



The Problem of Induction

Introduction

A lot of our reasoning falls into one or other of two categories: deductive or inductive. Here's an example of deductive reasoning:

- (1) All humans are mortal.
 - (2) Plato is human.
- Therefore, Plato is mortal.

(1), (2) and the conclusion ("Plato is mortal") form a deductive argument. The statements (1) and (2) are called the premises and the statement "Plato is mortal" is called the conclusion. The above argument is an example of a *valid* argument. The main feature of deductively valid arguments is that they are *demonstrative*. This means that if the premises are true then the conclusion *must* be true. It is logically inconsistent for the premises to be true and the conclusion to be false. That's all I'm going to say about deduction. I want to discuss induction. Here's an example of an inductive argument:

- 1. Zebra (1) has stripes.
- 2. Zebra (2) has stripes.
- 3. Zebra (3) has stripes.
- ⋮
- ⋮
- ⋮
- 1000. Zebra (1000) has stripes

Therefore, all zebras have stripes.

Inductive arguments typically move from particular to general - from a limited number of past observations of zebras we derive a general conclusion about all zebras. The main point, though, is that in contrast to deductive arguments, inductive arguments are *non-demonstrative*. That means that it is possible, even for a very strong inductive argument, for the premises to be true and the conclusion to be false. The 1001st zebra may not have stripes.

Much of our reasoning is inductive:

Watch out for funnel webs; they're always around at this time of year.
I'm bound to get a cold this winter; I get colds every winter.

Indeed, a lot of our reasoning whether about sunrises, weather patterns, elections, human behaviour, food and so on is based on past experience. We form beliefs and expectations on the basis of past observation and experience. That is to say, we reason inductively.

The great Scottish philosopher David Hume (1711 – 1776) was sceptical about induction and raised what has become known as the Problem of Induction (Hume didn't actually use the word "induction").

The Problem of Induction

Hume asked the question: What is the rational basis of inductive reasoning? Another way of putting this is: How can induction be rationally justified? In terms of our earlier example, the problem is this: Even if a suitably large number of zebras have been observed to have stripes, what reason have we for concluding that unobserved zebras have stripes? Why, for example, should we believe that the 1001st zebra will have stripes?

Thus, the problem of induction amounts to being able to show why it is that past experience provides a good reason for drawing general conclusions about the future. Drawing general conclusions based on a limited number of observations is risky. What if only zebras living in a certain region have stripes? Or perhaps only have them on a certain day of the week. Notice that there is no similar problem for deduction. If it's true that all humans are mortal and that Plato is human, then Plato *must* be mortal. To deny that Plato is mortal would be logically inconsistent with the truth of the two premises. The problem of induction arises just because there is no logical inconsistency in saying that 1000 (or 1,000,000) zebras have stripes but that the 1001st (or the 1,000,0001st) will be stripeless.

Hume's argument

Hume explains induction in the following way:

"Those instances of which we have had no experience resemble those of which we have had experience, and that the course of nature continues always uniformly the same".

So, the inductive principle can be expressed by saying that if, under similar conditions, a suitably large number of observed A's are without exception all B, then it is rational to infer that all A's are B's. On the basis of this principle we make inferences about unobserved black ravens, striped zebras, about metal expanding when heated, trees losing leaves in Autumn, the sun rising every day and so on.

Hume rejects this principle of induction. Here's the argument. Hume begins by asking what justifies the conclusion that all A's are B's. The justification can't be deductive, he says, because there is no contradiction in asserting that all observed A's are B's but that some unobserved A is not B. Thus, for example, no matter how many striped zebras you have observed, the next one may not have stripes. But, Hume continues, if the inductive principle can't be deductively justified, then how? The only way, it seems, is on the evidence of past experience. Accordingly, we point to the fact that in the

past induction has worked with zebras, ravens, sunrises, heated metals, etc. Thus, we have good evidence based on past experience that induction will succeed in the future. The trouble is, as Hume pointed out, this reasoning is circular, for it is *using induction* to justify induction. To say that induction will be successful in the future because it has always been successful in the past is to use inductive reasoning. And it is the rationality of this type of reasoning which Hume is questioning.

To summarise Hume's argument:

1. Induction can be justified either deductively or on the basis of past experience.
2. Induction can't be justified deductively.
3. Induction can't be justified by past experience, for that would be circular.

Therefore, induction can't be rationally justified.

If Hume is right and induction has no rational foundation, then what if anything is it based on? According to Hume it is based on custom or habit. He believed that induction was more like a natural instinct than a process of reasoning.

Is Hume right about induction? Isn't the process of basing conclusions about the future on past observations fundamentally *rational*? Surely, it's more than just custom or habit. And yet if we want to believe that, then Hume's problem about induction has to be solved. But how?

Some attempts to solve the problem of induction

1. The use of probability: The idea here is that the conclusions of inductive arguments should be expressed in terms of probability. For example, rather than conclude that all zebras have stripes after observing, say, 1000 striped zebras, instead we should say "It is highly likely that all zebras have stripes". We may even be able to assign numerical values to these probabilities. Thus, "The probability that all zebras have stripes is x ", where the value of x depends on how strong the evidence is. If x is close to 1 then the evidence and the argument are strong, and if x is close to 0 then the evidence and the argument are weak. Does the use of probability in this context avoid the problem of induction? This attempted solution has problems of its own. Firstly, even if our inductive generalisations are modified by probability, they are still generalisations about the future which are based on past experience. The statement "All zebras are very probably striped" talks about unobserved zebras. What justifies this statement? Secondly, future populations whether of zebras, sunrises, metals or whatever are at least potentially infinite. Yet probability as used here is defined for *finite* sets - packs of cards, tosses of a die. So how can numerical values be assigned at all to probabilities concerning future zebras, ravens and the like?

2. The linguistic solution: According to this approach, the use of inductive reasoning is part of what we *mean* by the terms "rational" or "reasonable". Thus, there can be no question of challenging the rationality of induction because to rely on induction is part of the very meaning of "rationality". To ask

whether induction is rational is much like asking whether the law is legal. Suppose that you have observed lots of striped zebras and none without stripes, and these observations have been made in a variety of circumstances. Then it is rational to believe that all zebras are striped, simply because widespread observations of striped zebras under a variety of conditions is part of what we mean by “rational”. Hume’s challenge is simply misplaced.

Does this proposed solution work? The answer depends on whether or not the use of induction is part of the meaning of “rationality”. Moreover, it seems hard to believe that we can solve Hume’s problem by appealing to the meaning of words.

Further discussion

1. Suppose that Hume is right and that induction can’t be rationally justified. It seems that perhaps we should abandon inductive reasoning. However, inductive reasoning is so deeply ingrained it is hard to imagine doing without it.

2. According to Hume, induction is no more than a natural instinct. But perhaps this is not a problem for us long as inductive reasoning gives us right answers. And yet, induction does seem more than just a custom, habit or instinct. It seems to be rational!

3. We might say that the reason we can infer that a certain metal will expand when heated is because there is a *law of nature* which explains why metals expand when heated. And it is this that forms the basis of inductive reasoning. However, Hume’s response would be, on what basis can we believe in the truth of the relevant law? A law can only be established on the basis of past experience and therefore rests on the principle of induction. However, this seems to be making use of induction to justify induction.

References

1. David Hume, An Enquiry Concerning Human Understanding.
2. David Hume, A Treatise of Human Nature, Vol. 1

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