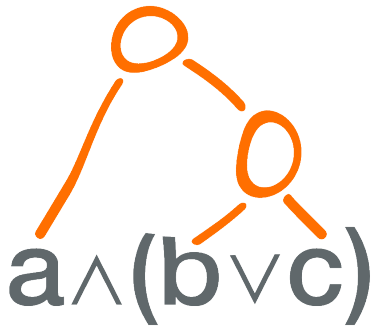
Nyāya for iPad

Interactive Environment with BoolTool



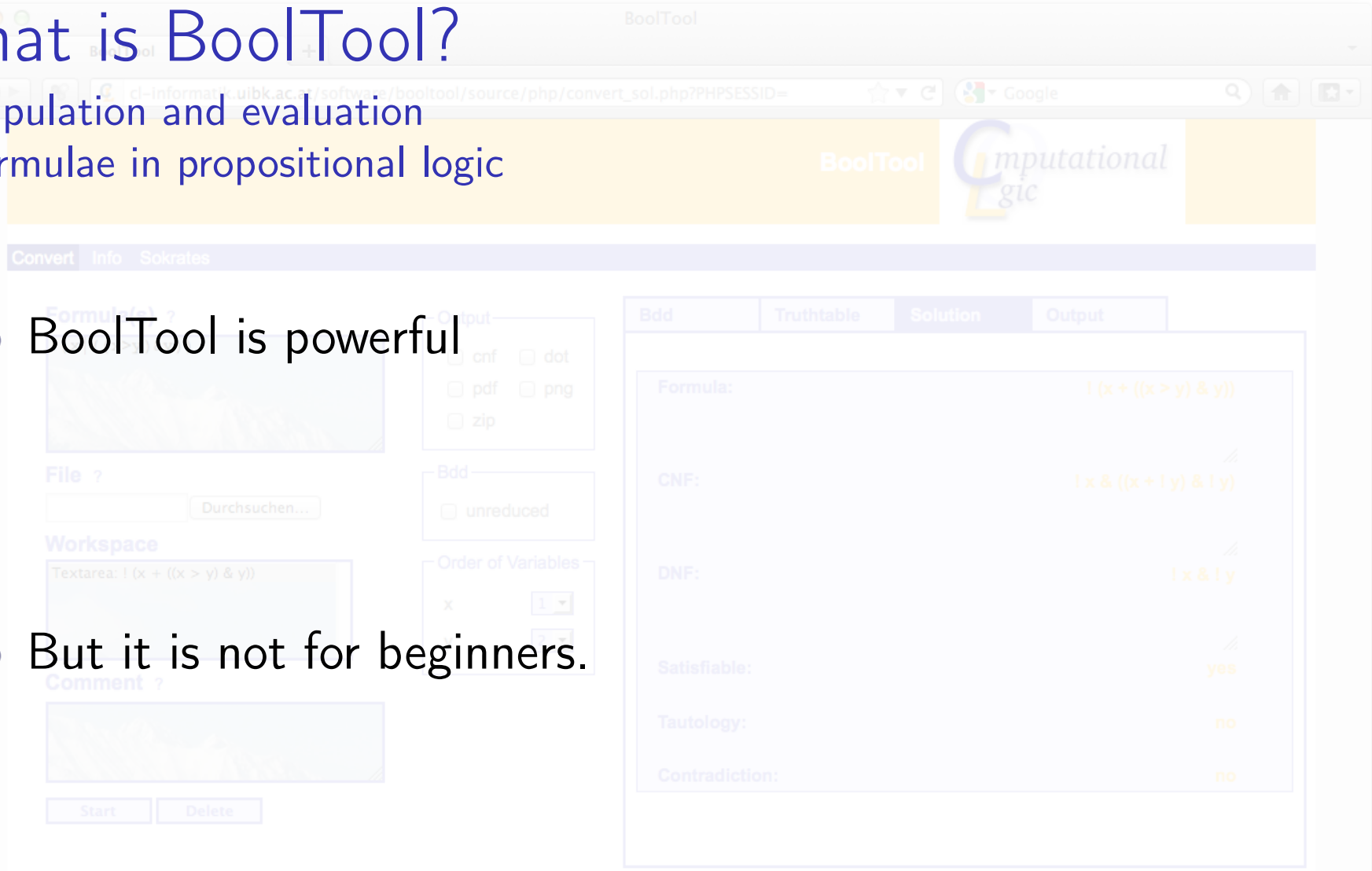
Alexander Maringele

March 5th, 2013

Supervisor: Dr. Georg Moser

What is BoolTool?

Manipulation and evaluation of formulae in propositional logic



- BoolTool is powerful
- But it is not for beginners.

