The Problem of Induction

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Induction

Induction is the process by which one makes an inference of a generalised conclusion from particular instances. In other words, you arrive at a conclusion, or a theory, via small scale examples that *confirm* your theory. It has long been a philosophical scandal since discovered as a tool that might be used to aid philosophers in understanding the world.

Until Hume and Kant (who really brought the issue to the forefront), deduction was considered the primary mode for philosophical discourse. In fact, the holding of reason and logic to such high regards made deductive logic a de facto standard for philosophical arguments.

Inductive Problem

David Hume, the skeptic that he was, brought up a really good point: although the Sun has risen and set always in the past, that's not to say that it definitively will always in the future. The Sun setting and rising in the past, so it will always do so in the future, is an inductive argument that has no basis...or does it?

The point is that Hume was trying to make is that no matter how many individual instances of a particular occurrence we have seen in the past, we can make no (rational, and logical) conclusions as to the occurrence in the future.

It, in effect, is a problem of justification and additionally, description. So we are left to ask ourselves whether a form of inductive reasoning, or a method of inference, that we can show will lead to true, or approximately true, conclusions most of the time? Although, note where this is going. It is not whether *all* inductive reasonings can be logically justified. The question is whether there can exist *at least* one form that works.

Deduction Vs. Induction

There are differences between induction and deduction. More specifically, there is a strange relationship between the two which shall be examined in this section.

The Deductive

In order to understand the issues surrounding inductive reasoning, let's detour to the solid form of logic, deductive reasoning. Deductive reasoning, or deduction, is an inference in which the conclusion about particulars follows necessarily from general or universal premises.

Application of the definition is defined in the age-old deductive demonstration as follows:

(1) All men are mortal.

(2) Socrates is a man.

(3) Hence: Socrates is moral.

Clearly, there are some generalisations made in this argument where it goes from the general to the specific. All parts of it can be logically matched and will reach a sound conclusion.

The Inductive

As mentioned before, induction is the ability to reach a general conclusion based on certain particulars. Below is an example of a typical inductive argument:

(4) The sun always rises in the morning.

(5) Hence: tomorrow morning the sun will rise.

One thing to notice, however, about this argument, is the striking similarity between (4) and (1). How do we *know* that all men are mortal? Although (1) is grounded in a general *truth-ness*, application of Hume's criticism on inductive statements might render this argument invalid. Although it is true that (1), how do we know that this will always be the case. (1) in and of itself is an inductive claim, and so is (4).

How do we know that all men are mortal: all men that we have seen (been in contact with) are capable, or have died. How do we know that the sun always rises: every day of our lives we have seen (been in contact with) a rising sun at the beginning of a day (even at the poles, although a day is 6 months long, there is still a beginning and an end.) Here is where we run into the "Problem of Induction's" two major stumbling blocks: justification and description.

Justification and Description

Peter Lipton [p. 412, Philosophy of Science: The Central Issues] points out the problem of induction as being subject to under-determination. In other words, some information about the initial conditions and rules or principles does not guarantee a unique solution.

It would be ridiculous to take David Hume's skeptical criticism to heart. In fact, given a particular inductive argument, we can say or rather feel if it's true or not. For example, if you were going to eat a piece of bread, and I told you not to do so because it was poisoned. You would have a very difficult time believing me. All the bread that you've eaten to this point has been fine. So there is a high *probability* that you will be fine after the next piece of bread, despite what i say. Similarly it is a philosopher's fancy if he thought it not true that the sun was to rise tomorrow morning; it looks great on paper but in reality it is something altogether different. I am sure the philosopher doesn't go to sleep at night wondering if the sun will ever rise again.

Justification

The point, of this is that there is truth, but there must be some way to expand upon this in a rational manner. In other words, the problem of justification is to show that our inferential methods are indeed good methods; to show that arguments we judge valid, are indeed so.

For induction, perfect reliability is out of the question. By pure definition an inductive argument is one where there might be true premises but a false conclusion. (5) above, might be proven false if the sun were to supernova at midnight. We do not have all of the facts (as under-determination implies.) In another world, the system's star might be dying, and ready to supernova at any moment. In that world, our inductive argument on the sun's rising would fail.

So let us bring in the fact that in other universes, with situations similar to ours, when the sun is aged the way it is, and conditions are alike, the sun would never supernova. Why would it not supernova tomorrow? Because we know that nature has rules that are followed. We know that since we have gravity, whenever we release a piece of chalk, it would fall to the ground.

Bringing the natural reasons for gravity, and the behaviour of the natural world through physics might explain that particular argument. However, we are now forced to justify the "natural reasons for gravity." Why is it that

gravity would not just cease to be tomorrow? What is stopping gravity from acting in the opposite direction (to repulse things.)

Here we enter into the second stumbling block of justification. Eventually, all attempts to justify inductive arguments would lead to a particular circularity. We would find ourselves attempting to justify (1) and (4) thus:

(6) All the men are organic.

(7) All organic matter decays.

(7') All matter that decays is mortal if it was once alive.

(8) Hence: All men are mortal.

So now, you ask, what kind of inductive conclusion did we use to get at (6) and (7). Just because all the men you have met are organic, doesn't mean that the next man you meet will definitely be organic. In fact this circularity can continue ad infinitum, possibly ending with glue-ons... but what next?

Description

The problem of description is not to show that our inductive procedures are reliable, rather it is to *simply* describe them as they stand. Unlike before, this doesn't necessarily raise the problem of circularity. As Lipton puts it, it's like using observation to study the structure and function of the eye. This should be a relatively easy task to accomplish. However, it is not. In fact, this is difficult because many times we know how to actually use inductive inference, but when asked to describe it become underrated.

For example, consider riding a bicycle, or talking. We know how to structure grammatically coherent sentences. We know how to keep a bicycle balanced and ride one. However, we have yet to be able to explain it to someone else exactly "how" it's done. With all the mathematics involved in keeping a bicycle aloof, we still cant *describe* to someone how its done, so that they may read it and say, "oh, i get it." and be on their way.

Popper-ism and Science

Karl Popper eschews the descriptive and "novelty" portion of the inductive issue, attributing it to psychologism. "the act of conceiving or inventing a

theory, seems to me neither to call for logical analysis nor to be susceptible of it."

Popper quickly turns his attention to the testing of scientific theories. He states a necessity to understand and be able to move forward with a solid explanation of inductive logic in order to differentiate between a scientific theory, and "the fanciful and arbitrary creations of the poet's mind." He states that the principle of induction must be a synthetic statement. According to Popper, this will not do; and neither will the probability logic, that he claims, many have adopted.

Instead Popper develops what he coins: deductivism. It would be used in the sciences in order that a theory may move beyond inductivism. This deductivism (in a nutshell) means that after a new hypothesis has been created (to advance science), it can only be empirically tested. After which time, the hypothesis can be said to be true or false.

This involves four major aspects:

1. the logical comparison of the conclusions among themselves
2. investigation of the logical form of the theory
3. comparison with other theories
4. testing by way of empirical application of the conclusions

The first denotes the internal consistency of the hypothesis. The second basically looks at the form of the hypothesis from a logical standpoint - is it tautological? If I came up with a theory: $2 = 0.5 + 1.5$ many would laugh at the obviousness of it. In fact, it would not even fall worthy of testing due to the fact that it is nothing new (nothing that advances science,) which is the third - external consistency. The fourth is the actual application of what we have learned. In other words, what can be derived from this "shedding of new light," (i.e.: practical applications.)