Review of Propositional Logic 1/2

Online lecture

Thinh Tien Nguyen, Ph.D.

Propositions

Definition:

Proposition is a declarative sentence which is either true (T) or false (F) but not both

Ex:

p: 2+2=4

q: Toronto is the capital of Canada

Ex:

What time is it?

Read it carefully!

Atomic propositions and Compound propositions

Definition:

Atomic propositions are propositions that cannot be expressed in terms of simpler propositions

Ex:

p: 2+2=4

q: Toronto is the capital of Canada

Atomic propositions and Compound propositions

Definition:

Compound propositions are propositions that can be formed from existing propositions using logical operators, e.g. NEGATION, AND, OR, ...

Ex:

p: 2+2=4

q: Toronto is the capital of Canada

p AND q: 2+2=4 AND Toronto is the capital of Canada

Logical operators: NEGATION

Definition:

The negation of a proposition p is the statement

“It is not the case that p”

The negation of p is denoted by ¬p. The truth value of ¬p is the opposite of the truth value of p

Ex:

p: Michael’s PC runs Linux

¬p: Michael’s PC does not run Linux

p	¬p
T	F
F	T

Logical operators: CONJUNCTION

Definition:

The conjunction of propositions p and q is the proposition “p and q”

The conjunction of p and q is denoted by $p \wedge q$

The truth value of $p \wedge q$ is true when both p and q are true and is false otherwise

Ex:

p: 4 is an even number

q: 3 is a prime number

$p \wedge q$: 4 is an even number and 3 is a prime number

Logical operators: CONJUNCTION

p	q	p∧q
T	T	T
T	F	F
F	T	F
F	F	F

Logical operators: DISJUNCTION

Definition:

The disjunction of propositions p and q is the proposition “p or q”

The disjunction of p and q is denoted by $p \vee q$

The truth value of $p \vee q$ is true when both p and q are true or when exactly one of p and q is true

Ex:

p: Nguyễn is a family name in Vietnam

q: 4 is divisible by 2

$p \vee q$: Nguyễn is a family name in Vietnam or 4 is divisible by 2

Logical operators: DISJUNCTION

p	q	pVq
T	T	T
T	F	T
F	T	T
F	F	F