Deductive Reasoning [1]

Assisted Self-Help [2]91.1K reads

Deductive reasoning, in contrast to inductive reasoning, proceeds from one or more general axioms and comes to a certain, specific conclusion using logic alone.
If the premises are true and the logic of the argument is valid, the conclusion is certainly true.

Deductive reasoning is “top-down” and makes conclusions about a specific case according to more general principles or rules.

Inductive vs. Deductive Reasoning

Let’s say that I have never met my neighbor, but know some things about them. I notice a car in the driveway that has a university staff parking badge on the front window. I sometimes receive their mail in error and notice that my neighbor is addressed as “doctor.” I sometimes see copies of old medical journals in my neighbor’s trash. I once saw a full-scale model of a human skeleton being delivered to the house.

Now, I don’t know for certain that my neighbor is a lecturer of medicine at a university, but I have enough evidence to support that probability. This kind of reasoning is Inductive reasoning [3] and “bottom-up.” I am using several pieces of evidence as premises to build evidence to a particular conclusion.

Deductive reasoning, however, doesn’t merely support a conclusion, it proves it 100%. Let’s say I receive some mail in error and notice that the letter addressed next door is to “Dr. George Bolton.” My reasoning process may go something like this:

1. The name written on a letter is always the name of the recipient
2. The name on the letter is “Dr. George Bolton”
3. The recipient of the letter is my neighbor
4. Therefore, my neighbor’s name is Dr. George Bolton

If 1, 2 and 3 are true, I know for certain that the conclusion 4 is true. This is a deductive process, as I begin with known “universals” and work my way to a conclusion about a specific case according to logic.

Obviously, real world examples are less clear cut. For example, I might make the following argument:

1. All people called George are male
2. George Bolton next door is therefore male

This is another deductive argument, although you may spot some potential for premise 1 to be untrue. Here, you might need to revert to inductive reasoning. Everyone you've ever known called George has been male. But you can imagine a rare case where George is possibly a female name.

Here we see the major weakness in deductive reasoning, a trap into which a scientist should not fall. Deductive reasoning relies heavily upon the initial premises being correct. If one or more premises are incorrect, the argument is invalid and necessarily unsound. Certain philosophers have even argued that deductive reasoning itself is an unattainable ideal, and that all scientific deduction is inevitably induction.

Many branches of applied science work around this, by assigning probabilities to events and outcomes. Whilst not a strict application of the scientific method, it is useful where incorrect deductions could be devastating.

For example, weather forecasting is an area where deductive reasoning probabilities are often used. A meteorologist will look at the data, and using their skill and judgment, decide upon the likely weather for that day. They are aware that a certain pattern of initial conditions frequently leads to a certain weather type. However, they will never say that it is definitely going to rain, because the weather is too unpredictable, and they can never be sure that their initial assumptions are correct.

Michael Fish, the respected British meteorologist, categorically stated in 1987 that there was no chance of a hurricane hitting Southern England. He was wrong, and the unprepared country was devastated. The initial premises of his deductive reasoning were wrong. These days forecasters always warn of adverse weather as a percentage chance, affording people the choice of preparing for the worst.
