CM0845 Logic
Introduction

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Course web page

http://www1.eafit.edu.co/asr/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

One of the popular definitions of logic is that is the analysis of methods of reasoning. In studying these methods, logic is interested in the form rather than the content of the argument. [Mendelson 2015, p. xv]

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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.

Truth and Validity

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].

Truth and Validity

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).