

CM0845 Logic

Introduction

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Administrative Information

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Course web page

<https://asr.github.io/courses/cm0845-logic/>

Exams, programming labs, bibliography, etc.

See course web page.

Tentative Program Course

- ▶ Propositional/First-order logic
 - ▶ Syntax for propositional/first-order logic
 - ▶ Semantics for propositional/first-order logic
 - ▶ Deductive systems
 - ▶ Normal forms
 - ▶ Resolution
- ▶ Intuitionistic logic
 - ▶ Constructivist reasoning
 - ▶ Propositional intuitionistic logic
 - ▶ First-order intuitionistic logic

The Central Problem of the Logic

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*It is easy to find answers to the question 'What is Logic?' According to Charles Peirce 'Nearly a **hundred** definitions of it have been given'. But Pierce goes on to write: 'It, will, however, generally conceded that its **central problem** is the classification of arguments, so that all those that are **bad** are thrown into one division, and those which are **good** into another ...'. [Copi 1973, p. 1]*

Preliminary Definitions

Definition

A **proposition** (or **statement**) is sentence that can be assigned a truth value of **true** or **false**.

Remark

The propositions do not include questions, exclamations or commands.

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A **(deductive) argument** is a finite set of propositions of which one (called the **conclusion**) is claimed to follow **only** from the others (called the **premises**), which are regards as grounds for the truth of that one [Copi 1973].

Preliminary Definitions

Definition

El lógico responde a la pregunta: ¿Se sigue la **conclusión** de las **premisas** que se han supuesto? Si afirmar la **verdad** de las **premisas** constituye una verdadera garantía para afirmar la **verdad** de la **conclusión** entonces el **argumento** es **válido**, de lo contrario es **inválido** [Sierra A. 2010].

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Remark

Note that a proposition can be **true** or **false**, and an argument can be **valid** or **invalid**.

Argumentos válidos		
	Conclusión verdadera	Conclusión falsa
Premisas verdaderas	[1] [Todos los números naturales son números enteros], [2] [todos los números enteros son números racionales]. Por lo tanto, [3] [todos los números naturales son números racionales].	Imposible
Premisas falsas	[1] [Todos los presidentes son depredadores], [2] [todos los depredadores son humanos]. Por lo que, [3] [Todos los presidentes son humanos].	[1] [Algunos caballos vuelan], [2] [todo el que vuela es un gran empresario]. Luego, [3] [algunos caballos son grandes empresarios].

Figure from [Sierra A. 2010].

Argumentos inválidos		
	Conclusión verdadera	Conclusión falsa
Premisas verdaderas	[1] [Cuando el sol agote su combustible entonces no irradiará calor]. [2] [el sol no agotó su combustible]. Por lo tanto, [3] [el sol irradia calor].	[1] [Cuando el sol agote su combustible entonces no irradiará calor], [2] [el sol irradia calor]. Por lo tanto, [3] [él sol agotó su combustible].
Premisas falsas	[1] [Todos los presidentes son depredadores], [2] [todos los depredadores son humanos]. Por lo que, [3] [algunos depredadores no son presidentes].	[1] [Todos los presidentes son depredadores], [2] [todos los depredadores son humanos]. Por lo que, [3] [algunos presidentes no son humanos].

Figure from [Sierra A. 2010].

References

-  Copi, Irving M. [1954] (1973). *Symbolic Logic*. 4th ed. Macmillan Publishing Co. (cit. on pp. 4–7).
-  Mendelson, Elliott [1964] (2015). *Introduction to Mathematical Logic*. 6th ed. CRC Press (cit. on pp. 4, 5).
-  Sierra A., Manuel (2010). *Argumentación Deductiva con Diagramas y Árboles de Forzamiento*. Fondo Editorial Universidad EAFIT (cit. on pp. 8–11).