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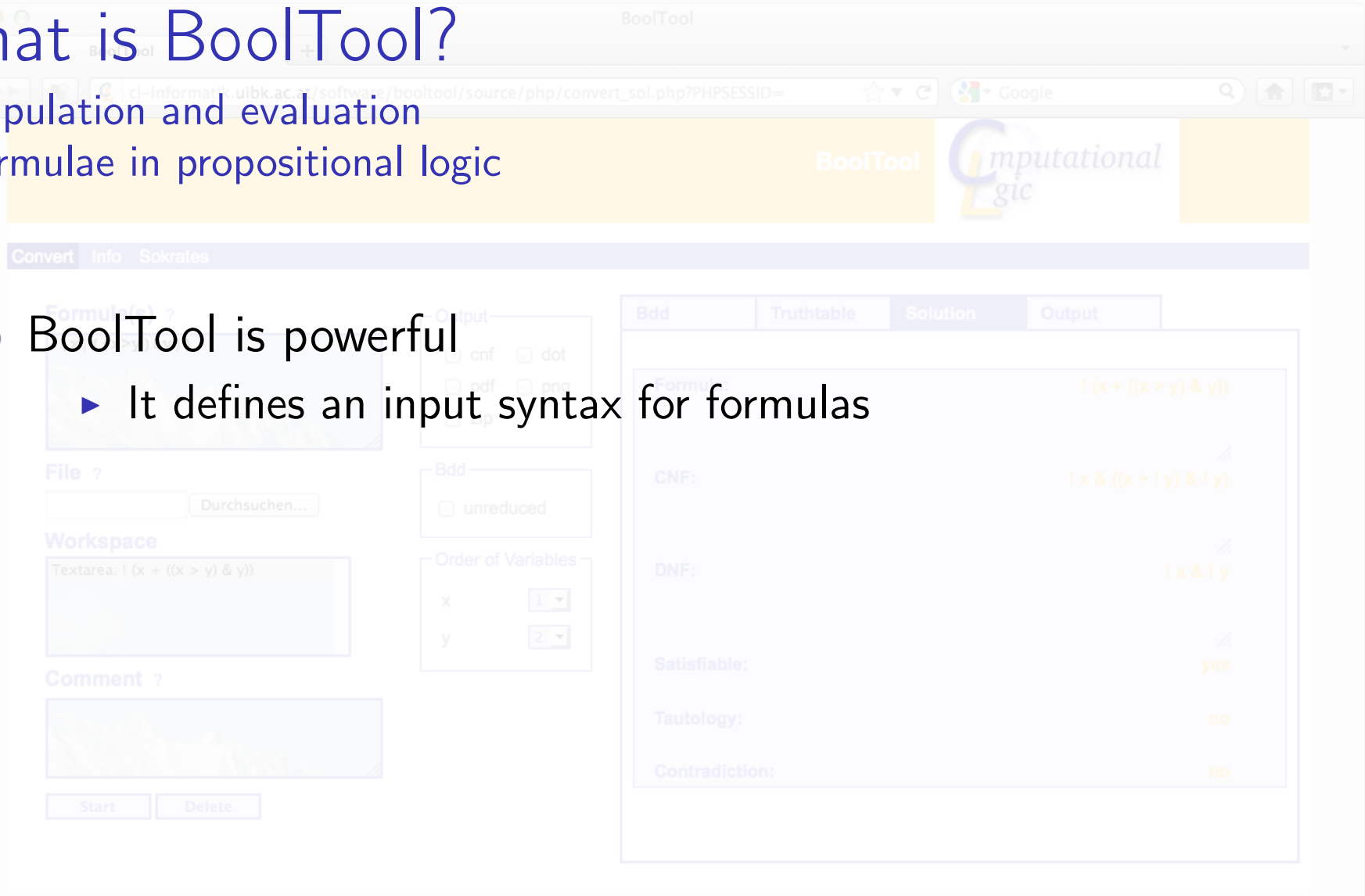

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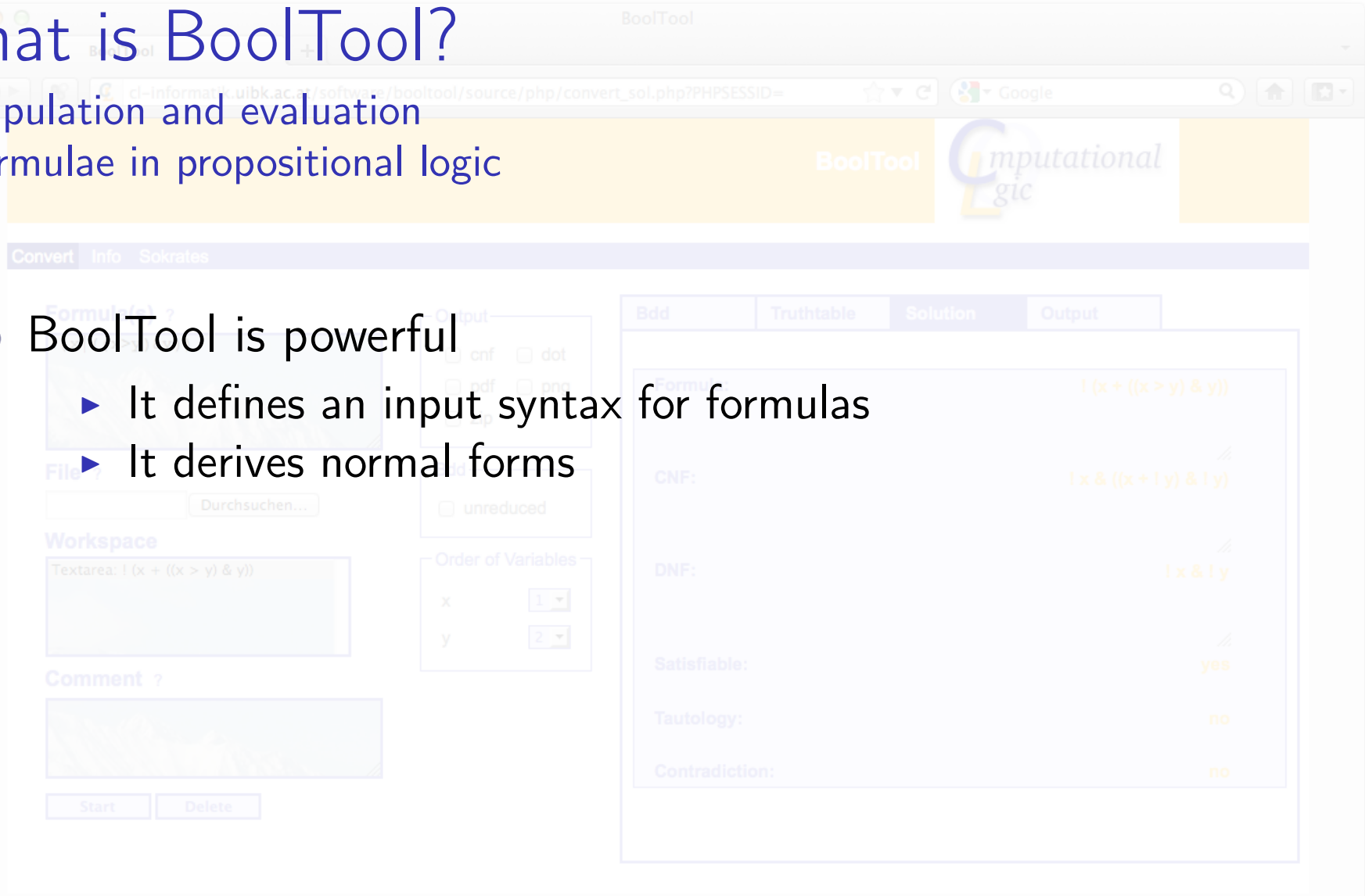

