PHIL2057 Essay 1

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Question

1. What are the old (Hume) and new (Goodman) problems of induction? Choose your favourite response to one of these problems and argue the case for or against it.

The Humean problem of induction revolves around how we can justify inductive reasoning as a valid form of inference. If we could find a way of justifying it, Goodman suggests a new problem anyway, that this definition of inductive reasoning equally supports logically-contradictory statements. I will argue that taken as Hume presents it, the old problem of induction appears insoluble. However Hume's terminology is poorly considered and his misuse of the term 'reason' creates a pseudo-problem that has been perpetuated by the subsequent confusion. I will construct instead a more rigorous definition of inductive reasoning and demonstrate how this definition leads to a method for differentiating good and poor inductions, although it requires the sacrifice of necessary truth in our inductive hypotheses.

1 The Humean Problem of Induction

Hume was the first to propose the traditional problem of induction, although he used different terminology to that used today. He broadly broke up cognitive analysis into two categories;

> "All reasoning falls into two kinds: **(1)** demonstrative reasoning . . . and **(2)** factual reasoning." (Hume, 1748, pp.16) [6]

Demonstrative reasoning concerns "the relations of ideas", that is how premises are logically related. This reasoning is necessary as there is no conceivable way you can infer a false conclusion from universally true premises (ideas). *Factual reasoning* however concerns "fact and existence", that is drawing conclusions from observations. This reasoning is contingent as there are plenty of conceivable examples where we can draw true and false conclusions from a set of observations. It seems that factual reasoning is founded in the principle of the uniformity of nature;

> “Instances of which we haven’t had experience must resemble those of which we have; the course of Nature continues always uniformly the same.” (Hume, 1739, pp.51) [5]

If factual reasoning were to be rational, then this premise would have to be established by factual or demonstrative reasoning. Since the principle is essential to proving the concept of factual reasoning as valid, we cannot then use factual reasoning; for example if we argue that ‘the uniformity of nature is true because it has proven to be so previously’ then this would be a case of *petition principia*, a circular argument. However it cannot be proved demonstratively because the statement is contingent and demonstrative reasoning is necessary. Thus the uniformity of nature, and hence inductive reasoning, cannot be rational as it cannot be proved with reason.

This negative argument is essential to Hume’s argument. If factual reasoning is not rational, that is to say not objective, then it must be the work of the mind and imagination, and thus subjective. Hence Hume proposes that factual reasoning is a habit developed by the human psyche and thus objective support for factual reasoning is an illusion. Hume thus concludes that given this subjectivity, the problem of induction is to develop a method of distinguishing valid inductive habits from invalid inductive habits.[9]

2 Goodman’s New Riddle of Induction

Goodman (1955)[2] presents us with further issues even if there is a method of differentiating inductive arguments. He shows this through the following example. We know according to inductive reasoning that if we have empirical evidence, collected at or prior to a time t, that emerald 1 is green, emerald 2 is green, etc. then this supports the universal hypothesis ‘all emeralds are green.’ Here Goodman (1955)[2] defines a new predicate, *grue*;

> An object is classified as *grue* if and only if it is observed before time t and is green, or unobserved before time t and is blue.

Then the evidence statements given before, that emerald 1 is green, etc. also inductively support the universal hypothesis that ‘all emeralds are grue.’ However this is a contradiction, we have two equally well supported hypotheses predicting that after time t, all emeralds will be both blue and green which is absurd. We may expect most emeralds to be green, so the number of unobserved blue emeralds (unobserved grue emeralds) may be very small. However this simply enforces the point.

One immediate rebuke we can make to this problem is to protest that the inclusion of the time specification t no longer makes the grue predicate purely qualitative and hence cannot be compared with predictions involving green. However Goodman (1955)[2] responded that this is simply a case of perspective. If we consider the obverse of grue, bleen, where emeralds are bleen if and only if they are observed to be blue before t or unobserved before t and green, then we can define green and blue in terms of grue and bleen. Grue and bleen simply become empirical properties so instead, we now define green with 'observed to be grue before t or unobserved before t and bleen.' Note that we in our green and blue world can only understand grue and bleen in terms of t, but in a grue and bleen world we would have the opposite problem. Hence we could formulate the problem from a grue and bleen perspective such that grue was a purely qualitative predicate. The question that arises from this is whether logic is preserved across different linguistic formulations but I won't explore that here.

Hence Goodman's 'new problem of induction' is to develop a framework for differentiating between reasonable inductive inferences, like 'all emeralds are green' and seemingly unreasonable inductive inferences like 'all emeralds are grue', given the apparent contradictory result reached above.

3 Relating Reason to Induction and Deduction

Vickers (2014)[9] concluded that the two problems expressed in the terminology above were insoluble. Hence, a large number of the responses to the problem of induction appear to revolve around proving why Hume's initial definition of the problem is inappropriate. The concept of *enumerative induction*, suggested by Hume, is defined explicitly in its simplest form below;

> Suppose we have observations $a_1, a_2, \ldots, a_n$ that each F is also a G.
> Then this implies the generalised hypothesis that all Fs are Gs.

This more robust definition shows the contingency of induction; it is possible to conceive of an observation, a_{n+k}, that has yet to be recorded where an F is not a G (or any number of these observations) that would make the hypothesis false. This is not so for deduction where the laws of classical first order logic reject the possibility of true premises leading to a false conclusion.

