Things Fall Apart

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Introduction

"The paradox of the ravens, also known as Hempel's paradox or Hempel crows is logical paradox formulated by the German mathematician Carl Gustav Hempel in the 1940s, to illustrate that inductive logic sometimes comes into conflict with the intuition. Hempel described this paradox as follows. Assume that there is a theory according to which "all crows are black." According to formal logic, this theory is equivalent to the theory that not “all things that are not black, are crows." If people see a lot of black ravens, his confidence that this theory is true increase. If he sees many red apples, it will increase his confidence that not all non-black objects are crows, and, according to the above, should increase his confidence that all crows are black.

However, this conclusion contradicts the intuitive perception of the situation the person - in real life this does not happen. Observation of red apples will increase confidence in the observer that not all non-black objects are crows, but it does not increase his confidence that all crows are black. The most common method to resolve this paradox is to apply Bayes' theorem, which relates the conditional and marginal probability of stochastic events.

The principle of induction

The principle of induction states that: Viewing the phenomenon of "X", which corresponds to the theory of the "T" increases the likelihood that the theory of the "T" is true.

Inductive reasoning is widely used in science. Opinion about the truth of many scientific laws (such as, for example, Newton's laws of motion or the law of gravity), based on the fact that the set of observations confirms their truth, while there are no observations that would contravene these laws (in those conditions where these laws should be applied according to the theory). In the paradox of black ravens, verifiable "law" is the statement "All crows are black." Since this statement is equivalent to saying "All things that are not black, are not sheep”. The probability of the truth of the latter must, in accordance with the principle of induction, increase when observing any non-ferrous objects are not crows, it turns out that the observation of red apples should increase the likelihood that all crows are black (Bugnyar and Kotrschal 189).

Proposed solutions

Source of the paradox lies in the fact that although the statement "All ravens are black" and "All things that are not black are not ravens" undoubtedly equivalent action on finding black raven has nothing to do with the action of finding no black object not a raven. Therefore, in real life observation of red apples does not affect the confidence in the truth of the statement "All crows are black" (Dun 135). Philosophers have proposed several ways to resolve this paradox. For example, the American logician Nelson Goodman suggested supplement inductive logic constraint, according to which the phenomenon should not be seen as supporting the theory of "All" P "are" Q "», if it also supports the theory of "None of that is not" Q ", not is "P" ».

Other philosophers have questioned the equivalence of the two statements in relation to inductive reasoning. In this concept observation red apples increases confidence that things are not black things are not ravens, without increasing the confidence that all crows are black. However, in classical logic, if the observer knows that the two statements are true, either simultaneously or simultaneously false, he cannot find one of them more relevant truth than another (Schloegl, Kotrschal and Thomas 771).

Goodman, and then another philosopher Willard Kuayn, proposed the concept of so-called "projective" and "non-projective" predicates. Statements that can be generalized using inductive logic (such as "all ravens are black"); they called projective predicates and assertions to which inductive logic does not apply (for example, "All non-black things are not ravens") - a projective. Quine proposed to determine which predicates are projective, and which are not, based on experience and common sense. He also pointed out that nonprojective predicates could not be confirmed by direct observation of the phenomena described in them, but confirmed by the observation of phenomena described by projective predicates equivalent source. This observation is not the concept of black apple "does not increase the" probability of not only the fact that all crows are black, but that is not all black things are not ravens; instead, both statements only confirmed observation of black ravens.

Using Bayes' theorem

An alternative to using the principle of induction is the use of Bayes' theorem, which is one of the fundamental theorems in probability theory and mathematical statistics.

Let "X" - a phenomenon that confirms the theory "T", and let the "I" - to our knowledge of the environment, except for the phenomenon "X".

Let Pr (T | XI) - the probability that the theory of "T" is true, with the proviso that it is known that "X" and "I" are correct.
Then: Pr (T | XI) = frac {Pr (T | I) cdot Pr (X | TI)} {Pr (X | I)}
where Pr (T | I) - the probability that the theory "T" is true, with the proviso that only an "I" is known, it is true; Pr (X | TI) - the probability that "X" is true, on the condition that a "T" and "I" are known to be true; and Pr (X | I) - the probability that "X" is true, with the proviso that only an "I" is known to be true (Stahler, Bernd and Douglas 287).
By using this theorem, paradox appears. If the observer chooses apple randomly, the chances of seeing a red apple does not depend on whether or not all crows are black or not. The second part of the numerator is equal to the denominator, and the probability of choosing a red apple will not change. Observation of "X" and the theory of "T" are not related, and seeing a red apple will not increase confidence that all crows are black.
If the observer chooses randomly not any black object, and it is an apple, the second part of the numerator is greater denominator is only a very small amount. In this scenario, watching a red apple will increase the likelihood that all crows are black, but only very slightly. Longer than black objects we observe are not among them ravens, the greater will be our confidence that all crows are black, but the rate of increase this confidence will be so small that they will not be felt intuitively. In the limiting case, if the observer cannot see all the black things in the universe and never find among them ravens, it obviously would make sure that all crows are black.

The "physical meaning" and terminology

Bayes' formula allows you to "rearrange the cause and effect": in the event known fact to calculate the probability that it was caused by this reason. Events that reflect the effect of the "causes" in this case is usually referred to as "hypotheses", as they are - "alleged" events that caused this. In addition, the unconditional probability of justice "hypothesis" is called "a priori" (how likely cause "in general"), and conditional when the event has occurred - "a posteriori" (how likely cause "was based on the data of the event.")

Consequence

An important consequence of the Bayesian formula is the formula of total probability of event-dependent "several" incompatible hypotheses (and only them!).: P (B) = sum_ {i = 1} ^ NP (A_i) P (B | A_i) - probability occurrence of the event "B", depending on a number of hypotheses A_i, if we know the degree of reliability of these hypotheses (e.g., measured experimentally); hider | hidden = 1 | title = Output | content-style = text-align: content = If an event depends only on the reasons A_i, what if it happened, then certainly there was some reason, i.e.: sum_i P (A_i | B) = 1, (Stahler, Bernd and Douglas 289).
According to Bayes formula: Sum_i frac {P (A_i) P (B | A_i)} {P (B)} = 1
Transfer of P (B) we obtain the desired expression of the right. “Unquote (Wikipedia).

Solution

This task includes the need to resolve several issues. This consideration:

1. The application of incomplete induction in the specific wording "all crows are black" to conclude that the degree of truth of a particular hypothesis;
2. Use of incomplete induction in general, abstract formulation for the conclusion of the degree of truth of any hypothesis;
3. Correct application of incomplete induction mechanism for a new sign

That is necessary to consider the specific hypothesis "all ravens are black" and solve the problem in fact - what is the truth degree of knowledge obtained by the method of incomplete induction. If we assume that the statement "all ravens are black" might be true, if it could be proved complete observation of this phenomenon or its equivalent negation of the opposite statement "all non-black objects are not crows", in this case, we would have taken upon lack of true situation any knowledge through method incomplete induction.

Works Cited

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