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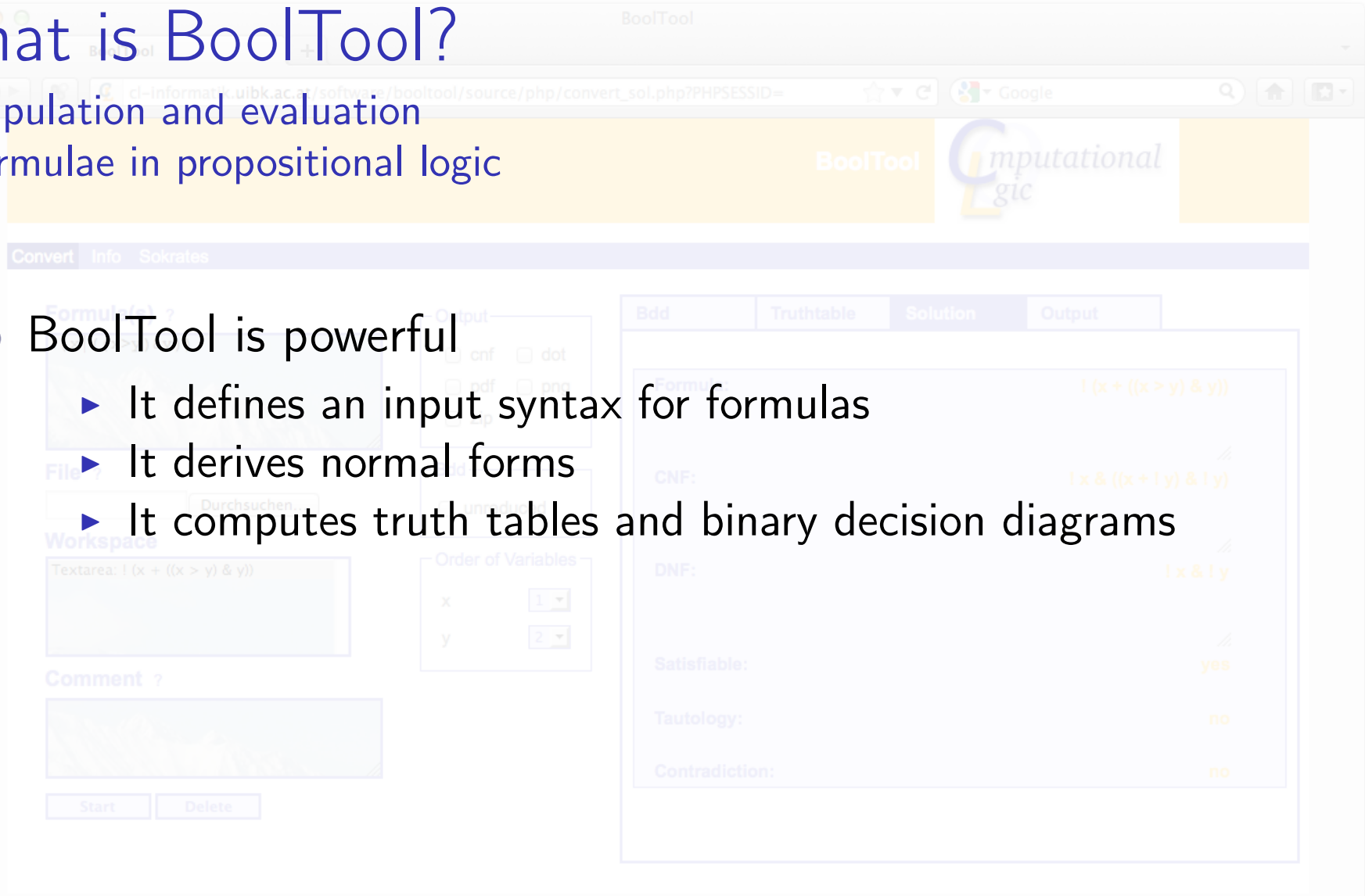

