

Statistical Induction Principle

Inductive statistics is a way for scientists to make evidence-based decisions based on empirical/experimental results. It is widely based on the probability theory. As humans, we think in 2 different ways:

1. in a deductive way;
2. in an inductive way.

Deductive Thinking

It is a process where we take into account already valid assumptions, laws, principles to reach a conclusion for a specific case. Mathematics clearly demonstrate this way of thinking when we use abstract mathematical models to reach to various conclusions.

Example: When a physician uses a gold-standard drug, he uses it because he made his/her decision deductively. The individual case (the patient) has the specific disease that the drug can treat, so he/she will use it.

Inductive Thinking

Inductive thinking, in contrast to deductive thinking, follows the opposite direction. For example, we observe new data for a new drug, and we want to reach to a generalized conclusion. Therefore, inductive thinking enables us to create general conclusions based on observation of individual cases. However, conclusions of inductive thinking procedures are **influenced by subjective attitudes** (of the observer) and have **limited validity**.

Example: "a new biological marker has shown significant increase when tested in individuals of a particular disease, 90% of the times". We can induce that this marker is *linked* to the disease one way or another, thus by testing it, we can detect the presence of a disease. However, in the above experiment, there were 10% of cases that did not show an increased value of the marker – this can be due to errors in the design of the experiment or observer error.

The error in the above trial, and in any other trial, can be quantified (i.e.: enumerated) within a certain degree of confidence, which is standardized among all statistical studies (i.e.: level of significance). In this way we can substitute the subjective (unquantified error) inductive thinking with objective inductive thinking, based on concepts and methods of the probability theory.

Methods of inductive statistics (so called statistical induction) can under given assumptions to make general conclusions and to objectively enumerate their degree of confidence. The main aim of inductive statistics is to elaborate procedures how to create general conclusions from empirical data that can substitute subjective inductive thinking by objective inductive thinking based on concepts of probability theory.

Two important concepts play a central role in methods of inductive statistics:

1. Population;
2. Sample.

If we use a sample to draw a generalized conclusion, inductive statistics can enumerate the probability of a statement being valid for the whole population. Of course, the larger the sample, the more valid the conclusion is, as it reflects more closely the whole population.

Links

Related articles

- Population Sample

Bibliography

- BENCKO CHARLES UNIVERSITY, PRAGUE 2004, 270 P, V, et al. *Hygiene and epidemiology. Selected Chapters*. 2nd edition. Prague. 2008. ISBN 9788024607931.