

Philosophy 200

inductive reasoning

Inductive reasoning

- “The process of deriving general principles from particular facts or instances.”
- "induction." *The American Heritage® Dictionary of the English Language, Fourth Edition*. Houghton Mifflin Company, 2004. 04 Nov. 2008.
- This is not correct. Inductive reasoning actually is a form of reasoning in which the conclusion is supposed to be supported by the premises, but the conclusion does not follow necessarily from them.
- The text describes the difference between inductive and deductive arguments as that deductive arguments are ***intended*** to be valid, while inductive arguments are not.

Is a bad deductive argument inductive?

- Consider the argument:
 - Limp Bizkit is a band.
 - All bands are good.
 - Limp Bizkit sucks though.
- This isn't inductive reasoning by virtue of being bad reasoning. The kinds of premises involved indicate that a deductive argument would result if the author of the argument were thinking more clearly.
- Generally, arguments that establish evaluative terms, arguments that establish 'should' or 'ought' statements, and arguments concerning morality or justice are all intended to be deductive arguments.

Another Characterization of Induction

- Often, critical thinking texts (in some sense including this one) will say that the difference between inductive and deductive reasoning is that deductive arguments guarantee their conclusions, while inductive arguments do not.
- This gives the impression that inductive arguments are somehow just not as good as deductive arguments, which doesn't really make sense.
- Inductive and deductive reasoning are simply different forms of reasoning each with their own different standards of evaluation, and we cannot avoid using either one.

Consider:

16% of Georgia residents are democrats

Bob is a Georgia resident

Bob has a 16% chance of being a democrat

It is tempting to call this an inductive argument because it contains statements of probability, but it is really a deductive argument because it is evaluated based upon whether the premises lead to the conclusion in the appropriate way, and then evaluated on the truth of the premises.

Consider:

All cigarette smoke contains tar

Inhaling tar causes cancer

Cigarette smoking causes cancer

Notice that this is a deductive argument, but when questioning the truth of the first premise, we notice that it is established via *inductive* reasoning (by generalization) while the second premise is established via *causal* reasoning, which, as a kind of explanation has its own standards of evaluation. The point is that we engage in three primary kinds of reasoning (deductive, inductive, explanatory) and rarely engage in only one at a time.

Induction

- What is inductive reasoning then? It is generally a kind of reasoning by example, and it is done in one of two ways:
 - Generalization: making an overall claim about a class of things from a sample of that class
 - Analogy: comparing the relevant properties of like things to infer further properties.

How do we evaluate induction?

- As before, inductive arguments are not the kind of reasoning to which the concept of validity applies, so it would be silly to evaluate them with respect to validity.
- Instead, inductive arguments are evaluated as to whether they are strong or weak.
- Unlike validity, there are varying degrees of strength or weakness.
- Generalizations and Inductive Analogies each have features that make for strong reasoning.

Generalization

- A generalization is an inductive argument that attempts to draw a conclusion about a feature of a whole class of things based on whether a sample of those things have that feature.
- Generalizations can be formal (scientific, like polls or studies) or informal (everyday reasoning).

Evaluating Generalizations

1. Sample Quality: The term for this is whether the sample is representative of the target class or not.
 - One determines this by looking for any relevant source of bias in the sample, or relevant differences between the sample and the wider class.
 - Biased generalization in informal generalizations is generally called prejudice.

