Critical Reasoning for Beginners: Five

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Michaelmas 2009

Recap on last week…

…evaluating inductive arguments….

….inductive generalisations and causal generalisations…

…. arguments from analogy and authority

Inductive generalisations:

- Is the premise true?
- How large is the sample?
- How representative is the sample?
- Beware ‘informal’ heuristics
- Is there a counterexample?

Causal generalisations:

- Is the premise true?
- How strong is the correlation?
- Does the causal relation make sense or could it be accidental?
- What causes what?

Arguments from analogy:

- are the two things similar?
- are they similar in respect of something relevant?
- can we find a disanalogy?

Arguments from authority:

- who exactly is the source of information?
- is this source qualified in the appropriate area?
- is the source impartial in respect of this claim?
- do other experts make other claims?

This week we shall be looking at…

… the distinction between validity and truth…

…at why validity is important…

….and at evaluating deductive arguments

A good deductive argument is SOUND if and only if it:

(a) is valid

AND

(b) has true premises

Is the argument sound?

	True premises	**False premises**
Valid		
Invalid		

Is the argument sound?

	True premises	**False premises**
Valid	**Sound**	**Unsound**
Invalid	**Unsound**	**Unsound**

The truth of the premises is not a matter for logicians or those interested in critical reasoning….

….there are many ways in which we determine the truth or falsehood of premises…

…and these ways do not fall into the scope of a class on critical reasoning

Validity, on the other hand…

…is very much of interest to logicians…

…because validity *preserves* truth…

…if an argument is valid, then if its premises are true…

…we can be *certain* its conclusion is true

Validity, in fact, is of interest to anyone…

…who is concerned about truth…

…because we *often* don't know the truth of our premises….

…and we *often* test the truth of our premises by…

… constructing valid arguments and..

…testing the truth of the conclusion

If we can show that…

…the conclusion of a valid argument is false…

…what do we thereby discover?

Hypothesis: **Smoking causes cancer**

Prediction: **if smoking causes cancer then every smoker will get cancer**

Test: **each smoker gets cancer**

All women are passive

Mrs. Thatcher is a woman

Therefore Mrs. Thatcher is passive

So what is this relation of validity that everyone is so concerned with?

Here is the best theory that philosophers and mathematicians can come up with…

An arguments is valid…

… if and only if…

… there is no possible situation in which…

…all its premises are true…

…. and its conclusion false

Beware: it is the possibility of the *combination…*

…of true premises and false conclusion….

….that is ruled out by an argument's being valid…

(this is why validity preserves truth)

Note: it is the *possibility* of the combination…

…of true premises and false conclusion that is ruled out by an argument's being valid…

…Not just the *actuality* of the combination of true premises and false conclusion

So, faced with an argument whose validity we are trying to determine, we must ask…

not (just):

> **ARE the premises true and the conclusion false together in actuality?**

But

> **COULD the premises be true and the conclusion false together in some situation?**

Please say whether or not you think arguments of the following sort could be valid:

(i) The premises of the argument are false

(ii) The premises of the argument are true and the conclusion is true

(iii) The premises of the argument are true and the conclusion false?

If the premises COULD be true…

…. TOGETHER WITH the conclusion's being false…

…then the argument is invalid…

…otherwise it *could be* valid

Could this argument be valid?

2 + 2 = 5

----

grass is green

Is there a situation in which the premise could be true and the conclusion false?

Could this argument be valid?

grass is green

----

2 + 2 = 4

Is there a situation in which the premise could be true and the conclusion false?

Is the argument valid?

	True conclusion	False conclusion
True Premises		
False Premises		

Is the argument valid?

	True conclusion	False conclusion
True Premises	Possibly valid	Invalid
False Premises	Possibly valid	Possibly valid

We shall have a look at this more closely by using Venn diagrams to determine, of some arguments, whether or not they are valid

Premises actually true and conclusion actually true

Valid Argument	Invalid argument
all cats meow Bo does not meow --- Bo is not a cat	All cats meow Dogs are not cats --- Dogs don't meow

In both cases the premises are actually true and so is the conclusion. But in the first case the truth of the premises *guarantees* the truth of the conclusion. In the second case the conclusion *could* be false despite the truth of the premises.

Premises actually false and conclusion actually true

Valid Argument	Invalid argument
all fish have lungs Whales are fish --- Whales have lungs	All fish have scales Whales have scales --- Whales are not fish

In both cases the premises are actually false, and the conclusion is actually true. But in the first case if the premises *were* true the truth of the premises would be *guaranteed.* In the second case even if the premises were true the conclusion *could* still be false.

Premises actually false and conclusion actually false

Valid Argument	Invalid argument
all fish have wings Whales are fish ---------- Whales have wings	All fish have scales Whales have scales ---------- Whales are fish

In both cases the premises and the conclusion are actually false. But in the first case if the premises *were* true the truth of the conclusion would be *guaranteed.* In the second case even if the premises were true the conclusion *could* still be false.

We have used Venn diagrams to determine the validity of the argument we have so far looked at….

….another way to determine validity is to create a counterexample set and determine consistency

To determine the counterexample set we set out the argument logic book style

If it is snowing the mail will be late

It is snowing

---------- ----------

The mail will be late

If it is snowing the mail will be late

The mail will be late

It is snowing

Then we negate the conclusion by tacking ‘it is not the case that’ in front of it

If it is snowing the mail will be late

It is snowing

It is not the case the mail will be late

If it is snowing the mail will be late

The mail will be late

It is not the case it is snowing

We then consider whether the set of sentences consisting of…

… the premises and the negation of the conclusion is consistent…

….i.e. whether they could all be true together

If the counterexample set *is* consistent then the original argument is invalid…

…if the counterexample set *isn't* consistent then the original argument is not valid.

Could these sentences be consistent – i.e. could they all be true together?

If it is snowing the mail will be late

It is snowing

It is not the case the mail will be late

If it is snowing the mail will be late

The mail will be late

It is not the case it is snowing

Is this argument valid?

All whales are mammals

---------- ----------

All whales are mammals

The counterexample set:

All whales are mammals

It is not the case that all whales are mammals

Are these sentences consistent?

All whales are mammals

It is not the case that all whales are mammals

Are these sentences consistent?

All whales are mammals

It is not the case that all whales are mammals

So the original argument is…..???

Is this argument valid?

If it is Friday Marianne is wearing jeans

It is Friday

Marianne is wearing jeans

The counterexample set:

If it is Friday Marianne is wearing jeans

It is Friday

It is not the case that Marianne is wearing jeans

Are these sentences consistent?

If it is Friday Marianne is wearing jeans

It is Friday

It is not the case that Marianne is wearing jeans

So the original argument is……???

Next week we shall be looking at common fallacies