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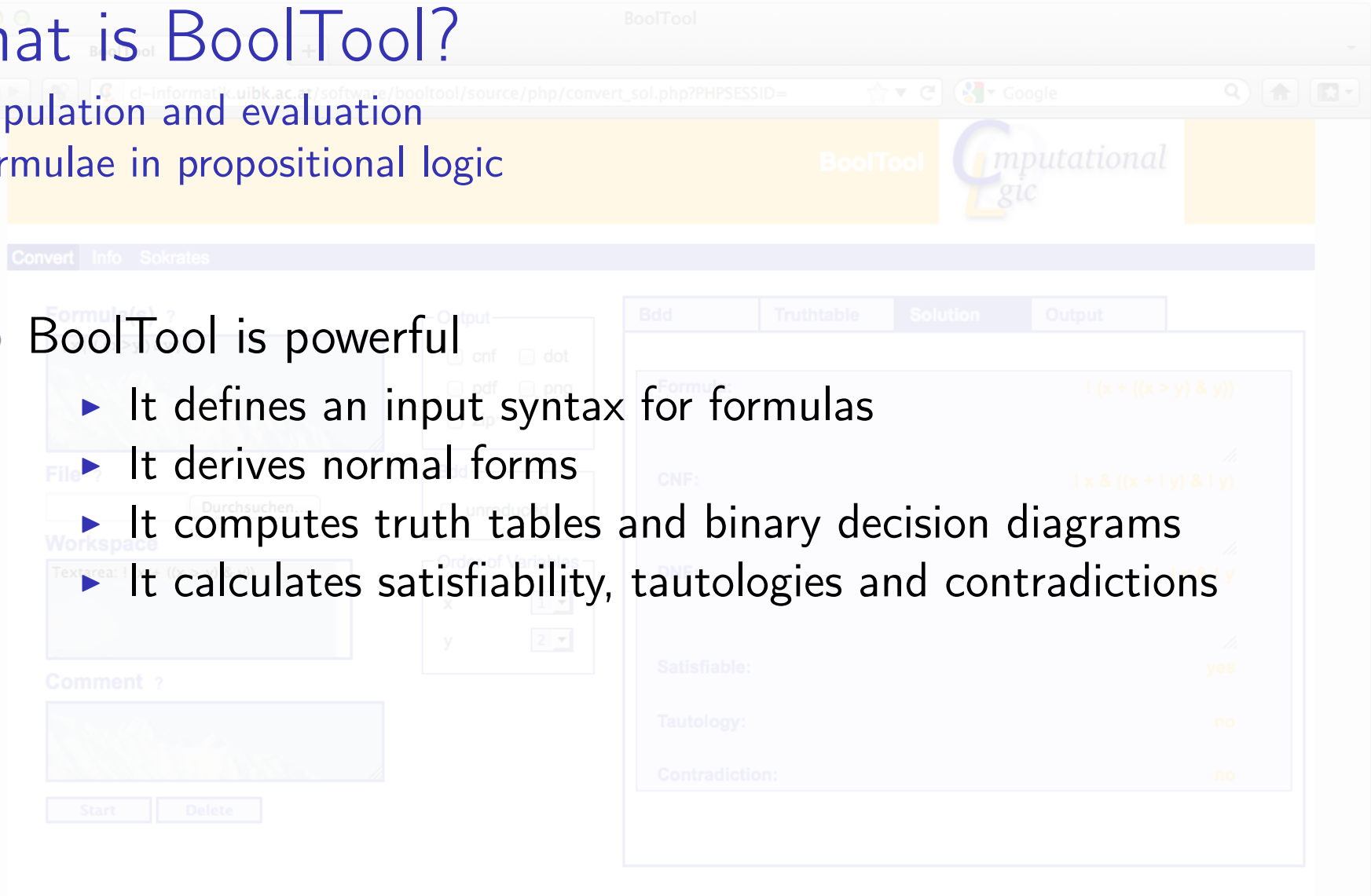

- BoolTool is powerful
  - It defines an input syntax for formulas
  - It derives normal forms
  - It computes truth tables and binary decision diagrams
  - It calculates satisfiability, tautologies and contradictions

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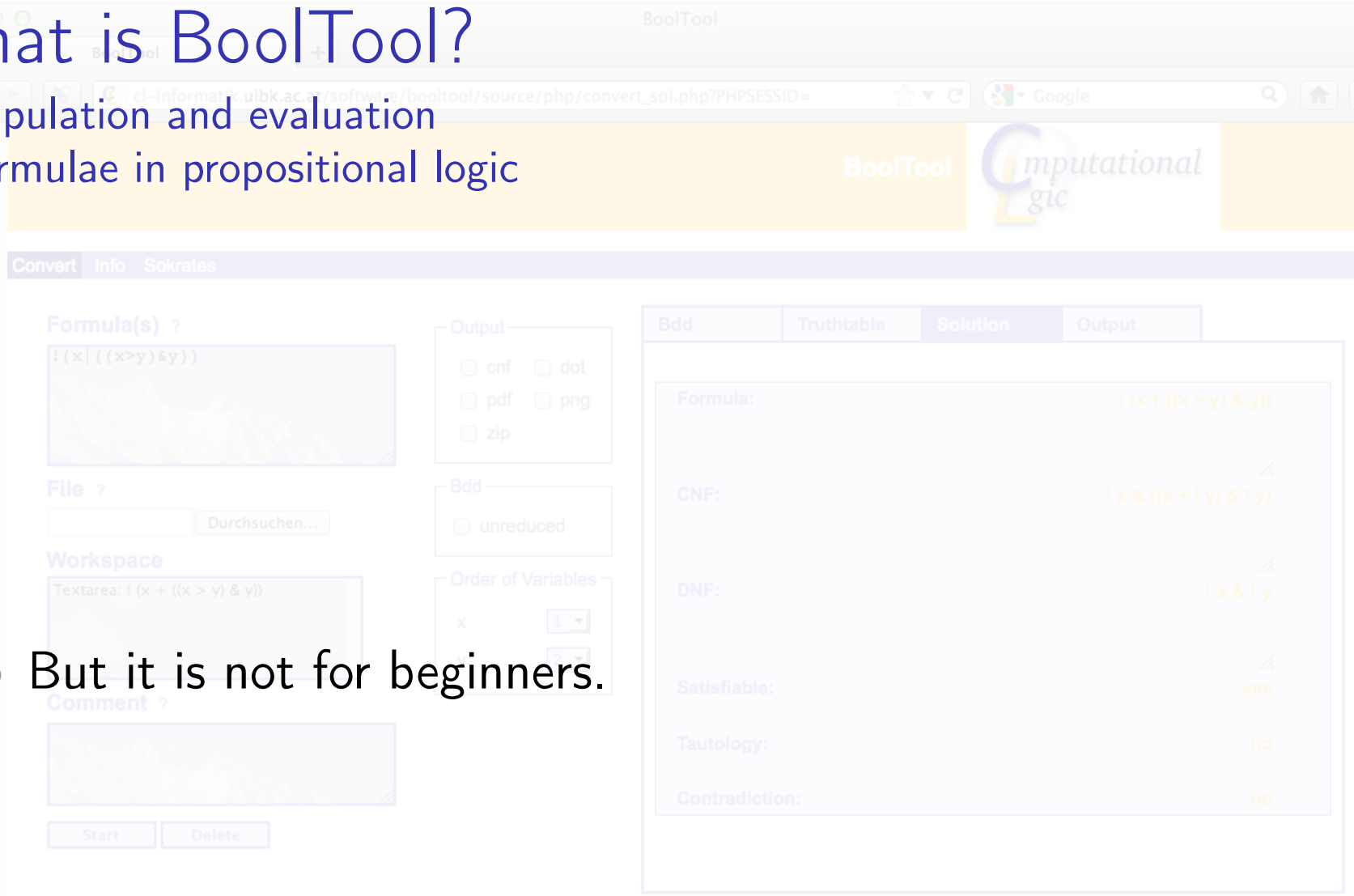

