Truth Tables for Propositions

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Today's Plan

Truth Tables for Propositions

1. What is a truth table and how to build a truth table
2. Computing compound propositions
3. Classifying propositional statements
4. Comparing propositional statements
5. Exercises

LAST WEEK: Summary of Previous Lecture

Every compound proposition has the property of bivalence.

Propositional Logic allows us to create compound propositions
We saw that if you know the value of its elements you can calculate the truth value of the whole proposition by looking at the main operator

Example:

TODAY: we will look at the case where we don t know the value of the elements contained in the proposition.

We look at how to build Truth tables and how to use them to calculate all possible truth values of a proposition

Looking at all possible truth values affords us to do two things:

1. classify specific types of statements. Some of those are always good and always true statements (these are called tautological) some of those are not etc..

2. compare compound statements. So, assess complex arguments

1. HOW TO CONSTRUCT A TRUTH TABLE

Equation tells how many lines a truth table need to be in order to adequately capture all possible truth values

L = number of lines
2 = numerical
n = number of propositional variables (unique propositional variables)

STEPS

1. Determine number of lines required
2. Make sure you consistently record the truth table (last version T/F; T/F; T/F)
3. Compute the table using the truth functional rules

2. ANALYSE COMPOUND PROPOSITIONS

If Cecilia goes to the party and Dave is not going to the party, then Erik will go to the party.

Under which conditions these statements will be truth?

3. CLASSIFYING STATEMENTS

1. TAUTOLOGY (all the values that fall under the main operator are true)
2. SELF CONTRADICTORY (all false values under the main operator – all possible conditions are always false: avoid)
3. CONTINGENT (mixed values under the main operator, at least one true and one false

Number of different simple propositions	Number of lines in truth table
1	2
2	4
3	8
4	16
5	32
6	64

If George goes to the party Harry is gonna go, and George is gonna go then Harry is gonna go.

4. COMPARING STATEMENTS (comparing two compound statements)

There are 4 possibilities:

1. LOGICALLY EQUIVALENT (identical values under the main operator)

2. CONTRADICTORY (opposite values under the main operator)

3. CONSISTENT (at least one line where both statements are true)

4. INCONSISTENT (there is no line where both statements are true) – they cannot be both truth at the same

INTERMIDIATE SUMMARY

- 3 types of statements:
  Tautology (all true values)
  Self Contradictory (all false values)
  Contingent (mixed values)

  When you compare such statements you get:
  Logically equivalent (identical values)
  Contradictory (opposite truth values)
  Consistent (at least one line where both are true)
  Inconsistent (no line where both are true)

ANALOGY WITH CSI CASE -

TWO WITNESSES

1. LOGICAL EQUIVALENCE – they both have the same story
2. CONTRADICTION – one of the them is telling truth; the other is telling a false story
3. CONSISTENCY - both could possibly be lying but is a possibility that they can both say the truth
4. INCONSISTENCY – both could be lying but there is no way in which both are telling truth

EXERCISES

Tautology, self contradictory, or contingent statements?

- WHAT YOU LEARNED TODAY?

- HOW TO COMPUTE TRUTH TABLES
- WHAT IS THE DIFFERENCE BETWEEN TAUTOLOGICAL, SELF CONTRADICTORY AND CONTIGENT STATEMENTS
- WHEN TWO STATEMENTS ARE LOGICALLY EQUIVALENT, CONTRADICTORY, CONSISTENT, INCONSISTENT

- PRACTICE MAKES IT PERFECT