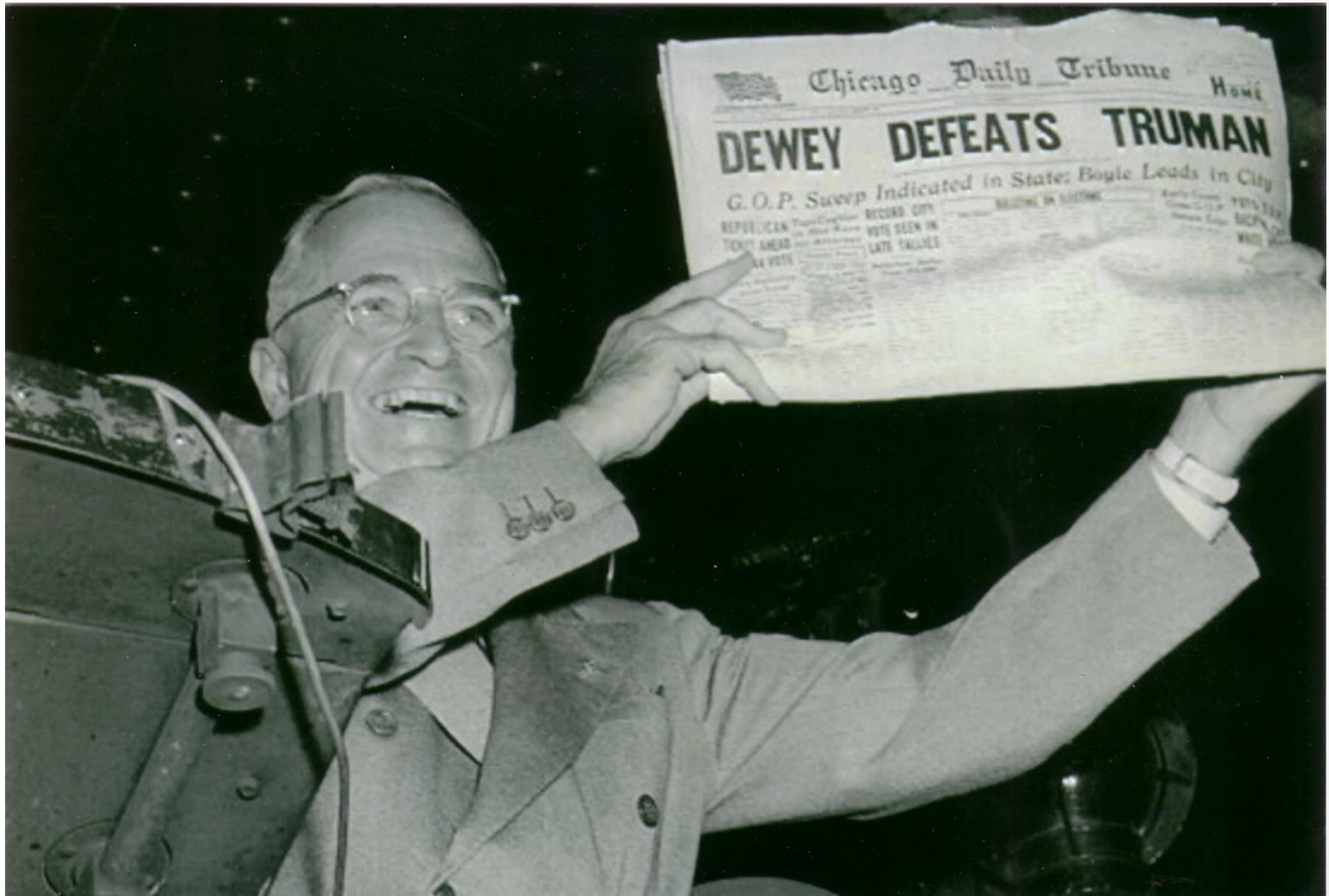
Evaluating Generalizations

2. Sample Size: I am putting this one at #2 because if the sample is biased, it doesn't matter how big it is. Once a sample is representative, it then becomes relevant to ask if it is large enough.
 - In formal generalizations there are sophisticated statistical methods to determine what a large enough sample is for the given generalization.
 - In informal generalizations, it's usually easy to spot when a sample size is too small.

Evaluating Generalizations

3. Nature of the target class: In this case the thing to key on is whether the target class is homogeneous (all of its members are very much alike) or heterogeneous (there is a great deal of diversity among the class)
 - Homogeneous versus heterogeneous is a spectrum. The more homogeneous the target class, the stronger the generalization. Some target classes are too heterogeneous to support any but trivial generalizations.