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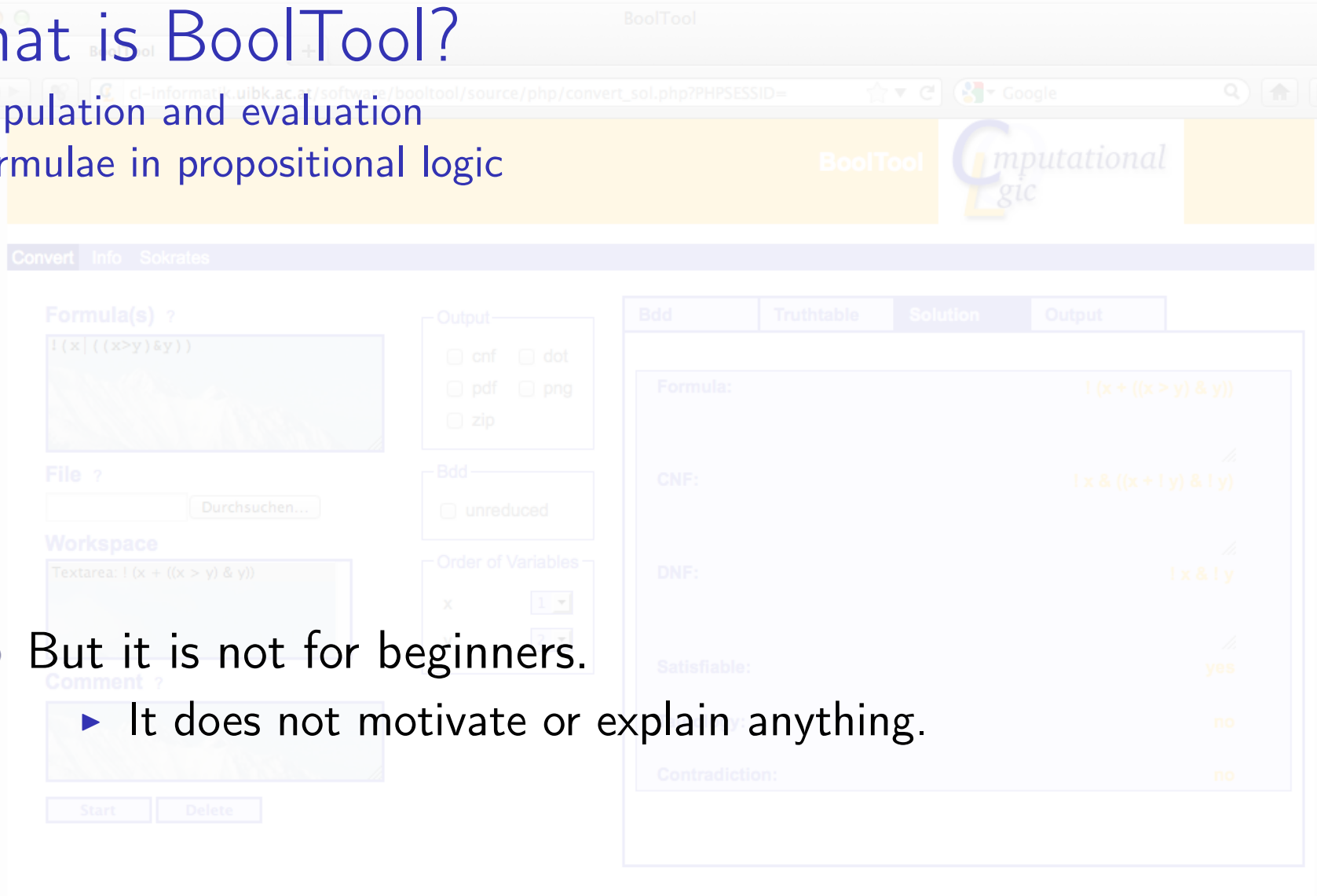

