication of inductive probability

Inductive probability is a vague concept.

> E.g., the inductive probability that a scientific theory is true, given the evidence, does not have a precise numeric value.

Since it is difficult to reason accurately with vague concepts, it is often helpful to find a more precise concept that can be used in place of the vague concept.

Definitions

- Explication: Finding a precise concept that can be used in place of a given vague concept.
- Explicandum: The given vague concept.
- Explicatum: The precise concept that is proposed to be used in place of the vague concept.

Plurals: "Explications," "explicanda," "explicata."

Criteria for a good explicatum

- **Similarity to the explicandum.** The explicatum must agree with the explicandum sufficiently that it can be used in place of the explicandum, at least for certain purposes.
  - This does not prevent the explicatum and explicandum differing in important ways. They must be different, since one is vague and the other is precise.
- **Fruitfulness.** The explicatum should allow general laws to be formulated.
- **Simplicity.** The explicatum should not be unnecessarily complex.

- Explications are not right or wrong but they can be better or worse according to these criteria.
- There can be different good explicata.

How to explicate inductive probability

For selected sentences E and H, choose a number as the explicatum for the inductive probability of H given E. We'll call this number $p(H|E)$.

Examples

- If E is that a coin has either two heads or two tails and is about to be tossed, and H is that it lands heads, we could specify that $p(H|E) = 1/2$.
- Suppose E is evidence that strongly suggests a defendant is guilty, and H is that the defendant is guilty. The inductive probability of H given E is high but has no precise value; we could specify that $p(H|E) = 0.9$, say.

Mathematical laws of probability

We require the numbers $p(H|E)$ to satisfy the mathematical laws of probability. For example:

- $0 \leq p(H|E) \leq 1$.
- If E logically implies H, then $p(H|E) = 1$.
- $p(H|E) + p(\sim H|E) = 1$. ($\sim H$ is the negation of H)

Justification:

- Quantitative inductive probabilities, where they exist, satisfy these laws.
- So, since an explicatum should be similar to the explicandum, we want the numbers $p(H|E)$ to satisfy these laws when the corresponding inductive probabilities have numerical values.
- The desideratum of fruitfulness justifies requiring that the same laws also hold when the corresponding inductive probabilities lack numerical values.

By choosing the values of $p(H|E)$ for various H and E, we have defined a function p that's an explicatum for inductive probability.

p is logical in Carnap's sense

- Elementary probability sentences for p have the form "$p(H|E) = r$," where r is a number.
- The value of $p(H|E)$ is fixed by definition.
- Therefore, elementary probability sentences for p are logically determinate.
- Therefore, p is logical in Carnap's sense.

So two kinds of probability are logical in Carnap's sense:

- Inductive probability
- Functions proposed as explicata for inductive probability

Logical probabilities of the second kind demonstrably exist!

Explication of incremental confirmation

Background evidence

- The judgment that E confirms H is often made on the assumption that some other information D is given; D is called *background evidence*.
- So a fully explicit judgment of incremental confirmation has the form "E incrementally confirms H given D."

Example

- A coin landing heads on the first toss incrementally confirms that the coin has heads on both sides, given that both sides of the coin are the same.
- There is no incremental confirmation if the background evidence is that the coin is normal with heads on one side only.

The explicatum C

- "E incrementally confirms H given D" means that the inductive probability of H given E and D is greater than the inductive probability of H given D alone.
- Our explicatum for that is $p(H|E.D) > p(H|D)$.
  ($E.D$ means E and D)
- Define $C(H, E, D)$ to mean $p(H|E.D) > p(H|D)$.
- So $C(H, E, D)$ is our explicatum for "E incrementally confirms H given D."

Verified consequences

Intuition

If H logically implies E given background evidence D, we usually suppose that observation of E would incrementally confirm H given D.

Example

Einstein's general theory of relativity, together with other known facts, implies that the orbit of Mercury precesses at a certain rate; hence, the fact that it does precess at this rate incrementally confirms Einstein's theory, given the other known facts.

Corresponding explicatum statement

If $H.D$ implies E then $C(H, E, D)$.

If p satisfies the laws of probability, this can be proved true provided $0 < p(H|D) < 1$ and $p(E|D) < 1$.

Where to find proofs

- In this article (and this course) proofs are omitted.
- Detailed proofs are given in my article:

"Probability Captures the Logic of Scientific Confirmation"
in
Contemporary Debates in the Philosophy of Science
ed. Christopher Hitchcock, Blackwell 2004, 69–93.

Intuitive reasons why the provisos are needed

1. $p(H|D) < 1$: Otherwise, H is certainly true given D alone, so no evidence can incrementally confirm H given D.
2. $0 < p(H|D)$: Otherwise, H is certainly false given D alone, and the observation that one of H's consequences is true needn't alter this situation.
3. $p(E|D) < 1$: Otherwise, E is already certain given D, so adding E to D only tells us something we already knew.

The value of explication

- Although the provisos make sense when one things about them, the need for them is likely to be overlooked when one thinks only in terms of the vague explicanda.
- Thus explication gives a deeper and more accurate understanding of the explicandum.

Questions

1. Define "explication," "explicandum," and "explicatum."
2. What is Maher's justification for requiring p to satisfy the mathematical laws of probability?
3. Is the function p logical in Carnap's sense? Why, or why not?
4. How is $C(H, E, D)$ defined and what purpose is it intended to serve?
5. It is usually supposed that if H logically implies E given background evidence D, then observation of E incrementally confirms H given D. What is the corresponding statement about C? What provisos must be added to make this true?
6. Let $D =$ Lime is an alkali; $E =$ Lime turns syrup of violets green; $H =$ All alkalis turn syrup of violets green. Does E incrementally confirm H given D? Justify your answer.