What went wrong?



The 1948 Polls:

| Candidate | Party | Electoral Votes | Percent Popular Votes | Final Gallup Estimate | Final Roper Estimate | Final Crossley Estimate |
|----------------|---------------|-----------------|-----------------------|-----------------------|----------------------|-------------------------|
| Harry Truman | Democrat | 303 | 49.6% | 44.5% | 38 | 45% |
| Thomas Dewey | Republican | 189 | 45.1% | 49.5% | 53 | 50% |
| Henry Wallace | Progressive | 0 | | | | |
| Strom Thurmond | States'rights | 39 | | | | |

Flaws in the Polls*

- A supposition of the committee was that in the last two weeks of the campaign when the interviewing after Crossley, Gallup, and Roper had completed their interviews, there had been a net shift to Truman of two to three percentage points. The pollsters had missed the necessity of measuring preferences just before the election. The Committee, however, would not flatly say that Crossley and Gallup had been right two weeks before the election. (Roper was too far off; he could not reasonably have been right a fortnight before.) The committee's conclusion on the last weeks' shift was "tentative."
- The committee voiced the suspicion that the pollsters' use of quota sampling rather than probability sampling had allowed interviewers to select somewhat more educated and well-off people within their assigned quotas. This biased their samples against Truman, who appealed more to the lower classes than Dewey.
- The pollsters had assumed that the undecided at the time of the interview would vote in the same way as those who had already made up their minds. This was an unproven assumption, and may not have been the case in the 1948 electorate.
- The pollsters had no certain way of deciding who would stay home on Election Day and who would go and cast a vote.

*Excerpted from "US Election 1948: The First Great Controversy about Polls, Media, and Social Science" by Hans L Zetterberg, November 2004

Scientific versus Journalistic Polling

- Scientific polling is done in the social sciences and is academically rigorous and is strictly controlled for quality.
- Journalistic polling has always been primarily for entertainment and to increase circulation numbers and ratings.
- When polls embarrassingly fail, the news-media tends to adopt (for a little while at least) more intellectually rigorous polling standards.

Several kinds of popular polling:

- The internet poll (typically an issue poll)
- The news-media issue poll
- The news-media election poll

The Internet Poll

- Many websites have polls for their readers. The important thing to realize about these polls is that they are for entertainment value only. They are all bad generalizations.
- The problem with these polls is that the sample is self-selected. A self selected sample is always a biased sample. Consider what has to be the case before anyone even responds to an internet poll:
 - Must have internet access
 - Must go to that particular website on that day
 - Must be interested in the feature connected to the poll
 - Must feel like responding to the poll question

Polling Vocabulary:

- Whenever you see a poll look for the following:
 - Error Margin: This is the percent of variation that the pollster would expect if they did the poll again with the same sample size and method.
 - Confidence: (This is usually 95% unless otherwise specified) This is the percent chance that another poll using the same sample size and method would fall within the error margin.

Who's Winning?

- Candidate A: 44%
- Candidate B: 41%
- Error Margin: +/- 3%
- Nobody is winning the above poll! It is a statistical tie. It could come out the exact opposite way if done again.

How big does a sample need to be?

- See the calculator at the below website for calculations of how large a sample must be to hit a certain error margin and confidence level.
- Statisticians have refined this method extensively over time.
- See: <http://www.surveysystem.com/sscalc.htm>

Analogical Arguments

Objects A and B have properties P, Q, R, etc.

Object B has property X

∴ Object A probably also has property X.

To evaluate:

- The premises must be true.
- The similarities between the things you are comparing must be relevant and important.
- Analogical arguments are stronger when:
 - 1. they cite more and closer analogies that are more important
 - 2. there are fewer or less important disanalogies between the object in the conclusion and the others
 - 3. the premise objects are more diverse
 - 4. the conclusion is more weakly stated