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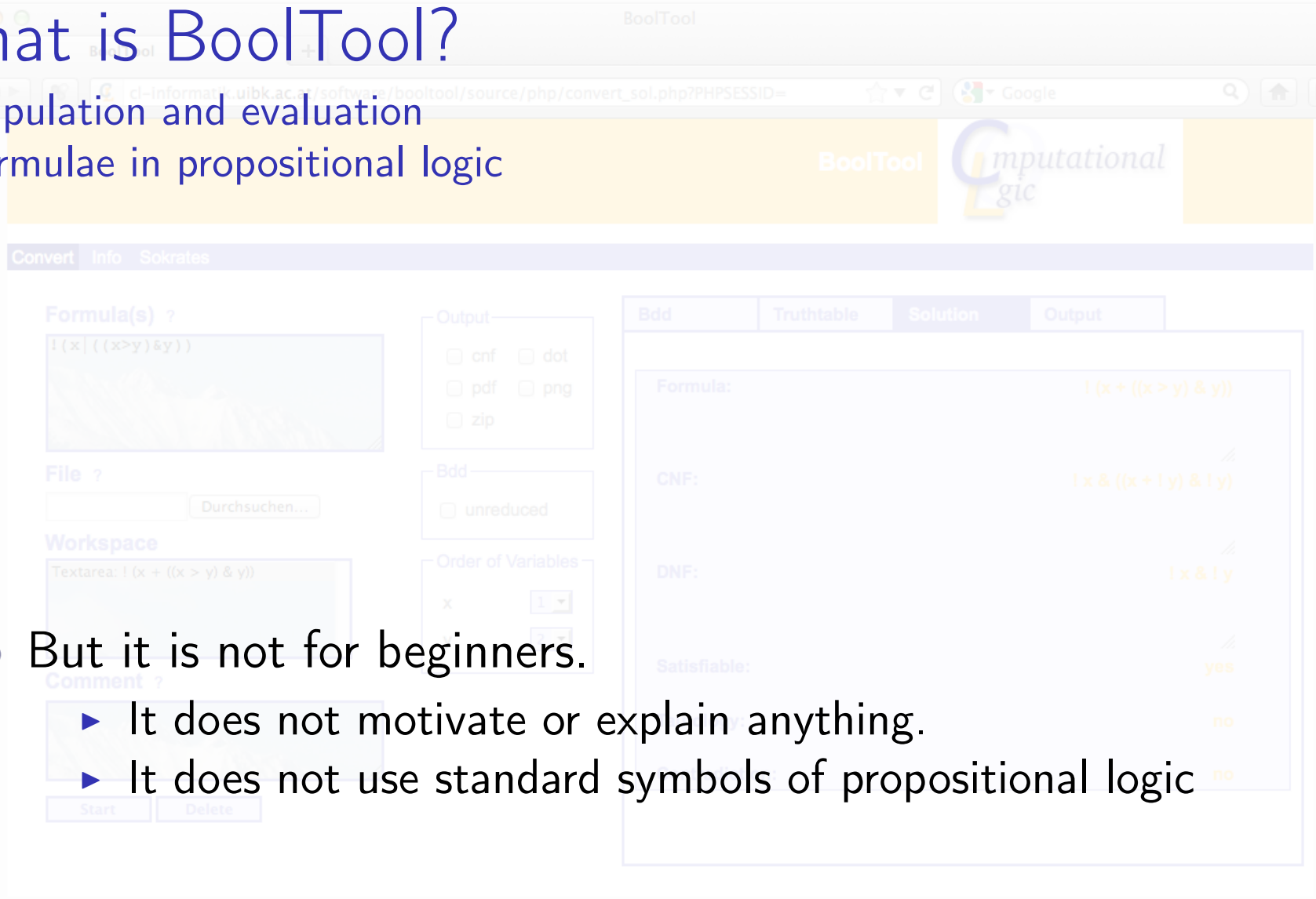

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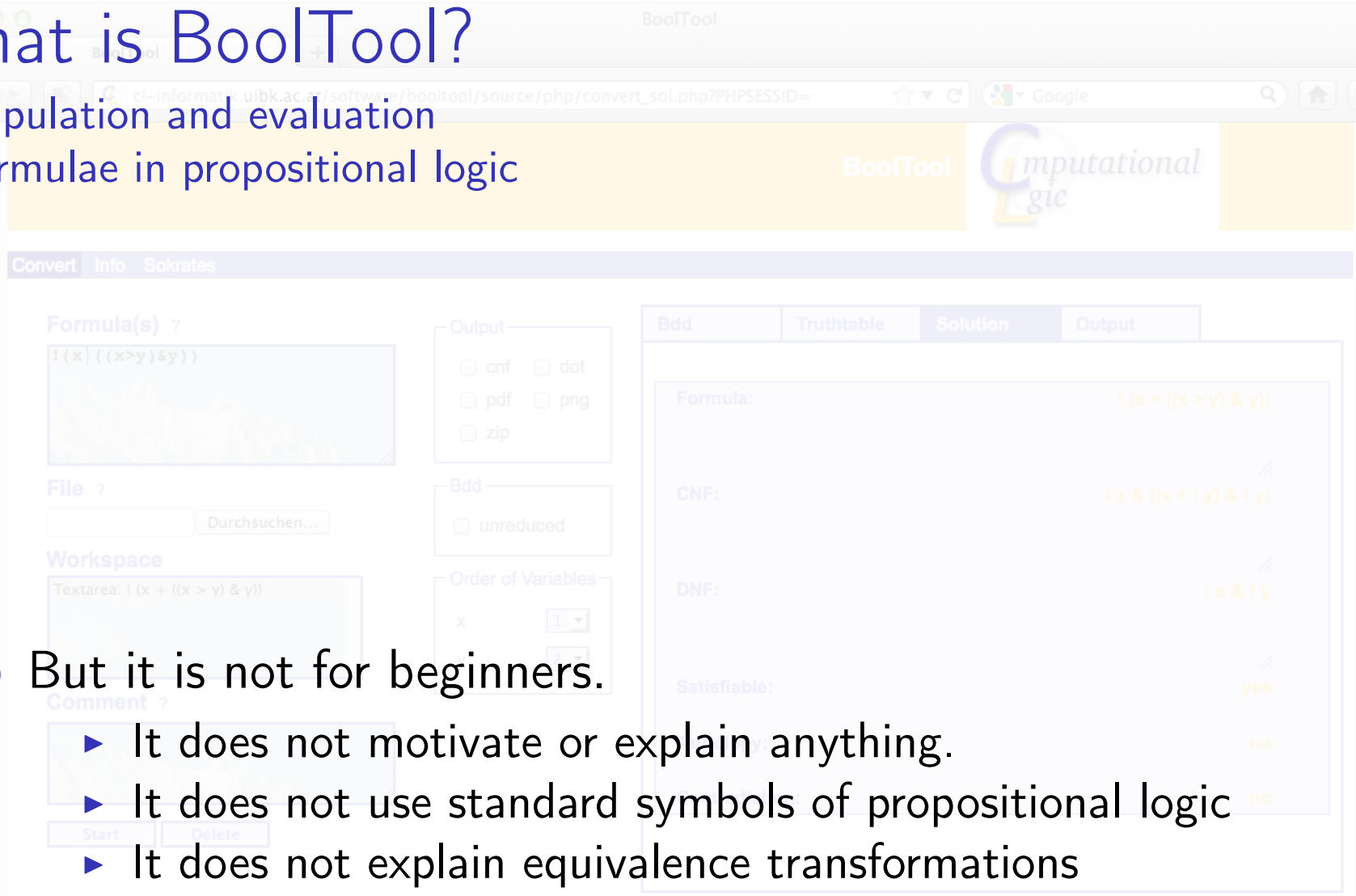

