Philosophy of Logics

qjshao@fudan.edu.cn

Chap3 Validity

- I. Arguments and its assessments
- II. Definitions of Validity
- III. Validity and Deduction

The notion of validity

- Logic is concerned with the principles of valid inferences.
- Logic is not simply valid argument but the reflection upon principles of validity.
- In pure mathematics we seek to prove abstract a priori truths, in metaphysics we seek to prove very general propositions about the structure of the world, and in everyday argument, especially political or forensic argument, we look for proofs of contingent propositions.

I. Arguments and its assessments

- Three ways of assessments of arguments
- i. Logical: is there a connection of the appropriate sort between the premises and the conclusion?
- ii. Material: are the premises and conclusion true?
- iii. Rhetorical: is the argument persuasive, appealing, interesting to the audience?

Different arguments

- Good/Bad argument
- Sound/Unsound argument
- Persuasive/Unpersuasive argument
- Valid/Invalid argument
- Deductive/inductive argument
- Explicative or non-ampliative argument
- Ampliative or non-explicative argument

A picture of sunset

Arguments include these features:

- A position/point of view

I like that picture

- A line of reasons/propositions to support the conclusion

The colour creates a powerful effect of a sunset which is pleasant to look at. The figures are interesting and well drawn.

- Conclusion/ The position the author wants you to accept

It is a good picture

More Key Terms

- Premises: propositions believed to be true and used to build an argument; similar to reasons.
- Predicate: the foundation/basis of an argument.

The windows rattled and the doors banged. The air felt changed. We were all frightened. A strange sound filled the air. It must have been a ghost.

- Predicated on the belief that such phenomena as rattling windows, etc. are caused by ghosts

Let's Hear some Arguments

- See if you can give arguments to support some of your beliefs.
- For example, do you think China can be the world leader in twenty years time? Why or why not? What arguments can you give to support your position?
- Do you think computers can have emotions? Again, what arguments can you give to support your viewpoint? Make sure that your arguments are composed of propositions.

Context or circumstances

- But he is still in Paris! Therefore, he cannot possibly be in Moscow tomorrow.
- If it were regarding some presently living person – Vladimir Putin, nowadays Moscow is only a few hours from Paris by aeroplane, …
- If it were given by someone in 1807,referring to Napoleon, the fastest way to travel then was by horse, …

II. Definition of validity

- 1. logic: a study of validity
- 2. Valid and invalid
- 3. Validity and truth
- 4. Some Examples

1.Logic is the study of validity

- The study of reasoning, in the sense in which logic is interested, concerns the issue of what follows from what.
- Less cryptically, some things—call them *premises*—provide reasons for others—call them *conclusions*. Thus, people may provide others with certain premises when they wish to persuade them of certain conclusions; or they may draw certain conclusions from premises that they themselves already believe.
- The relationship between premise and conclusion in each case is, colloquially, an argument, implication, or *inference*. Logic is the investigation of that relationship. A good inference may be called a *valid* one. Hence, logic is, in a nutshell, the study of validity.

2. Valid and invalid

- One desirable feature of arguments is that the conclusion should follow from the premises.

Argument #1 : Chen is over 90 years old. So Chen is over 20 years old.

- Valid;: Conclusion follows from premise.

Argument #2 : Chen is over 20 years old. So Chen is over 90 years old.

- Invalid: Conclusion does not follow from premise; Chen could be 30 years old.
- An argument is valid if and only if there is no logically possible situation where all the premises are true and the conclusion is false at the same time.

Other definitions

- To say that an argument is valid is to say: It would be impossible for all the premises of the argument to be true, but the conclusion false.
- To say that an argument is valid is to say: If the premises are (or were) true, the conclusion would also have to be true.

Remarks

- This definition has the consequence that if any premise of an argument is a necessary falsehood, or if the conclusion is a necessary truth, then the argument is valid (a necessary falsehood is a proposition that could not possibly have been true; a necessary truth is a proposition that could not possibly have been false). In such cases the premises may be entirely irrelevant to the conclusion.
- For example, 'There is a married bachelor, therefore the moon is made of green cheese' is valid, as is 'The moon is made of green cheese, therefore there is no married bachelor'.

