IA008: Computational Logic
Introduction

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Why Logic?

Logics are formal languages to make statements about mathematical objects.

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Logics are formal languages to make statements about mathematical objects.

They are used everywhere in computer science:

- databases (SQL)
- regular expressions
- software verification, hardware verification
- controller synthesis
- type systems
- SAT-solvers (optimisation)
- theorem provers

Basic logic problems

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Model Checking

Given a model $\mathfrak{M}$ and a formula φ, check whether $\mathfrak{M} \vDash \varphi$.

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Satisfiability

Given a formula φ, check whether there is some model $\mathfrak{M}$ with $\mathfrak{M} \vDash \varphi$.

Course organisation

Lectures

- **Thursday, 10:00, D1**
- language: English
- slides and video recordings will be available in IS

Exercise classes

- exercises done by students
- come prepared

Examination

- final written exam
- in English
- **k** and **z** completion possible

Prerequisites

- basic knowledge of logic
- propositional and first-order logic
- formula, model, satisfaction relation, entailment relation
- syntactic normal forms

Topics covered

- propositional logic, resolution
- first-order logic, proof calculi (tableaux and natural deduction)
- Prolog, databases
- expressive power, back-and-forth arguments
- modal logic
- induction
- many-valued logic (if time permits)