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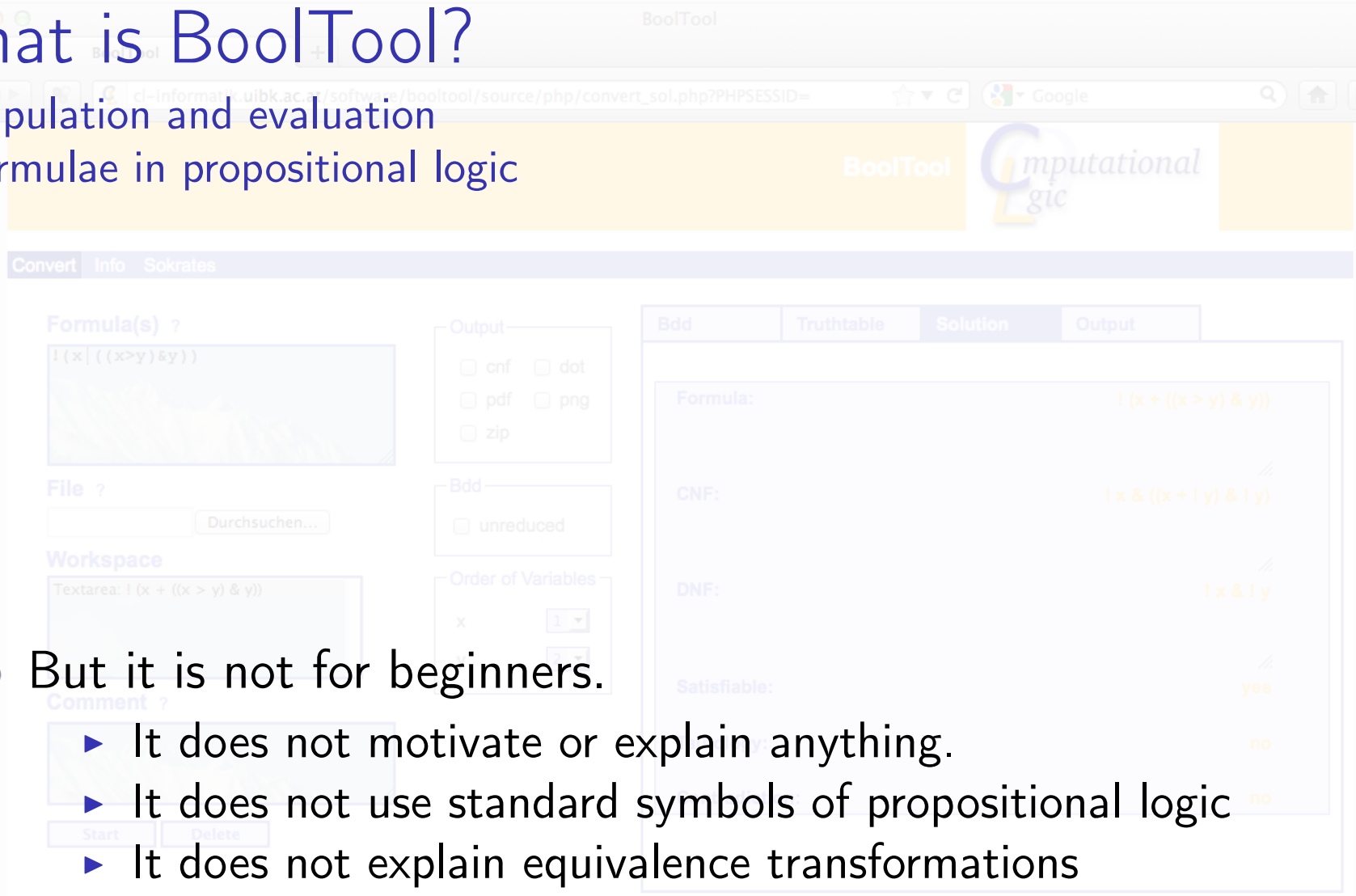

- But it is not for beginners.
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  - It does not explain equivalence transformations
  - It does not define normal forms.