3. Validity and truth

- Here is a valid argument but is it true?

All pigs can fly. Anything that can fly can swim. So all pigs can swim.

- If pigs can indeed fly, and if anything that can fly can also swim, then it must be the case that all pigs can swim. Validity is not the same as truth.
- The premises and the conclusion of a valid argument can all be false. Validity is about the logical connection between the premises and the conclusion. All that validity tells us is that if the premises are true, the conclusion must also be true.

Different cases

- 1 The premises are all (actually) true, and the conclusion is (actually) true.
- 2 The premises are all (actually) false, and the conclusion is (actually) false.
- 3 The premises are all (actually) false, and the conclusion is (actually) true.
- 4 Some of the premises are (actually) true, some (actually) false and the conclusion is (actually) true.
- 5 Some of the premises are (actually) true, some (actually) false and the conclusion is (actually) false.

Remarks

- The only case in which an argument cannot be valid is the case when the premises are all (actually) true, but the conclusion is (actually) false.
- For if that is so, then obviously there is a possible case in which the premises hold true when the conclusion is false – the actual case.

Validity: Points to Remember (1)

- The premises and the conclusion of an invalid argument can all be true.

Washington is the capital of the USA. So Beijing is the capital of China.

- A valid argument should not be defined as an argument with true premises and a true conclusion.

Validity: Points to Remember (2)

- The premises and the conclusion of a valid argument can all be false. (cf. *All pigs can fly ...*)
- A valid argument with false premises can still have a true conclusion.

All pigs are purple in colour. Anything that is purple is an animal. So all pigs are animals.

4. Some Examples

1. John shot himself in the head. So John is dead.
2. All management consultants are bald. Peter is bald. So Peter is a management consultant.
3. If time travel is possible, we would now have lots of time-travel visitors from the future. But we have no such visitors. So time travel is not possible.
4. Jen is either in San Diego or in Tokyo. Since she is not in Tokyo, she is in San Diego.

Are the following arguments valid?

5. Some people are nice. Some people are rich. So some people are rich and nice.
6. If I drink then I will be happy. If I am happy then I will dance. So if I drink then I will dance.
7. The services of mobile phone companies are getting worse as there has been an increasing number of complaints against mobile phone companies by consumers.
8. All capitalists exploit the weak and the poor. Property developers exploit the weak and the poor. So property developers are capitalists.

III. Validity and Deductions

- 1. Deductive logic
- 2. Forms of valid/invalid arguments
- 3. System-relative Validity

1.Deductive logic

- Logic is sometimes understood broadly as the systematic study of the principles of good reasoning. As such logic is not very different from critical thinking.
- But sometimes "logic" is understood more narrowly as what we might call "deductive logic".
- Deductive logic is mainly about: the consistency of statements and beliefs, as well as the validity of arguments.

Graham Priest

- Validity is the relationship of truth-preservation-in-all-situations.
- Doubtlessly, a valid inference is one where the premises provide some genuine ground for the conclusion.
- Traditionally, logic has distinguished between two notions of validity: deductive and non-deductive (inductive).
- A valid deductive argument is one where, in some sense, the conclusion cannot but be true, given the premises; a valid inductive argument is one where there is some lesser degree of support.

2. Four forms of valid arguments

- Patterns of Valid Arguments
- With valid arguments, it is impossible to have a false conclusion if the premises are all true.
- Modus ponens
- Consider the following argument:

If this object is made of copper, it will conduct electricity. This object is made of copper, so it will conduct electricity.

- Modus ponens - If *P* then *Q*. *P*. Therefore *Q*.

Modus Ponens

- Here, the letters *P* and *Q* are used to represent statements. By replacing *P* and *Q* with appropriate sentences, we can generate valid arguments.
- This form of valid argument is known as *modus ponens*.
- We can generate valid arguments based on:
- If *P* then *Q*. *P*. Therefore *Q*.

Modus Ponens

- *If today is Thursday, then I will lecture Year 1.*
- *Today is Thursday.*
- *Therefore, I will lecture Year 1.*

This argument is always valid on any day, but only true on Thursday.

