*The Principle of Induction and “The Problem” about it*

Let’s go back to classic logic.

There is another type of logic (other than deductive type) and it is considered a type of inference. ‘The problem of induction’ (**David Hume**, 1711-1776) which he became famous for, after his death, since Induction is a type of reasoning we all use on a daily basis.

The story so far:

If the premises are true, the conclusion is true. We conclude something about our middle term that is included in our major term.

*‘How do we know that the premises are true?’*

* **Counting**: One way to do it is to start counting (E eats pasta, F eats pasta… All Italians eat pasta).
* **Generalization**: We go from a finite list of instances to an universal statement, given certain conditions, that are: 1) Wide enough number of repeated cases 2) No conflicting evidence 3) All the properties we generalize about should refer to the same objects

**The principle of induction:**

If a large number of As have been observed under a wide variety of conditions, and if all those observed As without exceptions possessed the property b, Then all As have b.

To come to a universal statement we haven’t observed all Italians. **We build our confidence on this finite (“large enough”) number,** big problem for this type of inference.

‘Swans are observed to be white’.

We can draw two conclusions The next swan that will be observed will be white and all swans that will be observed will be white.

Logical problem

Even if my premise is true (P is T) and my conclusion is false (C is F) there is no logical contradiction.

\*\*Today my conclusion could be based on probability\*\*

**Deduction and Induction**

We all use this principle (of Induction) in our daily live. We are prepared also to trust some people on the basis of past experiences. We cannot prevent us to feel quite uneasy with this kind of reasoning.

* Clearly deduction is safer (we get what we see), whatever we claim is already implicit in the premise, and if the premise is true the conclusion cannot but be true. Yet deduction cannot be a good method for science, because in science we want to know the truthiness of the premises.
* Induction is better for science and help us feel more secure (Ampliative reasoning, how wide should the number of observations be?). We are led to believe that what holds for past experience might hold for future experiences.

How risky is induction? Hume: How can we formulate the problem of induction?

We first need some background.

Basic Distinctions: The first basic distinction is the one between

* Relations of ideas. **Relations of ideas** (used in geometry, algebra…) consist on *“every affirmation which is either intuitively or demonstratively certain”*. The truth of mathematical proposition is self evident. Contradictions emerge with [ROL] not with MOF
* Matters of fact’. **Matters of fact**, the propositions are as intelligible as its opposites. They either assert or imply existence  ‘That the sun will rise tomorrow’  ‘That the sun will not rise tomorrow’.  The first is not in contradiction with the second one. With matters of fact we are at the mercy of ‘existence’. Matters of fact either assert or imply existence. The example cannot be true unless there is such a thing than the sun.

Hume: existence either asserted or implied is not a matter of logic relation. There is no logical relation between ‘sun’ ‘to rise’ and ‘tomorrow’ that determines the truth of the proposition itself; there is no contradiction in assuming alternative states of affairs.

It is only by experience that we can determine which of a pair of affairs is actually true. But this defeats the very purpose of having an inference (which is trying to predict before any experience).

*A priori knowledge of matters of fact is impossible.*

Hume: What is the “*nature of that evidence which assumes us of any real existence and matter of fact beyond the present testimony of our senses, or the records of our memory*”?

How is it possible and legittimate to infer a universally generalized statement from a collection of past particular experiences?

Reasoning concerning matters of facts:

* Connection between a present fact and another fact, which the former is inferred from
* How do we reason here? Exactly in the same way in which we reason when we connect an effect to a cause.

**Hume’s strategy**

“The knowledge of this relation is not, in any instance, attained by reasoning a priori; but arises entirely from experience”

Most of our factual knowledge is based on what we see directly or on memory. As a matter of fact most of our knowledge concern events that are remote (in space and time) so we can’t say we have knowledge of them in present perception.

The general analog for this type of reasoning is the cause-effect connection.

1. The first thing is to claim that the knowledge of this relation can only arise from experience.
2. Experience will make us pronounce that this connection is there and at the same time we will expect that this connection will reproduce itself in the future.
3. Our **expectations** are based on repetitions of the experience.
4. Repeated Connections give rise to **custom** (on which we build these expectations). It is not a matter of logic here, we are just projecting expectation (it is our psychology that works like this). But custom is not apparent. What we think is that we are making an inference but we are wrong.

*Hume’s support for his claim: a counterargument*

Hume provides some support or his thesis, by using a counterargument: If we were to pronunce about the effect of a certain object presented to us without consulting past observation, how would the mind proceed.

Answers:

1. The mind should invent or imagine some event as an effect arbitrarily.
2. The tie between cause and effect is also arbitrary.

***Cause/ Effect: two separate events for Hume***

All I can see in the example of the billiard ball are the *contiguity in time and space*, the **priority in time**, and the ***regularity of the occurrence*** of this event.

i.e: we would expect that every time we see a billiard ball hitting another billiard ball the latter will proceed on a straight line (like O —> O —> ) but nothing excludes that the other billiard ball could start flying or doing other things

***Arbitrary tie between cause and effect: How do we know where the billiard ball will end up? Only experience tells us about cause and effect.***When we reason a priori we only see the effect (i.e. the ice) and do not know anything about its cause (i.e. the cold). It is barely impossible from the effect to the cause only by our faculties.

