Logic for AI — Master 1 Informatique
Class Assignment #1: Propositional Logic

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1 Formalization

Given the following symbols and sentences:

- f = "John is fit"

- l = "John is lucky"

- w = "the weather is good"

- c = "John succeeds in climbing mount Everest"

Formalize the following sentences in propositional logic:

1. John is fit and lucky

2. John is fit but not lucky, and the weather is not good.

3. If John is not fit and lucky, then he does not succeed in climbing mount Everest.

4. John succeeds in climbing mount Everest if he is fit and if the weather is good

5. If the weather is not good but John is lucky and fit, he succeeds in climbing mount Everest

6. If it is the case that the weather is good provided that John is lucky, then John succeeds in climbing mount Everest if he is fit and lucky.

2 Evaluation of Propositional Sentences

Let $\mathcal{I}$ be defined as follows:

constant	p	q	r
truth value	F	F	T

Evaluate the following sentences:

1. $p \Rightarrow q$

2. $q \Rightarrow r$

3. $r \Rightarrow p$

4. $\neg(q \Leftrightarrow r) \vee p$

5. $(p \Rightarrow (q \Rightarrow r)) \Leftrightarrow ((p \wedge q) \Rightarrow r)$

6. $(p \Rightarrow q) \Leftrightarrow (\neg q \Rightarrow \neg p)$

7. $\neg q \wedge (p \vee q) \wedge (q \vee r) \wedge (p \Rightarrow \neg r)$

3 Truth Tables

For each of the following sentences, list their properties (i.e., are they valid, satisfiable, contingent, falsifiable, or unsatisfiable):

1. $p \Rightarrow q$

2. $q \Rightarrow r$

3. $r \Rightarrow p$

4. $\neg(q \Leftrightarrow r) \vee p$

5. $(p \Rightarrow (q \Rightarrow r)) \Leftrightarrow ((p \wedge q) \Rightarrow r)$

6. $(p \Rightarrow q) \Leftrightarrow (\neg q \Rightarrow \neg p)$

7. $\neg q \wedge (p \vee q) \wedge (q \vee r) \wedge (p \Rightarrow \neg r)$