- *All men (P) are mortal (Q)*
- *Socrates is a man (P)*
- *Therefore Socrates is mortal (Q)*

Fallacy: Affirming the consequent

- However, don't confuse modus ponens with the following form of argument, which is not valid!
- Affirming the consequent - If *P* then *Q*. *Q*. Therefore, *P*.
- If Jane lives in London then Jane lives in England. Jane lives in England. Therefore Jane lives in London. [*Not valid - perhaps Jane lives in Liverpool*.]

Modus tollens

- Modus tollens - If *P* then *Q*. Not-*Q*. Therefore, not-*P*.
- If *Q* means "Today is hot.", then "not-*Q*" can be used to translate "It is not the case that today is hot", or "Today is not hot."
- If Betty is on the plane, she will be in the A1 seat. But Betty is not in the A1 seat. So she is not on the plane.

Modus tollens

- If I am the axe murderer (P), then I used an axe (Q).
- I cannot use an axe (not-Q).
- Therefore, I am not the axe murderer (not_P).

Denying the antecedent

- But do distinguish *modus tollens* from the following fallacious pattern of argument : - If *P* then *Q*, not-*P*. Therefore, not-*Q*.
- If Betty is competent, she will get an important job.
- But Betty is not competent. So she will not get an important job.
- [Not valid : Perhaps Betty is incompetent but her boss employs her because her father is an important man.]

Denying the antecedent

- If Queen Elizabeth is an American citizen (P), then she is a human being (Q).
- Queen Elizabeth is not an American citizen (not-P).
- Therefore, Queen Elizabeth is not a human being (not-Q).

Hypothetical syllogism

- If *P* then *Q*, If *Q* then *R*. Therefore, if *P* then *R*.
- If God created the universe then the universe will be perfect. If the universe is perfect then there will be no evil. So if God created the universe there will be no evil.

Disjunctive syllogism

- *P* or *Q*. Not-*P*. Therefore, *Q* ; *P* or *Q*, Not-*Q*. Therefore, *P*.
- Either the government brings about more sensible educational reforms, or the only good schools left will be private ones for rich kids. The government is not going to carry out sensible educational reforms. So the only good schools left will be private ones for rich kids.

Identify the forms of the valid arguments

- If Mary loves me, then I love Mary. I do not love Mary. Therefore, Mary does not love me.

1. MT/MP/ HS/ DS/

Either Jimmy is walking the dog or Claire is feeding the cat. Claire is not feeding the cat. Therefore Jimmy is walking the dog.

2. DS/MP/ HS/MT/

Identify the forms of the valid arguments

- If some sheep are black, then some ducks are pink. It is not true that some ducks are pink. Therefore, it is not true that some sheep are black.

3. MT/MP/ HS/ DS/

- If God is perfect, then God knows what people intend to do in the future. If God knows what people intend to do in the future, then God can stop people from bringing about evil.

4. HS/DS/MT/MP/

3. System-relative Validity

- $A_1 \ldots A_{n-1}$, A_n ($n \geq 1$) of which $A_1 \ldots A_{n-1}$ are the premises, and A_n the conclusion.
- Syntactic Validity:
- $A_1 \ldots A_{n-1}$, A_n is valid-in-L just in case A_n is derivable from $A_1 \ldots A_{n-1}$, and the axioms of L, if any, by the rules of inference of L.
- $A_1 \ldots A_{n-1} \vdash_L A_n$

Semantic Validity

- Semantic Validity:
- $A_1 \ldots A_{n-1}$, A_n is valid-in-L just in case A_n is true in all interpretations in which $A_1 \ldots A_{n-1}$ are true
- $A_1 \ldots A_{n-1} \vdash_L A_n$
- The 'L' in '$\vdash_L$' and '$\models_L$' serves to remind one that both these conceptions of validity are system-relative.

Zero-premise conclusions

- A is valid-in-L (is a theorem of L) just in case A follows from the axioms of L, if any, by the rules of inference of L ($\vdash_L A$).
- A is valid-in-L (is a logical truth of L) just in case A is true in all interpretations of L ($\models_L A_n$)