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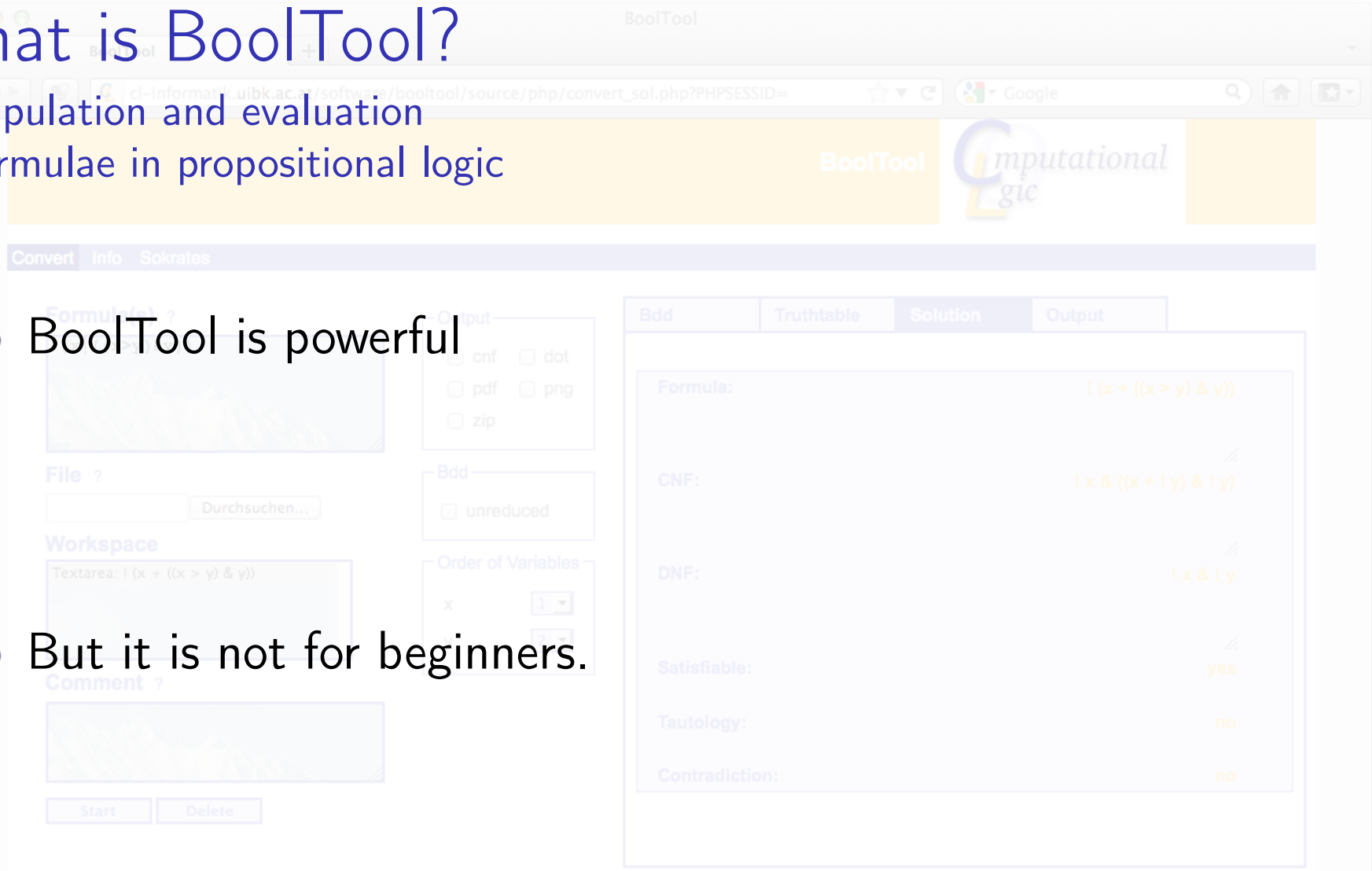

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What is an iPad?

not: useless, an big iphone, the saviour of the newspaper industry
always on, small screen, single window, small ram, small ops

What is Nyāya?

Project Aim

Allow the user to learn

- Formalism of propositional logic
- Separation of syntax and semantics
- Normal forms (NNF, CNF, DNF)
- Standard transformations of Boolean functions
- Coherence of different representations

in a self-explanatory environment.

What is Nyāya?

Platform agnostic concept

- Tutorials for general concepts and definitions
- Exercises to consolidate the learned concepts and definitions
- Playground to build and transform formulas
- Glossary of technical terms
- BoolTool

What is Nyāya?

Platform specific iPad App

Nyāya for iPad

A learning tool for propositional logic

Nyāya is an interactive environment to learn simple facts about the formalism of propositional logic and standard transformations of Boolean functions. It is integrated with BoolTool (provided by the Compututational Logic Research Group at the Institute of Computer Science on the University of Innsbruck) which allows the manipulation and evaluation of boolean functions. BoolTool supports different representations of boolean functions and a variety of different algorithms.

Overview

The tab bar on the bottom of this page let you switch between the five individual areas ot the app

- Nyāya – the first and actual page – presents an overview of the app.
- The Tutorials provides an introduction to propositional logic and exercises for knowledge checks.
- The Playground is a place to create and manipulate formulas freely.
- The Glossary is a simple list of technical terms used in propositional logic and this app.
- BoolTool provides an implementation of BoolTool that does not need an internet connection. It provides a native user interface which works similar to the new and simplified web interface.

Credentials

- Nyāya for iPad was implemented as part of a bachelor course in computer science at the University of Innsbruck and was supervised by Georg Moser.
- [LICS] Logic in Computer Science, Modelling and Reasoning about Systems, Michael Huth und Mark Ryan (Cambridge University Press 2004)
- [LLOG] Lecture Logic by Aart Middledorp (University of Innsbruck 2011/12).
- Nyaya's introduction to propositional logic follows corresponding sections in [LICS] and the structure of [LLOG].
- "Nyāya" (Sanskrit ni-āyá, literally "recursion" with the meaning "syllogism, inference") is one school of Hindu philosophy — specifically the school of logic. *Obtaining valid knowledge is the only way to obtain release from suffering.* (cited from wikipedia)

Tutorials

a	b	a∧b	a∨b	a⟶b
T	T	T	T	T
T	F	F	T	F
F	T	F	T	T
F	F	F	F	T

	a	b	c	¬b	¬b ∧ c	a ∨ (¬b ∧ c)	(a ∨ (¬b ∧ c)) ⟶ a
v	T	T	T	F	F	T	T
v	T	T	F	F	F	T	T
v	T	F	T	T	T	T	T
v	T	F	F	T	F	T	T
v	F	T	T	F	F	F	T
v	F	T	F	F	F	F	T
v	F	F	T	T	T	T	F
v	F	F	F	T	F	F	T

a	b	b⟶a	a⟶b
T	T	T	T

Exercises

check anwswer
next question
close exercise
Evaluate formula and tap on buttons to change truth values.
r
q
q → r
T
T
T
T
T
F
T
T
F
T
F
F
F
F
F
T

Playground

Glossary

BoolTool

Sources

- Barwise, Etchemendy und Barker Plummer, **Tarski's World**
- Middeldorp, **Logic**, Lecture
- Huth and Ryan, **Logic in Computer Science**
- Apple iOS Developer Documentation