*Compare Deductive and Inductive inference/reasoning:*

1. Either it is raining (p) or it is snowing (q)  it is not snowing (not q) ———————— it is raining (p).
2. There is a flash of light —————————— There will be a clap of thunder.  We go from an A event to a B event. It is not a contradiction. This show us that our second type of inference has nothing to do with logical implications…

*Adding a premise to (2)*

…But we have a way to make it work, by adding a second premise. Even if it sounds more plausible it does not solve our problems. It is still based on experience There is a flash of light,

If there is a flash of light, then there will be a clap of thunder

————— There will be a clap of thunder. But the second premise is based on past experience.

Hume’s problem with induction: **What allows us logically to infer that just because of past A-events have been followed by B-events, in the future A-events will be followed by B-events?**

*Structure of the inductive argument:*

1. I have found that such object has always been attende with such an effect
2. I foresee that other objects, which are in appearance similar, will be attended with similar effects
3. To go from (a) to (b) we need a ‘**medium**’ or an additional premise because the connection is not intuitive and it is always possible for A to be true and B to be false. Hume is quite skeptic about this medium, because it cannot be established logically/ rationally justified.

**The principle of Induction (the principle of the uniformity of nature)**

“The same patterns of relations between kinds of events will hold in the future as have held in the past” (nature proceeds in a uniform matter). By adding a medium, the inference from experience seems to work, but according to Hume this principle cannot be safely accepted. There is no logical justification for accepting that premise.

**The reasoning behind the problem**

Step 1. All reasoning are based on a) relations of idea or b) matters of fact.

Step 2. No reasoning of type a) applies to c). Because we can only know that added premise on the basis of experience.

Step 3. We should look at reasoning based on matters of fact, we are trying to reason inductively.

*The very problem*

By resorting to type b) reasoning we will enter in a vicious circularity because c) cannot be established by inductive inference since all inductive inferences presuppose c) as their foundation.

Doing so we are entering in a vicious circularity: my added premise cannot be established by inductive inference because all inductive inferences presuppose that added premise as their foundation. In a sense in order for an inductive type of reasoning to work we already need to know that induction works.

Here is Hume and Here is Hume again

* Our experimental conclusions are based on the principle of the belief the future will resemble to the past. So if we stop here, there will be no advancement in sciences and we will be stuck with the same answers of the past because they will be valid forever (vicious circle)
* But If we suspect that the course of nature might change and that the future will not be like the past, then experience loses its relevance and we cannot make any conclusion or inference. So it is impossible for experience to be a good argument in favour of my inferences from the moment that every single argument is based on the supposition that the future will resemble the past.

**Deductive circularity**The simplest version of circularity (argument which uses its conclusion as its premise). All these arguments are deductively valid.

But inductively correct argument cannot be dealt with the same rules as deductive arguments. We need to find a way for induction to be circular but in a way that it is not deductive

**Inductive circularity**

The purpose of c) is to provide a justification to all inductive inferences. But c) itself is an inductive inference. It goes  From ‘the future has always resembled the past’  To ‘the future will always resemble the past’.

*Vicious Inductive Circularity*

We are using the same type of reasoning which we are doubting the validity (**justifying induction with induction**).

**WHY do we do it? Why are we prepared to give this mighty authority to experience?**

Clearly an authority to induction is not based on reason, if it was so we could draw the conclusion by being exposed one to an event. It is only after a long number of observation that we are convinced of the cause-effect.

**The appeal to Custom**

Hume suggests a psychological cause to this predisposition to trust induction (a part from that there is no other reason, but above all there is no empirical foundation to this). If there is no logic, there must be some psychological principle, which is custom (the way we are habituated to make connection between things we used to see together lots of time).

Should we resist this instinct?

According to Hume we have no choice, being it an instinct it is **unavoidable**. If we didn’t believe in induction we wouldn’t act. So custom is the great guide of human life, it is the principle alone which render our past experiences useful to us. Plus fighting it is impossible since it derives from natural instincts which cannot be stopped by the process of the thought.

**Without custom we should never know how to adjust means to ends**.

**Hume’s Conclusion:**

1. IR cannot be rationally justified (vicious circularity);
2. IR is instinctual, therefore inevitable;
3. IR is at the basis of our beliefs about the future, this is how we form our beliefs about the future;
4. IR informs both scientific inquiry and purposive action (we make discoveries in science because of the inductive method);
5. IR is indispensable to both scientific inquiry and purposive action.

Inductive reasoning is either accepted (Logical Positivist) or rejected (Popper)

Hume has settled things neatly:

* It cannot be justified logically but it is a psychological principle
* This is why we all use it in absence of logical support
* Induction seems to work successfully many times (This is why we feel entitled to use it)

There are still many unresolved cases though.