Hume combined these two methods of inference under the banner of *reasoning*. Logicians have, until recently, taken reason to be applying logic and method to a set of premises to discern a conclusion.[3] To formalise this definition of reason would require finding a universal set of rules such that we are employing reason when we apply them to true premises and reach true conclusions. However this is formalised first order logic, or deductive logic. Hence, it is evident that what logicians consider reason to be is the process of deduction. So it is no wonder that we reach the problem of induction when we try to consider how to define reasonable inductive arguments because we are framing what it means to be reasonable in terms of deductive tenets, yet we assumed deduction to be different to induction.

The problem above stems from a deeper truth about deduction and induction. As Harman & Kulkarni (2006)[3] state, deductive rules characterise what follows from what, deduction is purely a method of relating ideas. Induction however characterises the generation of ideas. Deductive logic doesn't add anything to our knowledge, it simply orders it explicitly.[9] If our original premises imply the conclusions, then the conclusions are simply included in the knowledge of the original premises. Consider Mathematics. All real number mathematics, including calculus, etc. can be constructed using 13 axioms and the laws of formal logic. Since mathematics is a closed system, the deductive processes cannot have added any knowledge so real number analysis is contained within the axioms. Compare this to inductive processes where new knowledge is being generated. Scientific knowledge, for example, cannot be summed up in a small number of axioms. It is clear then that the same laws of reasoning would not apply to methods for reordering knowledge and those for generating new knowledge. So it is inappropriate to consider them as two facets of the same concept, 'reasoning', as Hume proposed.

4 Constructing the 'Standards of Induction'

We cannot, given the arguments above, appeal to deductive standards to determine whether induction is justified. So what set of standards can we compare inductive methods with to determine their validity? It is evident that inductive methods cannot be necessary so the task is to formalise what extent of contingency is acceptable.

We need to first establish a way of determining whether the data set for an induction is in fact *relevant* to the general hypothesis being proved. Obviously a poor induction is one where the evidence is not related to the hypothesis at all, for example observations that 'James goes to school' do not support the hypothesis that 'the earth orbits the sun.' We claim evidence supports a hypothesis if and only if that evidence could be predicted as a consequence of the hypothesis. This means an observation adds credibility to a hypothesis if, supposing the hypothesis were true for a certain set of conditions, it would predict *only* the existence of the observation. This 'only' condition prevents Goodman's problem that every statement confirms every other statement by ruling out the possibility of supporting conjunctive hypotheses.[2] This gives us a preliminary step for ruling out invalid inductions.

The truth of a statement is not necessarily obtained by just having supporting evidence. It may be a probabilistic hypothesis or a sheltered hypothesis that works in some situations but not universally, for example Newton's laws. But since inductive proofs cannot be necessary, that is a_{n+k} could always disprove the statement, we can only express our degree of confidence in a given hypothesis. But how can we quantify our confidence? One promising method, supposing we are considering the confirmation that 'all As are Bs', is that our confidence value will be the ratio between past As that were Bs and past As. This gives us a percentage reliability, C, for the hypothesis 'all As are Bs.' However if we use this percentage value to express our confidence, then how do we have a guarantee that this confidence will still hold when we apply the hypothesis to future circumstances? Reichenbach (1999)[7] suggests a solution, if not a pessimistic one. He suggests that although a confirmable application for the confidence value in future circumstances is unachievable, the confidence in our hypothesis derived from our current evidence is still related to the true 'correctness' of the hypothesis. When the number of As approaches infinity, then the limit of the ratio of ABs to As will approach the true confidence value.[1] Mathematically this is:

$$\lim_{n\to\infty} \frac{AB_1 + \cdots + AB_k}{A_1 + \cdots + A_n} = C, \qquad \text{where } k \leq n.$$

Using this method will give us a confidence percentage, C, for each hypothesis and hence allow us to differentiate between good and poor inductive reasoning.

The method proposed above [7] is important because it provides a structured way of establishing a numerical value for the certainty of a hypothesis inferred from inductive reasoning. It is also supported by the fact that it aligns with the scientific method which has proved very successful. In principle, an inductive hypothesis can never be proved necessarily true as it is practically impossible to observe an infinite number of As. This sacrifice of necessary truth however is small compared to the gains we receive in classifying inductive hypotheses and hence providing firm rules for the generation of knowledge.

I have suggested that the problem of induction arose from the conflation of two fundamentally different propositions, the necessary truth of the uniformity of nature and that induction is rational or reasonable.[8] However I have shown that reasoning need not be necessary which hence breaks the link between the two propositions. This enabled me to construct a set of standards against which to measure inductive inferences and to determine their rationality. Whilst this required giving up the ability for inductive proofs to produce necessary hypotheses, I argue that this is a preferable and necessary step in acquiring new knowledge. Note that this resolution does not solve Goodman's new problem of induction. We still have no method for differentiating between confirmable and accidental hypotheses. Hence we have found an acceptable solution to the old problem of induction whilst the new problem remains a challenge.

References

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[4] Harré, R. 1957, 'Dissolving The "Problem" of Induction,' *Philosophy*, Vol. 32, No. 120, pp. 58-64.

[5] Hume, D. 1739, *A Treatise of Human Nature* (Book 1) (excerpt, pp.50-54).

[6] Hume, D. 1748, *An Enquiry Concerning Human Understanding* (excerpt, pp.11-18).

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[8] Strawson, P. 1952, *Introduction to Logical Theory* (chapter 9), Methuen Publishing Ltd., London.

[9] Vickers, J. 2014 'The Problem of Induction', *The Stanford Encyclopedia of Philosophy* (Fall Edition), Zalta E. (ed.), URL = http://plato.stanford.edu/archives/fall2014/entries/induction-problem/.